PB92156421

A History of the Rectangular Survey System

U.S. DEPARTMENT OF THE INTERIOR
Bureau of Land Management

REPRODUCED BY
U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL
INFORMATION SERVICE
SPRINGFIELD, VA 22161

The United States of America,

To ALL to whom thefe prefents fhall come, Greeting:

KNOW YE, That for the confideration of Six hundred and forty Dollars, we have granted, and hereby do Grant and confirm unto John Martin the Lot numbered Twenty in the Townfhip, numbered Seven in the Range Fourth excepting and referving one third Part of all Gold, Silver, Lead and Copper Mines within the fame, for future Sale or Difpofition: To have to the faid John Martin his Heirs and Affigns for ever.

IN WITNESS WHEREOF, We, the Commiffioners of the Board of Treafury have, in conformity to an Act of Congrefs of the faid United States, of the Twenty-firft day of April, in the Year of our Lord, one Thoufand Seven Hundred and Eighty-feven, hereunto fet our Hands and affixed the Seal of the Treafury, this Fourth day of March in the Year of our Lord, One Thoufand Seven Hundred and Eighty Eight and of the Independence of the United States of America the Twelfth

(signed, Samuel Osgood,
Walter Livingston)

PB92-156421

Commd

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The United States of America,

To all to whom these presents shall come, Greeting:

Homestead Certificate No. 1
Application 1

Whereas, there has been deposited in the **General Land Office** of the United States, a CERTIFICATE of the **Register of the Land Office** at Brownville Nebraska, whereby it appears that pursuant to the Act of Congress approved 20th May, 1862, "To secure Homesteads to actual Settlers on the public domain," and the acts supplemental thereto the claim of Daniel Freeman has been established and duly consummated in conformity to law for the South half of the North West quarter and the North East quarter of the North West quarter and the South West quarter of the North East quarter of Section twenty six in Township four North of Range five East in the District of lands formerly subject to sale at Brownville near Beatrice, Nebraska — Containing One hundred and sixty acres

according to the Official Plat of the Survey of the said Land returned to the **General Land Office** by the Surveyor General.

Now know ye, That there is therefore granted by the UNITED STATES unto the said Daniel Freeman the tract of Land above described: **To Have and to Hold** the said tract of Land, with the appurtenances thereof, unto the said Daniel Freeman and to his heirs and assigns forever.

In testimony whereof, I, Ulysses S Grant, PRESIDENT OF THE UNITED STATES OF AMERICA, have caused these letters to be made Patent, and the **Seal of the General Land Office** to be hereunto affixed.

Given under my hand, at the CITY OF WASHINGTON, the first day of September, in the year of our Lord one thousand eight hundred and Sixty nine, and of the INDEPENDENCE OF THE UNITED STATES the Ninety fourth

By the President: U S Grant

By S. N. Burrett, Secy

J N Granger, Recorder of the General Land Office

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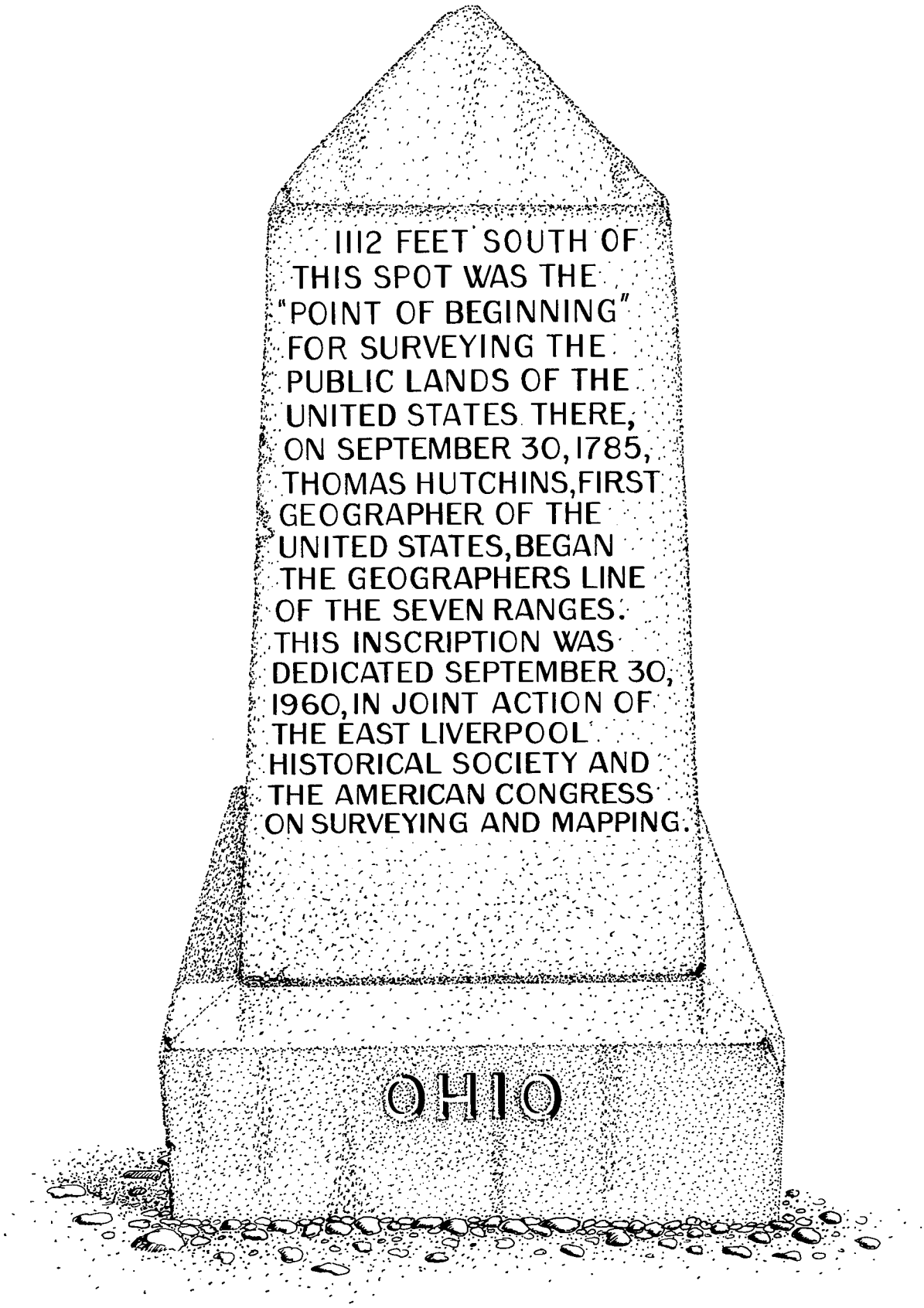
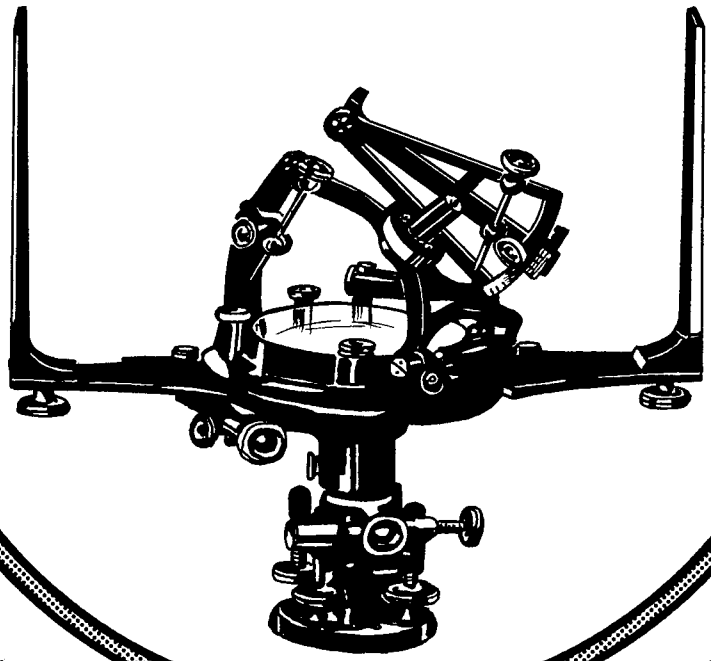

1112 FEET SOUTH OF
THIS SPOT WAS THE
"POINT OF BEGINNING"
FOR SURVEYING THE
PUBLIC LANDS OF THE
UNITED STATES THERE,
ON SEPTEMBER 30, 1785,
THOMAS HUTCHINS, FIRST
GEOGRAPHER OF THE
UNITED STATES, BEGAN
THE GEOGRAPHERS LINE
OF THE SEVEN RANGES.
THIS INSCRIPTION WAS
DEDICATED SEPTEMBER 30,
1960, IN JOINT ACTION OF
THE EAST LIVERPOOL
HISTORICAL SOCIETY AND
THE AMERICAN CONGRESS
ON SURVEYING AND MAPPING.
OHIO

A HISTORY OF THE RECTANGULAR SURVEY SYSTEM



by C. Albert White

UNITED STATES DEPARTMENT OF THE INTERIOR

James G. Watt, *Secretary*

BUREAU OF LAND MANAGEMENT

Robert F. Burford, *Director*

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United States Department of the Interior

BUREAU OF LAND MANAGEMENT
WASHINGTON, D.C. 20240

January 1983

Dear Reader:

With its beginning more than two hundred years ago, the United States Rectangular Survey System is typically, and yet somewhat uniquely, a record of the American frontier spirit blended with the concept of government for the people.

C. Albert White, U.S. Cadastral Surveyor, presents in this document a meticulous accounting of the vast story of public land surveying and registration. This classic research contribution is a detailed reference which will undoubtedly be well used by historians, land use specialists, surveyors, and attorneys for contemporary decisionmaking, understanding, and judgments.

Mr. White began his surveying career with the General Land Office in 1946. Subsequently, as both a Bureau of Land Management (BLM) and a private surveyor, he applied his diligent abilities to a wide range of activities including investigation of the durability of bearing trees, training, instrumentation, and refinements as well as performing hundreds of "Ground Pounding" land surveys.

Al White represents the U.S. surveyor of the mid-century of 1900's - a bridge and integrator of the wisdom and experience of his predecessors to the expanding uses of latest cost effective technology in cadastral surveying.

Bernard W. Hostrop
Surveyor General

ACKNOWLEDGEMENTS

The assistance of many persons was necessary to complete this work, and it would be impossible to thank them all by listing them here. However, acknowledgement and thanks are expressed to the U.S. Forest Service, National Advanced Resource Technology Center for their support and efforts in preparing a preliminary edition; to Away With Words for their excellent efforts in typing and editing; the Branch of Survey and Mapping Development, Denver Service Center, Bureau of Land Management for preparing numerous drawings and illustrations and administering the production of this publication.

Special thanks go to Jerry Edler and Herman Weiss of the Denver Service Center, Branch of Survey and Mapping Development.

The Washington Office, Division of Cadastral Survey, Bureau of Land Management provided enthusiastic support, and this publication has been made possible through that staff's special advice and cooperation.

INTRODUCTION

When first assigned to do an outline of the history of the development of the public land surveys and the social and economic conditions leading to the first land ordinance, my approach was the "usual" one: show the "changes" in the *Instructions to Deputy Surveyors* and the *Manuals of Surveying Instructions.*

I soon came upon nagging questions: Why were the original townships numbered north from the Ohio River? Why were the sections first called lots? Why was the scheme changed to "sections?" How did the present system of numbering the sections come about? Why did the *Act of February 11, 1805,* call for the intersection method of subdividing the "two-mile blocks" and extend later to the subdivision of sections? Why were lakes of "25 acres and upward" meandered?

The reader should by now understand the perplexities which were not answered by either the Instructions or the Manuals. These developments did not happen by accident; they had to have reasons and roots. But how to find the answers and were the answers even available?

I turned to my good friend Tom Tillman for advice and assistance, which was immediately given. He told me of the existence of Microcopy No. 478, which contained the letters from the Surveyor General Northwest of the Ohio (sent) to the Secretary of the Treasury and the Commissioner of the General Land Office; and of Sherman's book, Peters' book, and many others. He generously loaned me his collection of papers, and eventually told me how to obtain the Annual Reports of the Commissioners. We also discussed the format: by subject, or as a chronology? Chronology won because in the development, everything is cause and effect. One subject depends upon the other and cannot be divorced into neat little categories. The book is thus written in order of occurrence, wherever practical. Occasionally, as in legal cases, the subject is carried from inception to conclusion, but those instances are rare.

The book was started from January through April of 1976. I "retired" on April 30, 1976, and did not return to the Bureau of Land Management until August 1977. When asked to instruct the history of rectangular surveying at the Cadastral Surveying course (held in Arizona in 1980), I suggested that the book might be completed as a reference for the course. Permission was generously granted and I resumed work on the book.

The National Archives loaned me Microcopy No. 27, which contains the letters sent to the Surveyors General, 1796-1901, as well as thousands of letters to Congressmen, surveyors and citizens. The Multnomah County Library, Portland, Oregon, most generously allowed me to borrow the Serial Sets, the volumes of Senate and House Documents, which contained the Annual Reports of the Secretary of the Interior and Commissioner of the General Land Office. Various offices of the Bureau of Land Management supplied me with copies of requested plats and field notes. Mr. Richard Crawford of the National Archives in Washington, D.C., supplied me with vital copies of certain documents. All of these are herein combined into one. Innumerable miscellaneous textbooks, encyclopedias, publications by other authors, newspapers, library and historical society references, and articles printed by the American Congress on Surveying and Mapping were used as references in the preparation of this book. Reference was frequently made to the original field notes and plats of the public land surveys.

The intended use of this book is not that of a novel but as a reference for rules and policies, as well as the laws on which they are based. A subject is kept alive until finally laid to rest such as subdivision of sections or the survey of dried-up lakes. When a final decision is made, the subject is usually dropped. Some arguments have never been resolved: the use of line trees in establishing one sixteenth corners, the use of witness corners in restoring a true corner point, and the restoration of State boundaries which mark the boundaries of public lands. If the problem has never been finally resolved, the answers will not be found in this book. The book will not give the reader answers, only the precedence of what has gone before and why. Mineral surveys are not included.

After 1851, the copies of letters from the Commissioner to the Surveyors General were kept in separate volumes; that is, the letters to the Surveyor General of Oregon were kept in the Oregon Book, to California in the California Book, and so on. Microcopy No. 27 contains only the letters to the Surveyors General in the States of Minnesota, Iowa, Missouri, Arkansas and Louisiana, and the public land States lying east thereof plus the letters to Surveyors and other citizens in the same area. Letters and Instructions pertaining to Oklahoma and Kansas after 1875 are also on Microcopy No. 27. The many volumes of letters to Surveyors General west of Iowa have not been filmed and were therefore not available to me in preparing this book. Those volumes would undoubtably furnish additional information, as would all the other records pertaining to the public land surveys now stored in the National Archives. But I had to stop somewhere and use what I had, filling in the blanks with other sources.

The Appendix to this book includes the original *Instructions to the Deputy Surveyors,* circulars, important letters, and at least the pertinent parts of the *Manuals of Surveying Instructions.*

It is hoped that this book will be of value to all Surveyors dealing with the public land survey system, not just government surveyors. May it be some value to you all.

C. Albert White

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CHAPTER I

POLITICAL AND ECONOMIC EVENTS LEADING TO THE PASSAGE OF THE FIRST LAND ORDINANCE

ENGLISH CLAIMS TO AMERICA

By 1550, the Spanish had explored most of the eastern coast of North America and the French had explored the Gulf of St. Lawrence. The French and Spanish claimed all these lands, basing the claims on the right of discovery and conquest. The English had made very few explorations in the New World and had very little knowledge of the land, geography, and native inhabitants. But when England broke her close religious and political ties with Spain in the late sixteenth century, she repudiated the Spanish claim that prior discovery established the full right of possession. England took the stand that occupancy and use was the final test of ownership. Although she knew that the continent was occupied and in use by the native Indians, the Indians were considered inferior; they were non-Christian savages with no rights in land tenure under English law and customs.

It was on the basis of occupancy and use that England eventually took possession of the eastern coast of North America between 31° and 49° north latitude. The occupancy and use doctrine originally granted lands in the colonies and this has continued through the history of the United States to the present.

Colonization

All title to land in England was from the King who could grant lands as he saw fit under any conditions he felt met his needs and desires and those of the grantee. The King or Queen was the sovereign, but due to wars with Spain and France, the English sovereign was not financially able to bear the high cost of establishing colonies in America. If colonization were to take place, it had to be accomplished with private capital.

Generally, there were three classes of people in England who would participate in colonization:

(1) *The very rich merchants, traders and aristocrats.* This group could furnish the capital expense and outlay if they could expect a good return on their investments. Few would ever actually make the trip to America themselves.
(2) *The middle-class.* This group could finance the cost of ocean passage, provide themselves with tools, etc. But they needed a reasonable expectation of a better life and ability to build an estate in the new land.
(3) *The very poor tenants, unemployed, paupers and servants.* These people had little to lose and everything to gain if they could migrate but had no means to do so.

The solution to colonization was the groups of wealthy people formed companies, bought stock in a company, and undertook the expense of sending the third class of people to America. In return, the Crown granted such a company a charter for lands in America, which was largely a high risk investment; it eventually led to large land-speculating companies which still exist in one form or another in the United States.

The Virginia Charters

In 1606, the London Company was formed by a large group of investors. They were granted the right to settle the land between 34° and 41° north latitude. The Plymouth Company was granted settlement rights between 38° and 45° north latitude. Thus the foundation was laid for 200 years of land disputes regarding overlapping claims.

Under these charters the land was not granted outright to the company. Both colonial government and land distribution were subject to royal control.

In 1609, the two charters were relinquished and new charters were granted. The Virginia Company was granted land extending from 200 miles south and 200 miles north of Old Point Comfort (400 miles of seacoast) "extending west and northwest to the south sea" (Pacific Ocean). It was on this charter that Virginia was eventually to claim Kentucky and the Northwest Territory.

The Plymouth Company failed in its initial attempt at settlement and made no further efforts, so the charter was forfeited. In 1620, a charter was granted to the New England Council which covered the lands between 40° and 48° north latitude and from "sea to sea." Again the grants overlapped (see Fig. 1), but were not considered important because what the King granted the King could also take away, within limits, and the lands could only be held by actual settlement. The boundaries were later changed, in part, by grants and charters to other colonies.

New England

The 1620 charter gave the New England Council full power to grant lands and issue patents. In 1622, the Council granted the territory that is now New Hampshire and Maine to John Mason and Ferdinando Gorges, who divided the lands in 1635; Mason's portion became New Hampshire. Gorges' grandson sold Maine to John Usher, a Boston merchant, in 1677 for 1,250 pounds and Usher immediately deeded the land to Massachusetts.

In 1629, the Massachusetts Bay Company was given a charter to all of the land between parallels of latitude three miles north of the Merrimac River and three miles south of the Charles River. This charter was annulled in 1684, and the second charter of the Massachusetts Bay Company was issued in 1691; it incorporated the Plymouth Colony on Cape Cod and Maine.

The boundaries were well defined and describe the present Commonwealth of Massachusetts. But that state was later to claim western lands in what is now Pennsylvania, Michigan, Illinois, and Wisconsin on the basis of the 1629 charter. Maine remained a part of Massachusetts until 1820 (see Fig. 2).

In 1662, the settled towns in Connecticut were consolidated and a charter granted to that colony, which was bounded on the east by Narragansett Bay, on the north by Massachusetts and on the south by the Atlantic Ocean, including all islands along the coast, and extending to "the South Sea" (Pacific Ocean) to the west. It was on the basis of this grant that Connecticut was to claim and receive lands in what is now the State of Ohio (see Fig. 2).

Rhode Island was settled by Roger Williams and his followers in 1636 without benefit of a charter or grant; Williams purchased the lands from the Indians and claimed it on that basis. The Rhode Island settlement and Providence Plantations were considered squatters by Massachusetts Bay. A charter was granted in 1663 for the lands which are now essentially marked by the present boundaries of Rhode Island, although it took nearly 100 years to settle the boundary

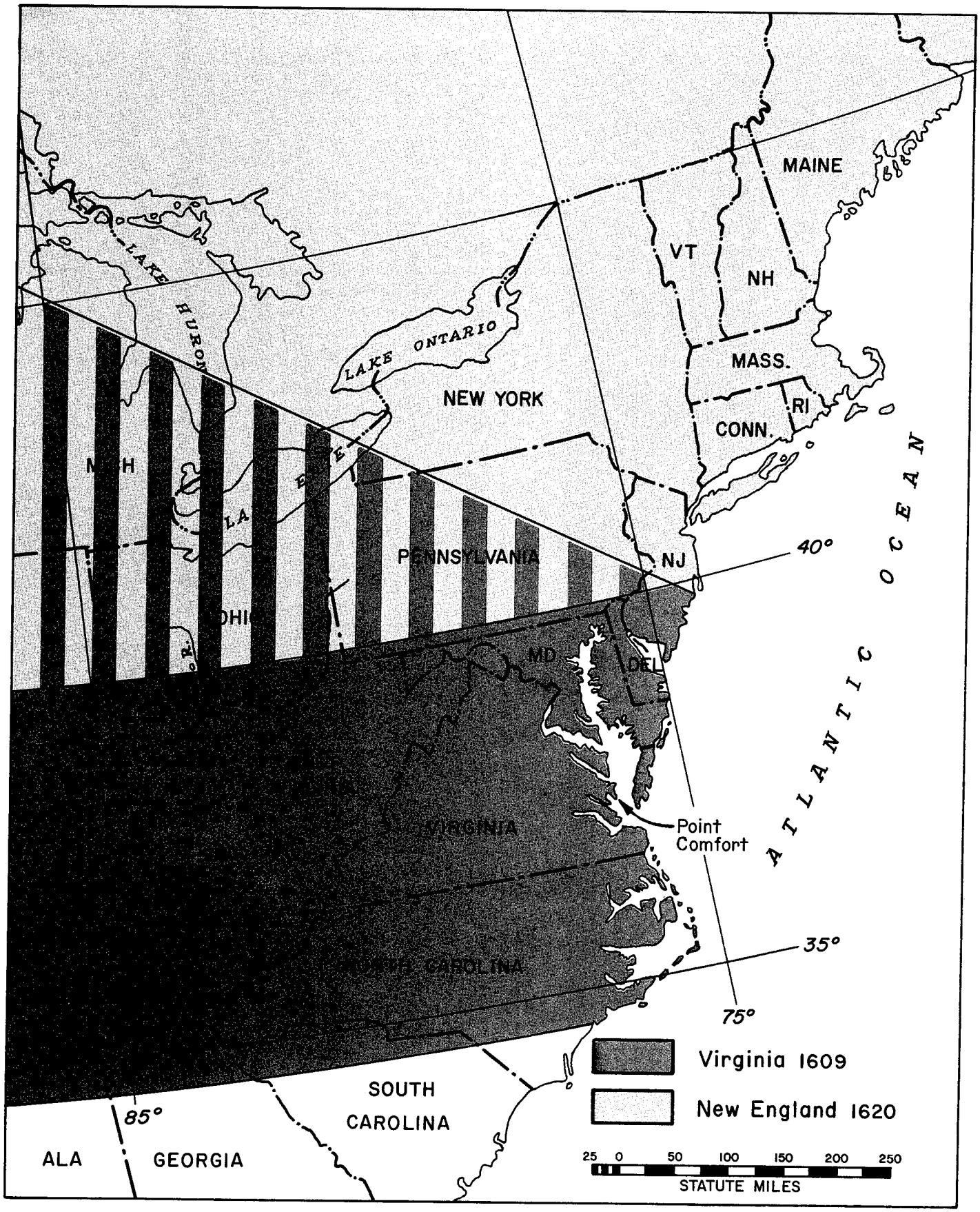


Figure 1. Territory Granted to Virginia and New England in 1609 and 1620.

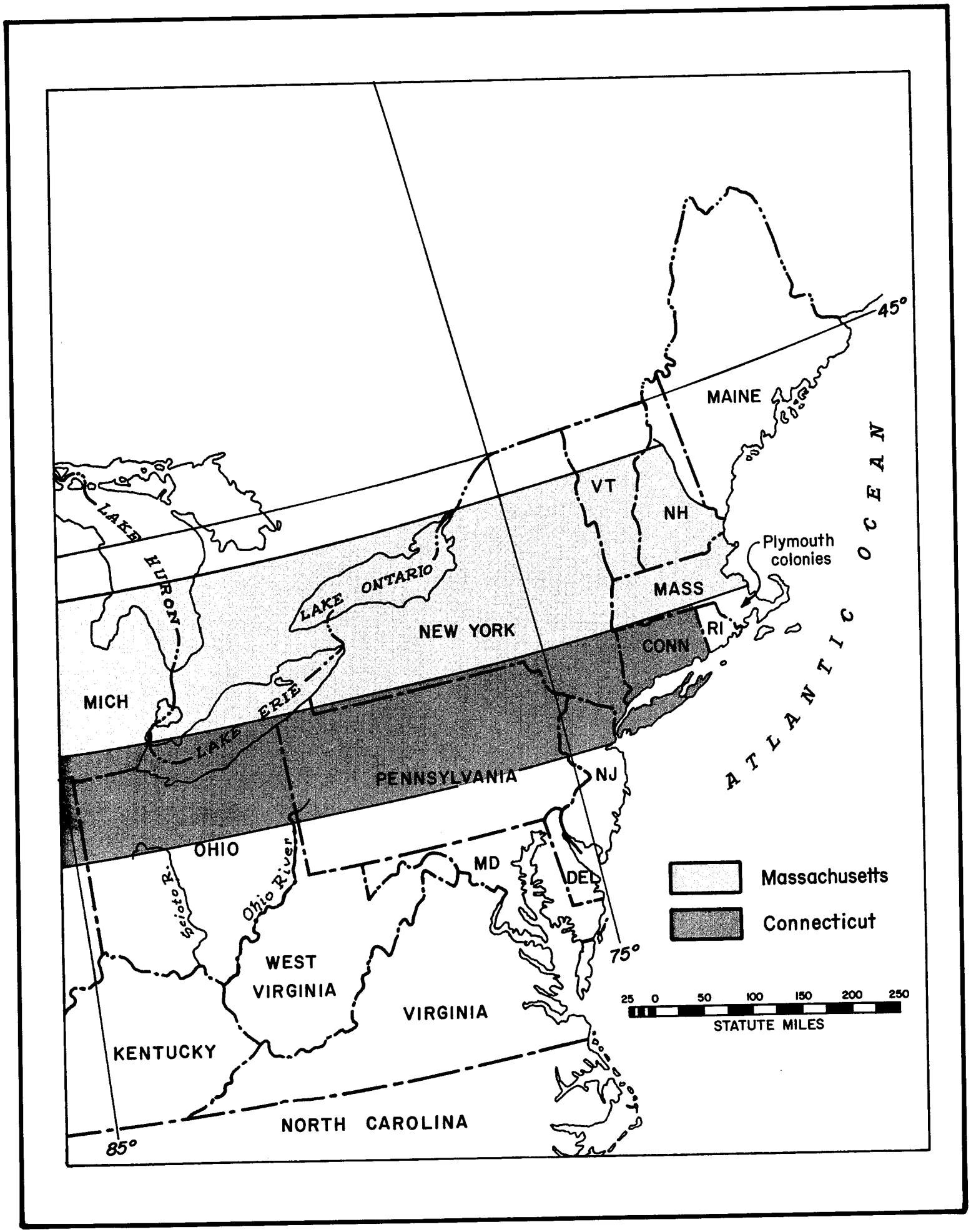


Figure 2. Massachusetts and Connecticut Grants of 1629 and 1662.

disputes with Connecticut and Massachusetts. Rhode Island never had any claim to western lands.

The present state of Vermont was claimed by both New Hampshire and New York, was never an individual colony, and, after settlement of boundary disputes, was admitted to the Union in 1791. All vacant lands within her boundaries became the property of the State.

New York

The Dutch settled and claimed the lands along the Delaware and Hudson Rivers based on the right of discovery and Henry Hudson's explorations. They settled on Manhattan Island in 1624 and eventually granted lands including the large patroon estates along the Hudson. Sweden established settlements in the Delaware Bay area in 1638 and later. England claimed these same lands, and in 1664 granted the lands between the Connecticut and Delaware Rivers to the Duke of York. The Dutch and Swedes had granted lands to their citizens, and the English honored these "foreign" patents after evicting the foreign governments. This policy of honoring all bona fide patents or claims issued by previous governments was to continue throughout all of the later land acquisitions by the United States.

The grant to the Duke of York included lands also granted to Connecticut, Massachusetts and New Hampshire, and many boundary disputes resulted. York's claim to lands in what is now western New York were based on his jurisdiction over the Six (Indian) Nations.

The territory which is now the State of New Jersey was deeded to George Carteret and John Berkeley by the Duke of York in 1664. They honored the previous settlers' claims, set up a government, and sold lands. New Jersey had no western land claims.

Maryland

In 1632, Lord Baltimore was granted the territory south of 40° north latitude, south to a line drawn easterly to the Atlantic from Watkins Point in Virginia, and from the ocean to the headwaters of the Potomac River and lying north of that river. Lord Baltimore was later to lose a substantial part of this grant to what are now the States of Delaware and New Jersey. Since Maryland had no western lands, this reduction in area was to rankle Maryland through the Revolutionary War period and cause numerous boundary disputes.

Pennsylvania

In 1681, William Penn was granted the lands south of 43° north latitude (actually the 42nd parallel), extending west from the Delaware River 5° of longitude. The southern boundary was to be determined by a circle of 12 miles radius around New Castle in Delaware connecting with 40° north latitude, which was the north boundary of Maryland. New Castle was much too far south of 40° latitude, and this resulted in the famous boundary dispute between Penn and Lord Baltimore, which was settled by court decision and adjudication. The southern boundary of Pennsylvania is the Mason-Dixon Line, surveyed along a parallel of approximately 39°43′15″ north latitude, which deprived Maryland of a rather large area along her northern border. Because of the definite western boundary, Pennsylvania could claim no western lands. But Penn's grant included land claimed by Connecticut in the "Wyoming Valley" in northeastern Pennsylvania. Several battles were fought over jurisdiction in that area and wasn't settled until 1782.

Delaware

The "Three Lower Counties" were first settled by the Swedes, taken over by the Dutch, granted to the Duke of York, and then sold to William Penn in 1682. Penn granted a separate charter to the Delaware counties in 1701. The grant to Maryland (Lord Baltimore) for these same lands was ignored. Delaware had no claim to any western lands.

The Carolinas

In 1663, Charles II made a grant of the charter of Carolina to the Earl of Clarendon and seven other proprietors covering the lands between 31° and 36° north latitude. A second charter in 1665 covered the lands between 29° and 36°31′ north latitude. Both charters extended from the Atlantic to Pacific Oceans. In 1729, the English government purchased the proprietors' rights in North Carolina and divided the colony into two parts. The boundaries of North Carolina were described as being: "On the north, the south boundary of Virginia (about 36°30′ north latitude), and on the south, by 35°34′ north latitude and extending to the Pacific Ocean." Presumably South Carolina contained the remainder; thus both North and South Carolina had claims under the charters to lands extending to the Pacific Ocean (see Fig. 3).

Georgia

Georgia was part of the Carolinas but was not being settled by those colonies. In 1732, King George II granted a charter to James Oglethorpe and a board of trustees for the lands between the Savannah and Altamaha Rivers and extending from the headwaters of those streams along parallels of latitude "to the South Seas." In 1764, the boundaries were expanded southerly to St. Mary's River (along the seacoast), up that stream to its headwater, west to the confluence of the Flint and Chattahoochee Rivers, up the Chattahoochee to 31° north latitude, and then along that parallel to the Mississippi River. Thus Georgia laid claim to what is now most of the States of Alabama and Mississippi (see Fig. 3).

An examination of Figs. 1, 2, and 3 reveals that all of the land east of the Mississippi River and north of 31° north latitude was claimed by one or more of the colonies under one charter or another at the beginning of the Revolutionary War. It was these claims and the lands involved that led to the need for the first land ordinance.

LAND TENURE SYSTEMS

The colonial governments, proprietors and companies had several systems for disposing of land and methods by which legal title to the land was held. Many of these customs and restrictions came to be a source of irritation to most people with the result that most were abolished after the Revolutionary War.

Grants

In the first instance, colonial land was granted to a settlement agency. The main "catch" was that in order to hold the land, settlers had to be placed on the land. The settlement agency could then grant the land to others under a wide variety of systems and acreages. Large grants were also made to individuals directly by the King. In some instances,

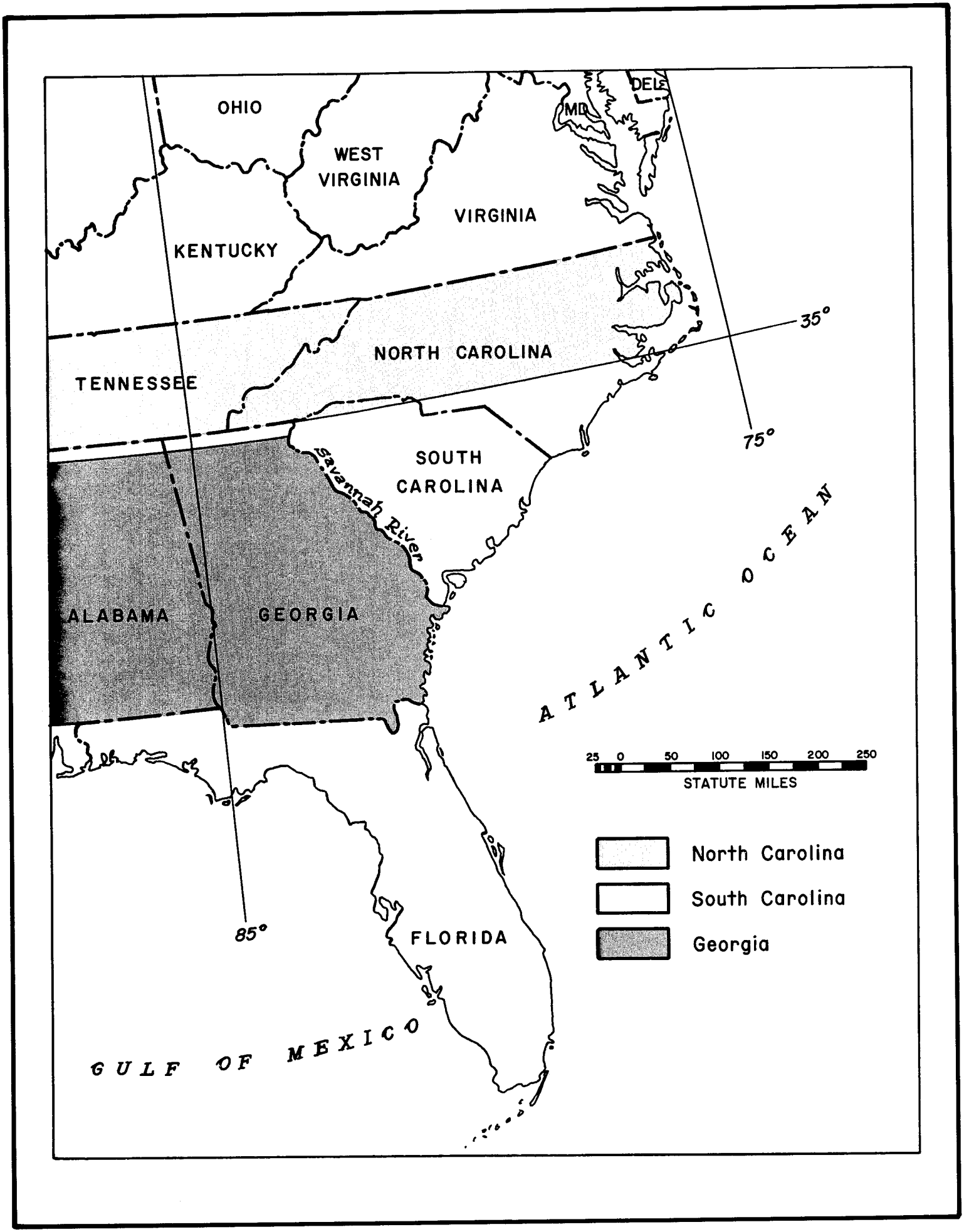


Figure 3. Territory Claimed by N. Carolina, S. Carolina and Georgia.

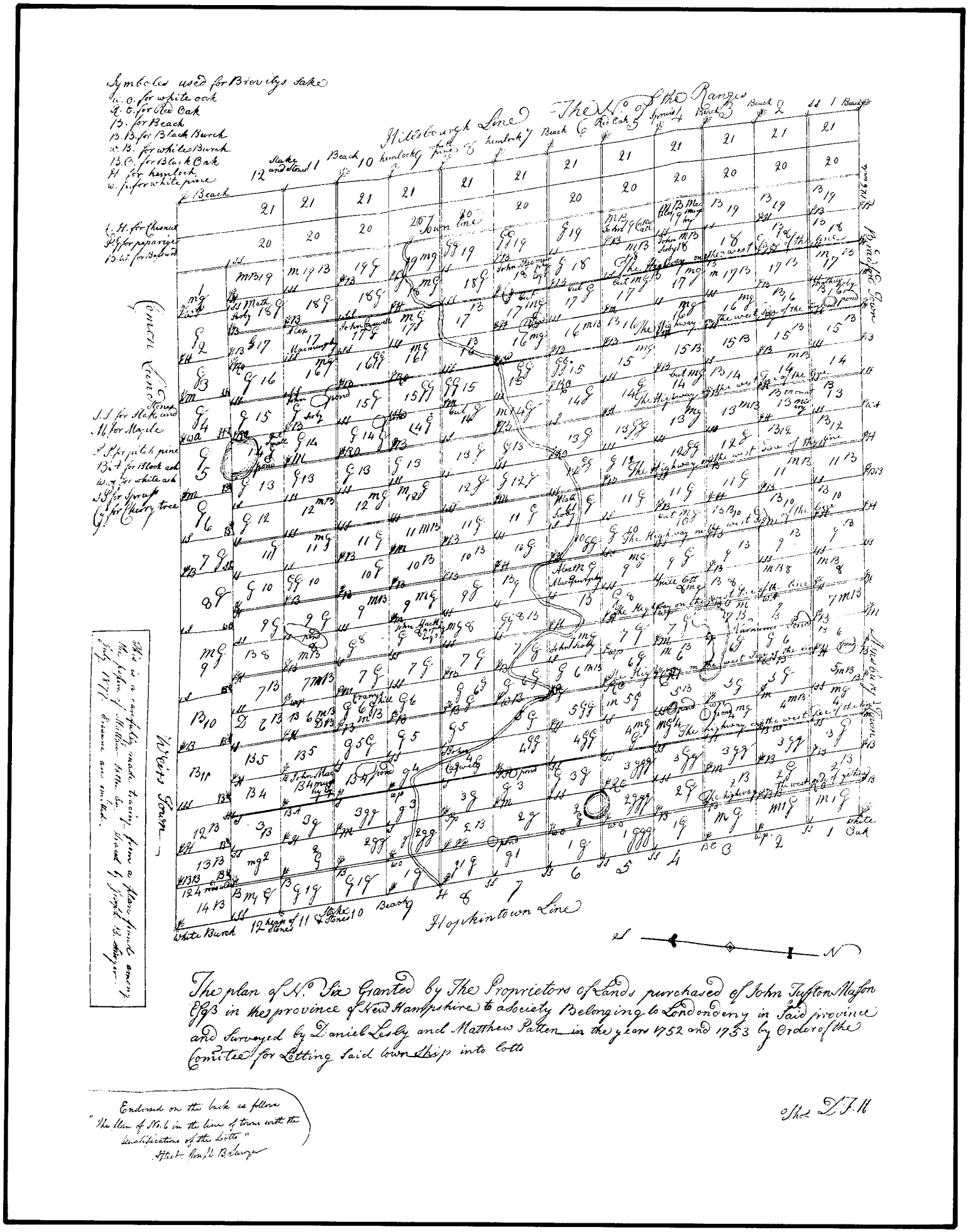


Figure 4. A New England Township (courtesy of New Hampshire Historical Society)

the grantee set up large manors or feudal-type estates. Shareholders in the settlement companies received large areas based on the number of shares they had purchased. Land grants were made to support schools, colleges and churches.

Headrights

In the southern colonies, each man was granted 50, 100, or more acres as a headright. He was required to settle on the land, clear part of it, and make a farm. Under this system every settler soon began to believe that he was entitled to land, one way or another. The practice soon developed of granting a headright to each person, an additional headright to the person who may have paid for passage, another to the captain of the ship who carried him across the ocean, etc. Thus if a man in London paid the expenses of 50 people to settle, each of those 50 people received a headright and the benefactor received a like amount; large land holdings were acquired in this manner.

Land Sales

Direct land sales took place at an early date in all of the colonies except New England. A man could request the right to purchase land and, if approved, would pay a stipulated price. Acreages ranged from 100 to 1,000 to perhaps 150,000 acres or more. The prices varied with location or quality but ranged from as little as three pence up to perhaps one pound per acre. Large land-speculating companies usually paid the least; however, selling land was not an established governmental policy.

New England Towns

The New England colonies of Connecticut, Massachusetts, and Rhode Island were corporate colonies where the land was held and disposed of directly by a corporation. The people had close religious ties, the land was of comparatively poor quality, and the climate severe. A group of 30 or more men with families would join together and apply to the corporation for a land grant; if approved, they initially surveyed the "town." The exterior boundaries were usually a rectangle of 6 to 10 miles square. The group then divided the land among the members according to each man's needs and issued title to the allotted lands. Land couldn't be sold without the group's permission. These New England townships are said to be the origin of our present-day rectangular township system. The big advantage was that of common boundaries, with no "gaps" or "gores" of land left between ownerships; other advantages were survey before occupancy and near certainty of boundary locations. New York, New Hampshire, and other colonies sometimes used a modified rectangular township system for disposing of land to the colonists. Later many townships were surveyed in Maine, six miles square in cardinal directions, six miles square non-cardinal, and rectangularly shaped lying in various directions. Fig. 4 is a township in New Hamsphire surveyed in 1752 to 1753 and illustrates a typical layout.

Free and Common Socage

Most patents or deeds to land were in "free and common socage," which meant that the patentee held a fee title but the land was subject to certain restrictions, such as the requirements for settling, clearing and payment of quitrent. Technically, the same type of title passed in New England but quitrent was usually not collected or even required.

Quitrent

One big source of irritation to the small land owner was quitrents. When land was granted to the settler he was usually free of quitrent from 7 to 20 years. But once he was producing an income he had to pay a small quitrent, perhaps only a few pennies per acre, to the grantor. Regardless of how many times the land might be sold, it was subject to quitrent, in theory, forever. The small owners hated paying quitrent and frequently refused to do so. Since the collection of quitrent was difficult and costly, the original grantor or his heirs could do little to collect it. Quitrent was not a tax as such, but was more in the nature of a perpetual lien against the land.

Primogeniture

An old English practice of inheritance by the oldest son was brought to America; primogeniture means that the oldest son inherits the entire estate. He may have a moral obligation to support his younger brothers and sisters but they could not inherit from him. This restriction in titles was distasteful to the younger children and the small land owners, but it was a means of keeping large estates and manors intact because the inheritance could not be sold and creditors could not foreclose.

Entails

If land granted to a man was entailed it meant that only his lineal descendants could own it thereafter. His heirs could not sell or transfer the land to someone else. If there were no heirs, the land reverted to the original grantor or his heirs; thus, the man and his heirs were not free to sell the estate.

TYPES OF GOVERNMENT

Three different types of government existed in the colonies immediately prior to the Revolutionary War under which land was sold, granted, and surveyed. These types were royal, proprietary, and corporate colonies, all of which were subject to at least some restrictions by the King and Parliament of England.

Royal Colonies

Prior to the Revolution, New Hampshire, New York, New Jersey, Virginia, North and South Carolina and Georgia were Royal Colonies. The King appointed a governor who took the place of the King in local affairs and who appointed the council (similar to the Senate); the local citizenry elected a lower house or assembly. The assembly had the power to approve or levy taxes and approve the laws made by the governor and council. The governor depended on taxes for his support, so the colonial assembly had considerable control over the governor's actions.

Proprietary Colonies

Delaware, Maryland and Pennsylvania were Proprietary Colonies. The proprietor took the place of the King, set up the system of government, and appointed the governor. Otherwise the system of local government was in the hands of the local assemblies, similar to the Royal Colonies.

Corporate Colonies

Connecticut, Massachusetts and Rhode Island were gov-

erned by the corporation under their charters. Rhode Island and Connecticut retained these charters and governed under them until after the Revolution. Massachusetts was forced to accept a Royal governor. He governed under a general assembly and had full power to grant lands, issued patents and make laws. This action by the King was partially responsible for the dissension which led to war.

Each of the colonies elected a colonial assembly, set up local and county governments, made laws, and had local courts, not dissimilar from what now exists in the United States, but they did not elect the governor and had no representatives except lobbyists in the English parliament.

LOCATING CLAIMS

Each colony apparently had a little different method of locating claims to the land, except for the New England towns.

Treaty and Purchase From the Indians

The Indians occupied the land not as individuals but as a tribe or whole group. They did not "own" land as the English understood ownership. But the English recognized the aboriginal rights of the Indians, at least to some extent. They were careful to purchase the Indians' rights, usually at very low prices in the form of trade goods. For specified areas, these purchases and treaties with the natives were made by the government or settlement agency. It was illegal for a private citizen to purchase land directly from the Indians, but that rule was frequently broken. Land-speculating companies made large purchases of Indian land at very low prices and then attempted to obtain a grant and patent based on a claim of Indian title, which in any case, had to be acquired before deeds or patents were issued to the settlers.

Land Grants

An individual desiring to purchase or obtain lands would apply for a grant in the appropriate land office and had to state the desired general land location and the number of acres. If approved, a warrant would be issued for the grant. A land-speculating company would usually have some political pull and the warrant would be for so many thousand acres located between certain rivers or other natural features. A military warrant was issued for a given number of acres, 50 to 400 or more, as a reward for fighting in some war, Indian battle, or for militia service. Military warrants were often sold at very low prices to land speculators who could then claim land under those warrants.

Location and Survey

The warrant holder would present it to the surveyor general, county surveyor, or whomever was in charge of surveying, who would then go to the land, check to see that the tract was not already claimed by or surveyed for someone else, survey out the tract by metes and bounds, and prepare the plat and certificate. The claimant paid for the survey, and after payment or arranging for payment of the land (about 60 cents to $1 per acre in the 1770's), a patent or deed was issued and recorded.

Survey descriptions were often vague and were tied to trees, rocks, creek junctions, or stone mounds. The lines were often not run or blazed. If after survey the land was not immediately occupied, another man might think it vacant and make his claim on the same land. This whole system led to many overlapping claims, boundary disputes, and clouded titles which the courts were swamped with.

The New England town system of prior rectangular survey, careful marking and surveying the lots within the town, walking the bounds each year to preserve the boundary marks, and careful platting and recording was far superior to the indiscriminate location methods used in the other colonies. It also prevented the taking of only the good land, leaving the poorer land unused. The New England townships also provided for roads and highways, gave a definite lot to schools and churches, and had other advantages.

Squatters and Preemption

It was supposed to be illegal for a man to occupy land without permission or by some type of grant, but the practice of squatting on the land, building a cabin and clearing ground for crops was widespread, especially west of the mountains in Kentucky and Tennessee. The Indians often took offense at the practice and massacred the squatters, which would then cause retaliation by the white man and result in an Indian war. Although the colonial governments tried to stop the practice, they did not succeed, and the squatter usually ended up getting legal title by patent; in other words, the squatter, by being there first, preempted the right to the land by occupancy and use. The squatter was largely responsible for the prior survey and sale provisions in the first land ordinance.

THE WESTERN LANDS

As has already been noted, Virginia claimed all of the land west of the Allegheny Mountains and north of 36°30′ north latitude including part of western Pennsylvania. Connecticut and Massachusetts contended otherwise, as did New York. Much of Kentucky was already occupied with scattered settlements under grants and titles issued by Virginia. There were very few, if any, settlers in the area north of the Ohio River.

Based on her original charter, Massachusetts laid claim to the area north of her southern boundary extending west past Pennsylvania (see Fig. 2).

Connecticut claimed lands in Pennsylvania and continuing west across what is now Ohio, Indiana and Illinois, an extension of her northern and southern boundaries.

North Carolina claimed and had some settlers in what is now the state of Tennessee. South Carolina had claim to a narrow strip 10 to 15 miles wide lying south of Tennessee, while Georgia had a good claim to all of the lands lying west of that State.

These then were the western lands. How would they be settled, who was to have jurisdiction and how were new States to be added to the Union at the end of the war? None of the colonies had a clear and undisputed title. The English Proclamation of 1763 had outlawed any settlement or further land grants west of the Allegheny Mountains. This proclamation outraged the colonies who claimed lands to the west, and they largely ignored the proclamation as being illegal. To further compound the outrage, Parliament passed the Quebec Act in 1774, which added all of the land north of the Ohio River and west of the mountains to the Province of Quebec. It is not too clear that the land-claiming colonies had

a really valid claim; the King and Parliament had issued the original charters and grants on which the colonies laid claim to the western lands, then through the 1763 Proclamation and Quebec Act they rescinded those grants. But that point was made moot by the war and subsequent independence from English rule.

EVENTS DURING AND FOLLOWING THE REVOLUTIONARY WAR

Land Confiscation

Immediately following the Declaration of Independence on July 4, 1776, the newly declared States confiscated the lands of those people who remained loyal to the English Crown, and declared such lands State property. Each state also declared all "Crown Lands" and the unpatented proprietors' lands State property. In this manner, the new States became owners of millions of acres of public domain within their own boundaries and under their jurisdiction. These confiscations included the "Crown Lands" in the western territory to which the States laid claim. They later sold the lands within their borders to pay debts and raise revenue. Much of the land was used to pay the soldiers who fought in the war.

Military Bounty Warrants

It was a common practice to grant lands as a reward for military service in the colonies, in the form of a warrant for a stated number of acres, ranging from as little as 20 acres for common soldiers to several hundred acres for officers. After the Declaration of Independence, each of the States granted bounty lands to her soldiers for military service. The Continental Congress had no land but still offered bounties of 100 acres for soldiers and over 500 acres for officers, which were given to Revolutionary soldiers and to men who deserted from the British army. Land warrants could not be sold until after the close of the war. Military bounty land warrants were issued for several million acres of land.

Currency Depreciation

The Continental Congress had no power to levy taxes and had no direct method of raising funds to pay for the war. The Congress issued bills of credit, somewhat similar to promissory notes, in the form of currency. Congress asked the States to levy taxes and redeem these bills, but the States failed to do so, and in addition, issued their own paper money. Since the Continentals were not backed with silver and were not redeemable, they soon depreciated in value. In 1780, one silver dollar was worth 40 continental dollars, and by 1782, the continental paper dollar was nearly worthless and speculators bought them for almost nothing, hoping that Congress would eventually redeem them for at least part of their face value. Much of this money was converted to securities, or bonds, and the bonds were later used to purchase public lands in the Ohio country.

Treaty With England

At the close of the Revolutionary War, the treaty to end the conflict was negotiated with England, Spain, and France. England was inclined to favor the United States at the expense of French and Spanish territorial claims. The final treaty was signed on September 3, 1783, and gave the United States jurisdiction over all the territory east of the Mississippi River, south of the Great Lakes and north of Spanish Florida (31° north latitude). The United States also acquired full navigation rights on the Mississippi River; however, because New Orleans was held by Spain, navigation of the Mississippi was restricted and impeded settlement in the Ohio country until after 1800.

Land Cessions

The Continental Congress had made several requests, without success, of landed colonies to relinquish their claims to western lands. The western lands question was a hot political issue; the seven States with western land claims were opposed by the six States with definite boundaries. Maryland led the battle and refused to ratify the Articles of Confederation until the landed States ceded their claims. Maryland had been reduced by the Pennsylvania boundary settlement and by the Delaware counties; she especially disliked Virginia and that State claimed an enormous area. The smaller States feared the power of the larger States and the greater power they would have if allowed to retain their western land claims.

New York had a dubious claim to lands based on her sovereignty over the Six Nations. Since the Indians claimed lands in New York and to the west and southwest in Ohio, New York claimed those Indians lands. New York broke the deadlock in Congress by ceding her land claims to the Congress on February 19, 1780.

Connecticut followed New York's lead and ceded her claims on October 10, 1780, but reserved a total of 3,800,000 acres between 41° and 42° north latitude, extending 120 miles west from the west boundary of Pennsylvania. These lands were called the Connecticut Western Reserve and the "Firelands." Connecticut lost her claim to lands in the Wyoming Valley in Pennsylvania.

On January 2, 1781, Virginia agreed to cede most of her claims north of the Ohio River. In doing so, Virginia relinquished all of her claims northwest of the Ohio River except an area between the Scioto and Little Miami Rivers. This area, known as the Virginia Military Reserve, was used to pay military land bounties issued to soldiers by Virginia. Virginia retained Kentucky and also stipulated that 150,000 acres in Ohio be granted to George Rogers Clarke and his regiment, and that private land grants already made in Ohio by Virginia and France be confirmed.

Eight states, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, Virginia and South Carolina, had ratified the Articles of Confederation. When Virginia agreed to cede her claims, Maryland ratified on March 1, 1781, and thus completed the necessary two-thirds to put the Articles into effect.

Massachusetts and North Carolina ceded their claims in 1784. North Carolina ceded all of her lands in what is now Tennessee, except lands needed to satisfy her land grants and military bounties. After those reservations were satisfied, so little land remained that in 1841 Congress gave any remaining land to the State of Tennessee, so for all intents and purposes, Tennessee was not a public land State.

South Carolina did not cede her claims until 1787. Georgia was the last state to cede; her cession was ratified in 1802.

After the New York, Connecticut, Virginia, and Massachusetts cessions and ratification of the Articles of Confed-

eration, the Congress of the Confederation had land but no money. The immediate question was how to sell the land to raise revenue to pay off the massive debts incurred during the war.

Land Companies

The land-speculating companies began early to petition the Congress for land grants. Wealthy and influential men held stock in these companies and also held large amounts of continental currency and treasury notes. These companies put forth various schemes to buy millions of acres, first in Kentucky and Tennessee, and then later in Ohio and Indiana. Since land companies had been very active and a large part of the land-settling system in the colonies, they were very persuasive in their plans for land grants and settlement in the Northwest Territory. The Ohio Company of Associates was the company that finally succeeded.

Need for Revenue

Congress under the Confederation was deeply in debt to France and other creditors. Millions of dollars in continental bills and treasury notes were outstanding and Congress had no power to levy taxes on the land or States.

The Northwest Territory loomed as the only asset the new country had which might be turned into hard money. If the vast public domain could be sold to settlers, it could return millions of dollars to the treasury and solve the pressing immediate need for money. The big question was how the sale of the western lands could be accomplished.

Small Farms Versus Large Grants

Politically there were two factions in the debate:

(1) On one side were the advocates of sale to individual settlers in small parcels. The small farmers, frontiersmen, and merchants argued that an essential part of a democracy was the right to own property. They could not afford to buy land in large tracts, and if it were sold in huge blocks to wealthy men, the small man would be squeezed out or forced to pay high prices and interest.

(2) The conservative group, generally made up of wealthy southern aristocrats and plantation owners, did not think the democracy advocates were capable of settling the land intelligently or capable of handling land ownership. The conservatives were in favor of large grants at low prices to companies or wealthy men who would then handle the business end of settlement, such as surveying and patenting.

Generally the democracy advocates were from New England and other northern States. The spokesmen for this group were John Adams and Thomas Jefferson. The conservatives were led by Alexander Hamilton and John Jay.

The Jefferson group advocated a system of rectangular survey before any sale or settlement, with land to be sold at auction with a minimum price and in small parcels, giving everyone a fair chance to acquire land. They argued that survey before sale was necessary to prevent overlapping claims and to simplify deeds and registering. A rectangular system would survey all the land, with no gaps or gores, make the buyer take the poor land along with the good land, and make every man's land have a common boundary with his neighbor. The thousands of boundary disputes already in the courts made the rectangular system and prior survey sound attractive even to many of the conservative group.

Hamilton was in favor of indiscriminate location, the old metes and bounds system. This group thought that prior survey would never work and that people would settle and occupy the land faster if left free to do so. It had not been the general governmental policy in the colonies to sell land as a source of revenue prior to the war. The people were familiar with the free settlement system and would occupy and hold the territory faster if allowed free location.

In 1784, a committee headed by Jefferson drafted an ordinance which called for prior survey of tracts ten geographical miles square, which were called hundreds; they would be subdivided into lots one mile square. The lines would run due north and south, east and west and settlement would be by hundreds or by lots. This plan did not call for reservations for schools or churches. It is generally believed that Jefferson drafted the original ordinance. This draft was debated at length and was then referred to a committee composed of one man from each State. Jefferson was in Europe and Grayson from Virginia was named to replace him. This new committee made some alterations; they reduced the tract size to a seven-(statute) mile-square township with 49 lots. One lot in each township was reserved for schools, one lot for religious purposes and four lots to Congress for future disposal. One third of any gold, silver, lead, or copper which might be found was also reserved. The townships would be sold whole at auction for a minimum of $1 per acre, minus the reservations of six lots.

This plan drew objections. The sale of whole townships would place most of it in the hands of land speculators and would also encourage widespared and scattered settlement affording little protection from the Indians. In debate the size of land sales was reduced to 640 acres, although attempts were made to get the size down to 320 acres. Many other points were debated and the final result was passage of the *Land Ordinance on May 20, 1785.*

LAND ORDINANCE OF 1785

The following is the text of the Land Ordinance as finally approved by Congress:

AN ORDINANCE FOR ASCERTAINING THE MODE OF DISPOSING OF LANDS IN THE WESTERN TERRITORY

Passed May 20, 1785.

"Be it ordained by the United States in Congress assembled, that the territory ceded by individual states to the United States, which had been purchased of the Indian inhabitants, shall be disposed of in the following manner:

"A surveyor from each state shall be appointed by Congress or a committee of the states, who shall take an oath for the faithful discharge of his duty, before the geographer of the United States, who is hereby empowered and directed to administer the same; and the like oath shall be administered to each chain carrier, by the surveyor under whom he acts.

"The geographer, under whose direction the surveyors shall act, shall occasionally form such regula-

tions for their conduct, as he shall deem necessary; and shall have authority to suspend them for misconduct in office, and shall make report of the same to Congress, or to the committee of the states; and he shall make report in case of sickness, death, or resignation of any surveyor.

"The surveyors, as they are respectively qualified, shall proceed to divide the said territory into townships of 6 miles square, by lines running due north and south, and others crossing these at right angles, as near as may be, unless where the boundaries of the late Indian purchases may render the same impracticable, and then they shall depart from this rule no further than such particular circumstance may require. And each surveyor shall be allowed and paid at the rate of two dollars for every mile, in length, he shall run, including the wages of chain carriers, markers, and every other expense attending the same.

"The first line, runing due north and south as aforesaid, shall begin on the river Ohio, at a point that shall be found to be due north from the western termination of a line, which has been run as the southern boundary of the state of Pennsylvania; and the first line, running east and west, shall begin at the same point, and shall extend throughout the whole territory; provided, that nothing herein shall be construed, as fixing the western boundary of the state of Pennsylvania. The geographer shall designate the townships, or fractional parts of townships, by numbers progressively from south to north; always beginning each range with No. 1; and the ranges shall be distinguished by their progressive numbers to the westward. The first range, extending from the Ohio to the lake Erie, being marked No. 1. The geographer shall personally attend to the running of the first east and west line; and shall take the latitude of the extremes of the first north and south line, and of the mouths of the principal rivers.

"The lines shall be measured with a chain; shall be plainly marked by chaps on the trees, and exactly described on a plat; whereon shall be noted by the surveyor, as their proper distances, all mines, salt-springs, salt-licks, and mill-seats, that shall come to his knowledge; and all water-courses, mountains and other remarkable and permanent things, over and near which such lines shall pass, and also the quality of the lands.

"The plats of the townships respectively, shall be marked by subdivisions into lots of one mile square, or 640 acres, in the same direction as the external lines, and numbered from 1 to 36; always beginning the succeeding range of the lots with the number next to that with which the preceding one concluded. And where, from the causes before-mentioned, only a fractional part of a township shall be surveyed, the lots, protracted thereon, shall bear the same numbers as if the township had been entire. And the surveyors, in running the external lines of the townships, shall, at the interval of every mile, mark corners for the lots which are adjacent, always designating the same in a different manner from those of the townships.

"The geographer and surveyors shall pay the utmost attention to the variation of the magnetic needle; and shall run and note all lines by the true meridian, certifying, with every plat, what was the variation at the times of running the lines thereon noted.

"As soon as 7 ranges of townships, and fractional parts of townships, in the direction from south to north, shall have been surveyed, the geographer shall transmit plats thereof to the board of treasury, who shall record the same, with the report, in well bound books to be kept for that purpose. And the geographer shall make similar returns, from time to time, of every 7 ranges as they may be surveyed. The secretary at war shall have recourse thereto, and shall take by lot therefrom, a number of townships, and fractional parts of townships, as well from those to be sold entire, as from those to be sold in lots, as will be equal to one-seventh part of the whole of such 7 ranges, as nearly as may be, for the use of the late continental army; and he shall make a similar draught, from time to time, until a sufficient quantity is drawn to satisfy the same, to be applied in manner hereinafter directed. The board of treasury shall, from time to time, cause the remaining numbers, as well those to be sold entire, as those to be sold in lots, to be drawn for, in the name of the thirteen states respectively, according to the quotas in the last preceding requisition on all the states; provided, that in case more land than its proportion is allotted for sale in any state, at any distribution, a deduction be made therefor at the next.

"The board of treasury shall transmit a copy of the original plats, previously noting thereon, the townships, and fractional parts of townships, which shall have fallen to the several states, by the distribution aforesaid, to the commissioners of the loan-office of the several states, who, after giving notice of not less than two nor more than six months, by causing advertisements to be posted up at the courthouses, or other noted places in every county, and to be inserted in one newspaper, published in the states of their residence respectively, shall proceed to sell the townships, or fractional parts of townships, at public vendue; in the following manner, viz: The township, or fractional part of a township, No. 1, in the second range, shall be sold by lots; and No. 2, in the same range, entire; and so in alternate order through the whole of the second range; and the third range shall be sold in the same manner as the first, and the fourth in the same manner as the second, and thus alternately throughout all the ranges; provided, that none of the lands, within the said territory, be sold under the price of one dollar the acre, to be paid in specie, or loan-office certificates, reduced to specie value, by the scale of depreciation, or certificates of liquidated debts of the United States, including interest, besides the expense of the survey and other charges thereon, which are hereby rated at 36 dollars the township, in specie, or certificates as aforesaid, and so in the same proportion for a fractional part of a township, or of a lot, to be paid at the time of sales; on failure of which payment, the said lands shall again be offered for sale.

"There shall be reserved for the United States out of every township the four lots, being numbered 8, 11, 26, 29, and out of every fractional part of a township, so many lots of the same numbers as shall be found thereon, for future sale. There shall be reserved the lot No. 16, of every township, for the maintenance of public schools, within the said township; also one-third part of all gold, silver, lead and copper mines, to be sold, or otherwise disposed of as Congress shall hereafter direct.

[*Here follow the terms of the deed to be given when a township or a lot is sold.*]

"Which deeds shall be recorded in proper books, by the commissioner of the loan office, and shall be certified to have been recorded, previously to their being delivered to the purchaser, and shall be good and valid to convey the lands in the same described.

"The commissioners of the loan-offices respectively, shall transmit to the board of treasury every three months, an account of the townships, fractional parts of townships, and lots committed to their charge; specifying therein the names of the persons to whom sold, and the sums of money or certificates received for the same; and shall cause all certificates by them received, to be struck through with a circular punch; and shall be duly charged in the books of the treasury, with the amount of the money or certificates, distinguishing the same, by them received as aforesaid.

"If any township, or fractional part of a township or lot, remains unsold for 18 months after the plat shall have been received, by the commissioners of the loan-office, the same shall be returned to the board of treasury, and shall be sold in such manner as Congress may hereafter direct.

"And whereas Congress, by their resolutions of September 16th and 18th, in the year 1776, and the 12th of August, 1780, stipulated grants of land to certain officers and soldiers of the late continental army, and by the resolution of the 22nd September, 1780, stipulated grants of land to certain officers in the hospital department of the late continental army; for complying therefore with such engagements, Be it ordained, That the secretary at war, from the returns in his office, or such other sufficient evidence as the nature of the case may admit, determine who are objects of the above resolutions and engagements, and the quantity of land to which such persons or their representatives are respectively entitled, and cause the townships, or fractional parts of townships, hereinbefore reserved for the use of the late continental army, to be drawn for in such manner as he shall deem expedient, to answer the purpose of an impartial distribution. He shall, from time to time, transmit certificates to the commissioners of the loan-offices of the different states, to the lines of which the military claimants have respectively belonged, specifying the name and rank of the party, the terms of his engagement and time of his service, and the division, brigade, regiment or company to which he belonged, the quantity of land he is entitled to, and the township, or fractional part of a township, and range out of which his portion is to be taken.

"The commissioners of the loan-offices shall execute deeds for such undivided proportions in manner and form herein before-mentioned, varying only in such a degree as to make the same conformable to the certificate from the secretary at war.

"Where any military claimants of bounty in lands shall not have belonged to the line of any particular state, similar certificates shall be sent to the board of treasury, who shall execute deeds to the parties for the same.

"The secretary at war, from the proper returns, shall transmit to the board of treasury, a certificate, specifying the name and rank of the several claimants of the hospital department of the late continental army, together with the quantity of land each claimant is entitled to, and the township, or fractional part of a township, and range out of which his portion is to be taken; and thereupon the board of treasury shall proceed to execute deeds to such claimants.

"The board of treasury, and the commissioners of the loan-offices in the states, shall, within 18 months, return receipts to the secretary at war, for all deeds which have been delivered, as also all the original deeds which remain in their hands for want of applicants, having been first recorded; which deeds so returned, shall be preserved in the office, until the parties or their representatives require the same.

"And be it further ordained, That three townships adjacent to lake Erie be reserved, to be hereafter disposed of in Congress, for the use of the officers, men, and others, refugees from Canada, and the refugees from Nova Scotia, who are or may be entitled to grants of land under resolutions of Congress now existing or which may hereafter be made respecting them, and for such other purposes as Congress may hereafter direct.

"And be it further ordained, That the towns of Gnadenhutten, Schoenbrun and Salem, on the Muskingum, and so much of the lands adjoining to the said towns, with the buildings and improvements thereon, shall be reserved for the sole use of the Christian Indians, who were formerly settled there, or the remains of that society, as may, in the judgment of the geographer, be sufficient for them to cultivate.

"Saving and reserving always, to all officers and soldiers entitled to lands on the northwest side of the Ohio, by donation or bounty from the commonwealth of Virginia, and to all persons claiming under them, all rights to which they are so entitled, under the deed of cession executed by the delegates for the state of Virginia on the first day of March, 1784, and the act of Congress accepting the same: and to the end, that the said rights may be fully and effectually secured, according to the true intent and meaning of the said deed of cession and act aforesaid, Be it ordained, that no part of the land included between the rivers called Little Miami and Scioto, on the northwest side of the river Ohio, be sold, or in any manner alienated, until there shall first have been laid off and appropriated for the said officers and soldiers, and persons claiming under them, the lands they are entitled to, agreeably to the said deed of cession and act of Congress accepting the same.

"Done by the United States in Congress assembled,

the 20th day of May, in the year of our Lord, 1785, and of our sovereignty and independence the ninth.

"RICHARD H. LEE, President."
"CHARLES THOMPSON, Secretary."

An examination and evaluation of the Land Ordinance reveal the basics of the system and some reasons for them.

(1) Only the land that had been purchased from the Indians was to be surveyed. This provision would appease the Indians, follow the practice of purchase traditional in the colonies, and since only Congress could buy land from the Indians, would prevent private claims based on private purchases.

(2) A surveyor from each State was to take an oath before the Geographer of the United States. The western lands had been won in a war fought by all the States, each of which had a common interest in the territory and would participate in the surveying. Many fradulent surveys had been made during colonial times causing land disputes. The oath of faithful discharge of duty would hopefully cause honest work to be done. A Geographer of the United States, representing the federal authority to supervise the work, would be in charge of the surveyors.

(3) The townships were to be six miles square (reduced from seven) with north and south lines crossed at right angles, as near as possible. It must have been recognized that surveying was not an exact science. Indian boundaries were also recognized as a limiting factor.

(4) The survey was to begin on the Ohio River (presumably the north bank) due north of the western termination of the south boundary of Pennsylvania, which was the southwest corner of that state. The west boundary of Pennsylvania was not surveyed to the north bank of the Ohio until later in 1785. The first line was to run due "east and west," however, it could only run due west for there was no public land in Pennsylvania. The Geographer was to personally run the first line, running west, which would insure that a proper and correct line would be surveyed as the base for the townships to the south. Though not called a base line, the Geographer's Line (the boundary of the seven ranges) was just that in actual fact. The line was to "extend throughout the whole territory." Taken literally that would be all the way to the Mississippi River. The first range was to extend from the Ohio to Lake Erie.

(5) The lines were to be measured with a chain, which didn't necessarily mean that a Gunter's link chain had to be used, just that the chain was the unit of measure. The chain unit was used throughout all of the colonies to measure land, but Jefferson had originally advocated a geographic mile (approximately 6,080 feet) be used. This would have made a lot about 849 acres, a very oddball figure, so the unit of measure was made part of the Ordinance to make it clear that the accustomed 80-chain mile was to be used.

(6) The lines were to "be plainly marked by chaps on the trees." In the metes and bounds system of indiscriminate location, the surveys were often very difficult to find and poorly identified. This was remedied by law; the lines were to be clearly and plainly blazed (the monument of the survey itself) so that the survey could be found on the ground.

(7) All major items of topography, including land quality, were to be noted at their proper distances. Topographic features, such as streams and mountains, would help to locate the survey. Mines, salt licks, salt springs, millseats and soil quality would greatly aid in knowing the value of the land for settlement. The lands were to be sold at auction hundreds of miles away, so it was necessary to know just what was being sold or bought.

(8) The plats of each township were to be divided into 36 lots, now called sections, with number one in the southeast corner of a full township and number 36 in the northwest corner. The interior lines of the townships were not surveyed on the ground, only protracted on the plat, which must have been purely an economy measure to keep the surveying cost to a minimum.

(9) After seven ranges were surveyed, the Geographer was to return the plats to the Board of Treasury because the whole purpose of the land sale was to raise money for the Treasury. The Secretary of War was to have recourse to the plats and draw from the hat one-seventh of the townships for use by the Continental Army. This made provision for granting lands to ex-soldiers to satisfy the military land warrants issued to them. Many warrants had been sold; thus it is unknown just how many actual veterans received land in those townships.

(10) After one-seventh of the townships for soldiers were drawn, the remaining townships were to be distributed to the States by lot or drawing. The plats were to be sent to each State where they were to be sold at public auction to the highest bidder at not less than $1 per acre. The first township in the first range was to be sold whole as one solid tract. The second township in the same range was to be sold by lot, the next township whole, and so on. This sale method would in theory satisfy the proponents of both the land speculators and the New England town system settlement. A religious group could band together and buy a whole township, subdivide it and settle on the land, forming their own community, or the land speculator could buy a whole township and sell the land to settlers, hopeful of a profit. An individual could also be satisfied by letting him purchase a lot for himself. The sales held in each State could give everybody a chance to buy without travelling all the way to Ohio, New York, or some other central point in those days of poor roads. The minimum price of $1 per acre was also the going price of land in many of the colonies just prior to the war.

(11) The price was to be paid in specie (hard-coined money) or in depreciated loan office certificates reduced to specie value or certificates of liquidated debts (treasury bonds) including interest, which assured a return for those who held continental dollars. Certificate of debt (bond) holders could get the face value plus interest for them. And the government could get out of debt.

In addition to the $1 per acre minimum price, the expenses incurred were fixed at $36 per township. Survey and sale expenses were also to be paid by the buyers.

The $36 figure may not have covered the expenses but was obviously $1 per lot, so a buyer of a single lot would have to pay a minimum of $641 for it.

(12) The money was to be paid immediately with no credit given. If a man bid on a section and then couldn't pay for it, the section was reoffered for sale.

(13) Four lots were to be reserved for future sale. The reason Congress made this reservation is not immediately known, but it may have been to provide for government seats or for future educational or even religious grants. In the original draft of the ordinance, one lot in each township was reserved for religious purposes. Giving religious grants was the orindary practice in colonial days, but these grants were deleted in the Ordinance as passed.

(14) Lot 16 in each township was reserved for use in maintaining public schools and was located as near to the center of the township as possible. If a township was purchased and settled by a group and a school was built on this land, it would be centrally located, but, most importantly, governmental support of public schools was established. In colonial days grants were made for education, but the schools were usually available only to the affluent population. Now the common man would theoretically have access to an education.

(15) The last reservation was for one-third of gold, silver, lead or copper found in the township and was almost automatic. The King had always reserved one-fifth of all gold and silver in his land grants, then the proprietor or settlement company reserved another one-fifth. Since no significant amounts of gold or silver had been discovered in the colonies, this reservation was a hedge against the possibility that it might be found somewhere.

(16) The final paragraph of the Ordinance explicitly spells out that the Continental Army was to receive their lands. Years had gone by without the Army being able to cash in their land warrants and they were getting restless over the delay. The paragraph puts the anxiety to final rest.

It should be realized that this Ordinance was passed by a Congress which had limited powers under the Articles of Confederation. It left much to be desired in regard to how the surveys were to be executed, how field notes were to be written, how plats were to be constructed, how corners were to be monumented, and how townships were to be subdivided into lots of 640 acres. But it was a good basic start. Thomas Hutchins, the Geographer, was involved in land companies and was an experienced surveyor, and the details of executing the field operations were left to him to work out. Also, many Congressmen did not favor the rectangular system and prior survey. Some flexibility was necessary to bend with the political tide if experience proved faults in the system; fortunately, no great faults were found.

THE NORTHWEST ORDINANCE OF 1787

It wasn't sufficient to pass a law for the surveying and sale of land without providing for government in the territory being settled. In 1784 a committee headed by Jefferson suggested in a report that the Northwest Territory be divided into states approximately 150 by 200 miles in area, but this report was never passed into law.

The Ohio Company of Associates, a land-speculating company led by Manasseh Cutler, Samuel Parsons, and Rufus Putnam, was pressing Congress for a land grant in Ohio. These men succeeded in getting Congress to pass the Northwest Ordinance which provided for establishing governments in the territories and was the basis for establishing territorial governments and later Statehood. It is basically still in effect. Some items of principal importance in the Northwest Ordinance of July 13, 1787 are:

(1) It outlawed primogeniture and entails in land tenure by providing for inheritance by all the children and the widow. Land could be freely sold. In effect, it outlawed any feudal type of land tenure including quitrents.

(2) It provided for appointment of territorial governors, secretaries, and judges. Each man appointed had to have a freehold estate of a specified number of acres in the territory which would prevent outsiders from being government officials. A provision was made for territorial legislatures and their election. These members also had to be residents and landowners, as did an elector. These provisions placed the local government and territorial affairs in the hands of the residents.

(3) After providing for territorial government and laws, the Ordinance spelled out fundamental rights and policies in the form of Articles, similar to the Constitution, which was being drafted at that time.

ARTICLE 1: Complete religious freedom.

ARTICLE 2: Habeas Corpus, bail, trial by jury, property rights.

ARTICLE 3: Public schools, protection and rights of the Indians.

ARTICLE 4: States to be formed must become part of the United States, settlers subject to pay their share of the Federal debt, no property taxes on Federal land, nonresidents cannot be taxed higher than residents, navigable streams are public highways and forever free to everyone without taxes or duties for using them.

ARTICLE 5: Northwest Territory to be divided into three to five new States with Congress fixing the boundaries. When a territory contained 50,000 free inhabitants, it could be admitted as a new State.

ARTICLE 6: Slavery and involuntary servitude outlawed in the Northwest Territory.

Although the Northwest Ordinance contains nothing pertaining to surveying, it did outlaw entail estates, established fee simple estates as a national land tenure policy, provided government and protection of property rights, and provided for the establishment of new territories and States. These policies encouraged rapid settlement which in turn created the need for surveys and land offices. In the years to come, surveyors would be very busy men indeed.

SUMMARY

The Land Ordinance of 1785 and the Northwest Ordinance of 1787 did not contain any radical departures from the practices used in the colonies. Instead they incorporated and consolidated the better features of the old system and outlawed some of the practices which the people as a whole had come to dislike.

Primogeniture and entails were abolished. Quitrents had been outlawed, with a few exceptions, by the colonial assemblies soon after 1776, and most people had stopped paying them anyway. These practices were on the way out of society and independence just hastened the process.

Land reform was uppermost in the minds of the majority of the population. Large land grants to favored people or nobility had to go one way or another, and the sentiment was against "land speculators and land jobbers." The direct sale of land was designed to correct some of the old abuses. Prior survey and sale was a departure from most established practice. The headright system had given land to the little guy but was now abolished. Squatters were to be a problem and as a result, eventually led to preemption. The headright system was reinstated in the form of the Homestead Acts in 1860's.

The Revolutionary War had drawn the new States into a closer common bond and made possible the cession of the western lands to a central government. The Congress took the place of the Crown and the Congressmen immediately exercised the power to dispose of the new public domain for the common good. The rectangular system was not dreamed up out of the whole cloth. The New England towns had proven to be a superior method of land disposal even though the system was based on close religious ties. All it took was some adjustments to make the system adaptable to millions upon millions of acres of wilderness. Along with the Northwest Ordinance, the Land Ordinance firmly established a system of land tenure, land acquisition and government which has proved very successful. For the most part, it ended the territorial and private boundary disputes, which alone would have made the effort all worthwhile.

CHAPTER II

DEVELOPMENT OF THE RECTANGULAR SYSTEM OF SURVEYS

THE PERIOD 1785-1796

The Seven Ranges

Viewed from a present-day level of technology, the surveys under the Land Ordinance were crude and inaccurate. However, they laid a basis for a system of surveys that could be improved and refined as better equipment and funding became available. A brief resume is included to show the need for changes in the system afterward.

Thomas Hutchins was the Geographer and was reappointed for a three-year term in 1784. He was a capable man and had worked on the survey of the south boundary of Pennsylvania, along with Andrew Ellicott, and David Rittenhouse. That boundary was surveyed using a transit (tangent) line and offsets made to the parallel of latitude prior to monumentation. There can be no doubt that Hutchins knew how to accurately survey a parallel of latitude, with the instruments, time, and funds for such work.

Thirteen surveyors, one from each State, had been appointed to assist Hutchins in the survey of the first Seven Ranges. Only eight surveyors showed up in Pittsburgh in September 1785, all with varying experience and ability. These men were:

(1) Edward Dowse — New Hampshire. Little is known about him. He was not from New Hampshire, but was available in New York and accepted the appointment of the New Hampshire delegates.

(2) Benjamin Tupper — Massachusetts. That state originally appointed Rufus Putnam, but Putnam was one of the original founders of the Ohio Company of Associates and had just accepted the position of Surveyor General of Massachusetts for lands in Maine. Putnam requested that Tupper go in his place. Tupper was really an advance scout for the Ohio Company and little is known of his true ability as a surveyor.

(3) Isaac Sherman — Connecticut. That state had chosen Samuel Parsons but, like Putnam, Parsons was also involved in the Ohio Company. Isaac was the son of Roger Sherman and it is said that his primary motive for going West was to gather intelligence about the Connecticut Western Reserve. Little is known of his qualifications in land surveying.

(4) Absalom Martin — New Jersey. He was an experienced surveyor but his motive was to scout the country for prospective land speculators. Martin actually worked more or less for John Cleves Symmes who was from New Jersey. This aided Symmes when he later purchased a large area of land between the Miami Rivers.

(5) William Morris — New York. He was a mathematician and surveyor and was the only one of the original group who was on a par with Hutchins in his ability to execute accurate surveys.

(6) Alexander Parker — Virginia. He was an old county surveyor and frontiersman who knew his way around the woods.

(7) James Simpson — Maryland. He actually came from New York and his qualifications are unknown.

(8) Robert Johnston — Georgia. He actually came from Baltimore. Hutchins referred to him as "Doctor" Johnston and it is said that he was a wealthy man, presumably with some knowledge of surveying.

So it was a very mixed group of men who gathered on the north bank of the Ohio River in September 1785.

The boundary commission, headed by Andrew Ellicott, had established a wood post at or near the high water line on the north bank of the Ohio River and on the west boundary of Pennsylvania on August 20, 1785. That boundary was run with a transit and on a true astronomic meridian. Hutchins and his group began the rectangular surveys at the aforementioned post on September 30, 1785. The only known instruments that Hutchins possessed were a sextant, common compasses, and circumferentors. It would have been an easy task to determine the compass variation accurately because a true meridian was available and there is little doubt that Hutchins made such use of the existing line. He undoubtedly used a sextant to determine the latitude of the beginning point by observations of Polaris and the sun as they crossed the meridian. Hutchins reported the latitude as being 40°38′02″. The actual latitude is about 40°38′27″, an error of 25 seconds. There is no record that Hutchins ever attempted to determine the latitude of the western end of what is now called the "Geographer's Line" or of the southern end of the first north-south line, as prescribed in the Land Ordinance.

Between September 30 and October 8, 1785, Hutchins, the other 8 surveyors, and a crew of about 30 chainmen and axemen ran 4 miles of line west from the beginning point. The line was run with a compass or circumferentor, with orientation at each point by using the compass needle, and measured with a two-pole Gunter's chain held horizontally. A post was set at the end of each mile. Bearing trees were taken and scribed using either a carpenter's race knife or cooper's (barrel maker's) knife. At the rate of $2 per mile, the crew only earned $8 for nine day's work. On October 8, 1785, Hutchins stopped work because he had word of Indian trouble at Tuscarawas, 50 miles to the west. Though Hutchins made an elaborate report of these four miles of line to the Congress, it was nevertheless a very poor showing for the year.

Hutchins complained of the difficulty of surveying by referring to the true meridian at a rate of $2 per mile. On May 9 and 12, 1786, Congress passed resolutions suspending the true meridian requirement and instructed Hutchins to resume work, limiting the surveys to seven ranges south of the Geographer's Line. The Connecticut Reserve was located north of 41° north latitude, so it was decided to limit the surveys (in the May 12 resolution) to the townships south of the Geographer's Line.

When surveying resumed on August 9, 1786, six of the old group returned, i.e., Tupper, Sherman, Morris, Martin, Simpson, and Johnston. The new men added were Winthrop Sargent (replacing Edward Dowse for New Hampshire), Charles Smith (replacing Parker for Virginia), Ebenezer Sproat for Rhode Island, Adam Hoops for Pennsylvania, Israel Ludlow for South Carolina, and Samuel Montgomery for North Carolina. Sargent and Ludlow were the most notable men; and along with Martin and Sproat, they were to continue surveying in Ohio for many years to come. Sargent became Secretary of the Ohio Company.

With a contingent of 12 surveyors (Delaware never did

send a surveyor) and full crews, the work resumed with vigor. Hutchins ran the Geographer's Line on to the west. As soon as six miles were completed, Absalom Martin began the first range line, running south to the Ohio River. As each township corner was reached, another surveyor started running a range line south. In this manner, Hoops, Sherman, Sproat, Sargent, and Simpson, in that order began the range lines. Morris drew the seventh range. When Hutchins started into the eighth range, trouble with the Indians began again. Although Sargent finished a large part of the fifth range, he had to stop work by the end of October because of the Indians. Hutchins had the other six surveyors busy running the east-west township lines, but by mid-November 1786, only four full ranges of township boundaries were completed. The surveyors spent about two and one-half months writing field notes and drawing plats of these surveys. On January 27, 1787, Hutchins left Ohio for New York to present to the Board of Treasury the plats and descriptive notes of these four ranges.

Work was resumed by Ludlow and Martin in April 1787, closely followed by Simpson. Ludlow finished the west boundary, to the Ohio River, of the seventh range in about two weeks. In spite of thefts and some harassment by the Indians, Simpson and Martin completed the fifth and sixth ranges soon after Ludlow finished. Although the field work was completed in June 1787, and all of the records were in New York by September, the Board of Treasury did not receive the final plats and notes until July 1788.

Results of the First Surveys

There is no written record of instructions to the surveyors from Thomas Hutchins. Any instructions given them were probably verbal because Hutchins was on the ground with them in 1785 and 1786. The field note records show that as a general pattern, the range lines were run southerly from the Geographer's Line using a common compass or a circumferentor. There is no indication that any attempt was made to correct the compass needle for the magnetic variation. As a result, the range lines have an actual bearing of about S. 2° W., with a maximum bearing of about S. 3° W. The east-west township lines deviate about the same amount from cardinal and intersect the range lines at approximately a right angle.

The west end of the Geographer's Line is about one mile south in latitude of the beginning point, an average deviation from due west of 1°21′. The magnetic variation at the time in this general area of Ohio was about 30′ to 1° east.

Only the lot and township corners around the exterior boundaries were monumented. The corners were marked using either wood posts or a corner tree, witnessed by two bearing trees. The bearing trees were blazed and scribed with bearings and distances given to the trees from the corner. (See Fig. 5 for monumentation, numbering system, and the reserved lands within the original Seven Ranges.) The Ohio River was meandered between township and range lines as the situation dictated. The ranges were numbered west from the Pennsylvania boundary. The townships were numbered north from the Ohio River. In retrospect, this system of numbering the townships was very confusing and cumbersome. For example, Township 2, Seventh Range, is located west of Township 1, Sixth Range. Until Ludlow reached the Ohio River on the west boundary of the seventh range, he did not know the township number (16) of the township at the northwest corner of the seventh range. This use of a natural boundary was unsatisfactory even in 1786 and 1787, but it would be 20 years before the system was corrected to the system used today.

Another large flaw of procedure in the original Seven Ranges was the manner of surveying the township boundaries. The range lines were to be run due south, but because of the Ohio River, they had to be run in a stairstep pattern to offset west from the river and continue south. The township lines were to cross the range lines at "right angles, as near as may be," according to the Land Ordinance. The surveyors were apparently all individuals with individual concepts of how to comply with the "six miles square" and "right angle" requirements. Nothing in the Ordinance specifically stated the township corners had to be common to all four townships; although that seems to be unnecessary, it should have been self-evident. But the surveyors ran east or west on a township line and measured six miles and set a township corner, even though one already existed on the north-south range line. The result of this was anywhere from one to four corners supposedly standing for what in theory should have been a common corner of all four townships. Some examples of these corner situations are illustrated in Fig. 6. The idea of random and true line for township lines apparently was not considered, probably because of the expense of that procedure. At $2 per mile the cost and time to run random and true on the east-west lines was out of the question.

The line measuring was done with a common two-pole Gunter's chain. Hutchins instructed that the lines be measured horizontally, but the terrain was very rough, hilly, and covered with timber. Speed was of the greatest importance. The resulting measurements were very crude and some of the problems created by large errors in measurement will be discussed later in this book. (See Fig. 7 for a general view of the Seven Ranges.)

The plats were delivered to the Board of Treasury and contained the descriptive notes of the township, corner monumentation, and bearing trees. These descriptive notes were not the field notes; they were a listing of each corner showing how the corner was monumented (post or tree), the bearing trees, and the soil type, terrain and quality of land along each mile surveyed. The use of descriptive notes was continued until the early 1900's.

Congress was impatient and put the first four ranges up for sale in 1787. The first lands were sold at an auction in New York City between September 21 and October 9, 1787. Some 108,431 acres were sold for $176,090. But 35,457 acres were later forfeited, leaving a net sale of 72,974 acres for which $117, 108 in public securities was received. The total cost of surveying the Seven Ranges during 1785 through 1787 including the Geographer's salary and all other claims made by the surveyors, was $14,876.45. Congress was very disappointed with the showing and no further surveys were made by the government during the existence of the Congress of the Confederation.

The first patent was issued at New York City on March 4, 1788, to John Martin and is simply for Lot 20, Township 7, Range 4. He paid $640 for that section. Since that lot is located within the township, no corners of the patent existed on the ground. Although the lot boundaries were protracted

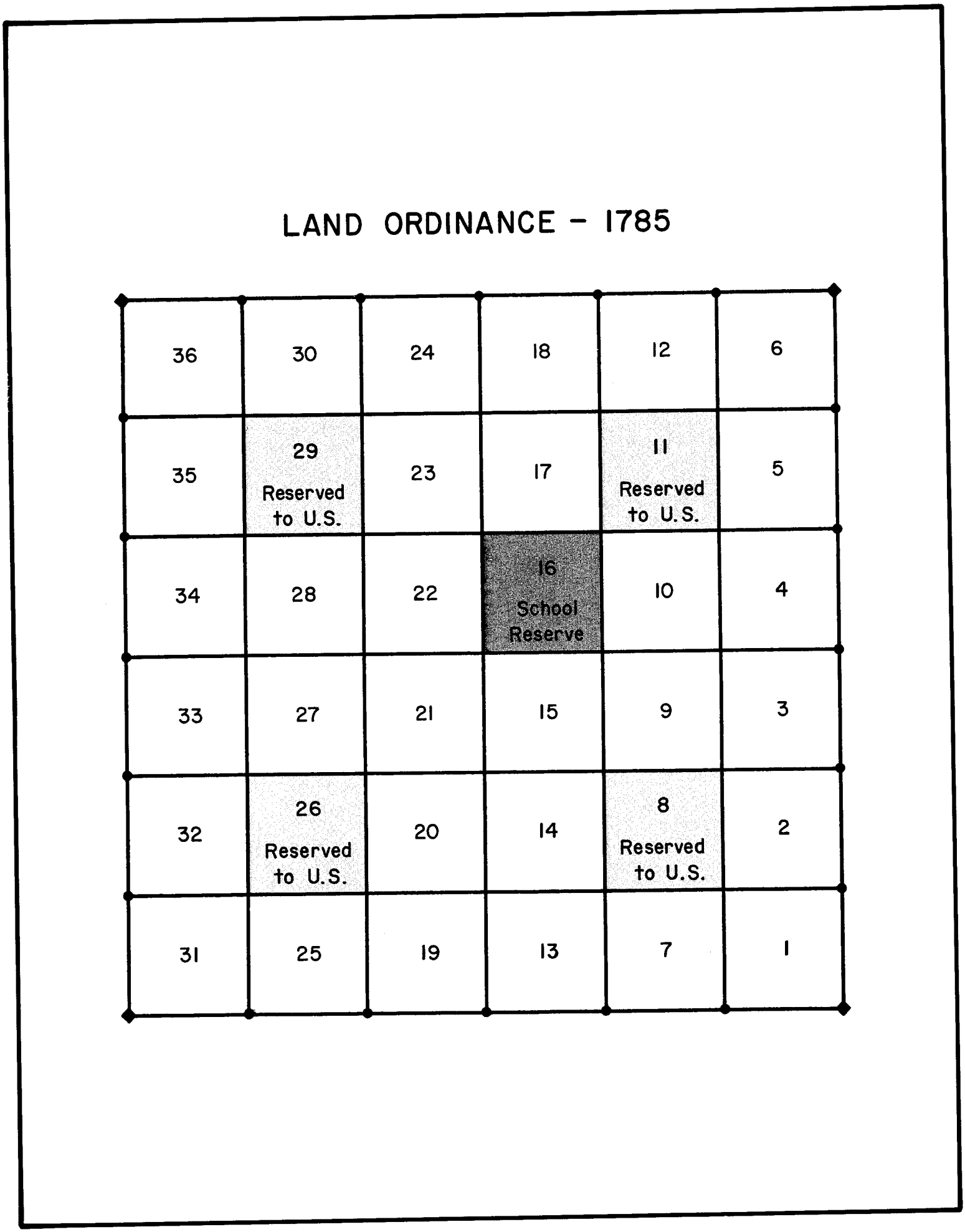


Figure 5. Monumentation and Reserves in the Original Seven Ranges, Ohio.

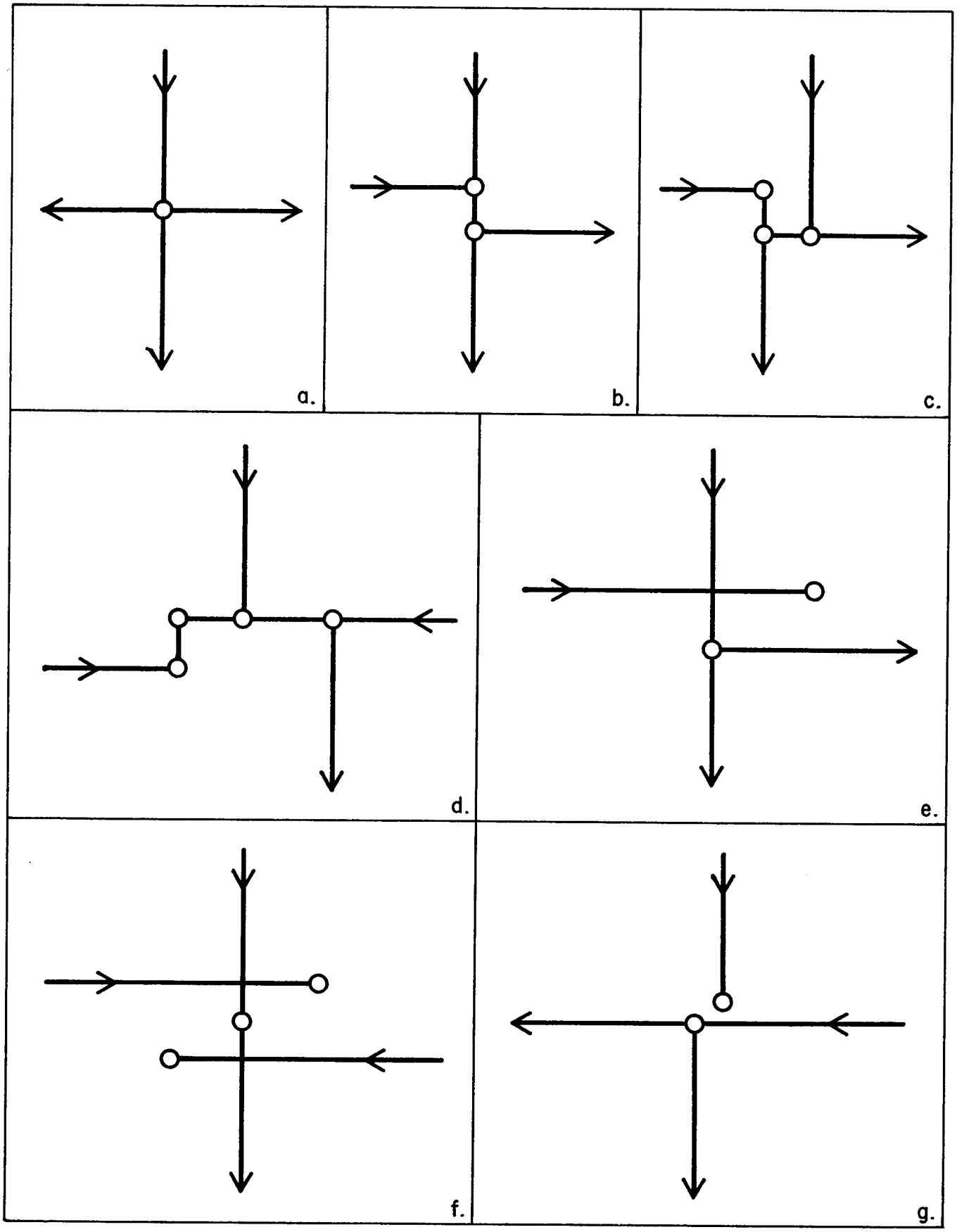


Figure 6. Examples of Township Corner Monumentation in the Original Seven Ranges.

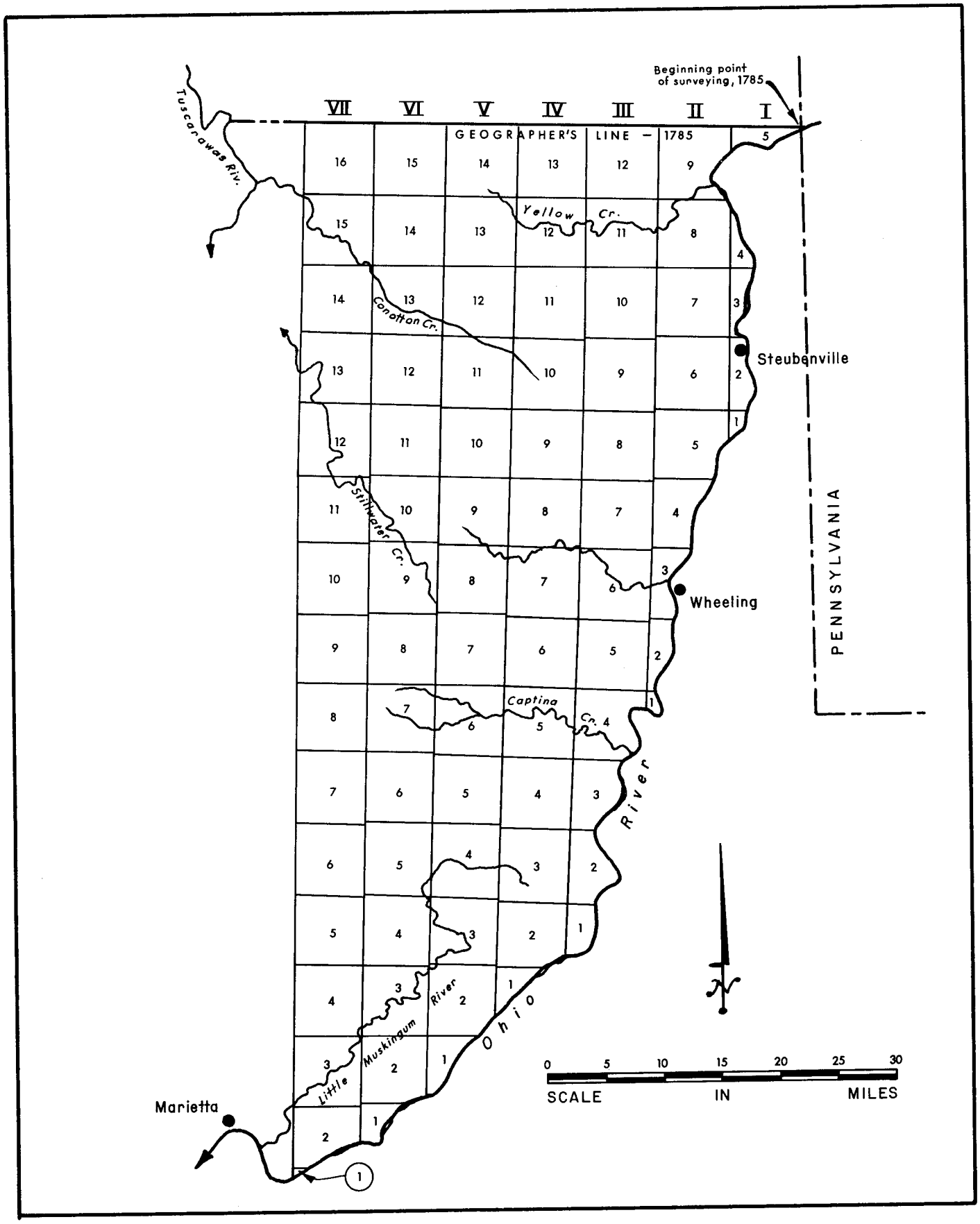


Figure 7. The Original Seven Ranges.

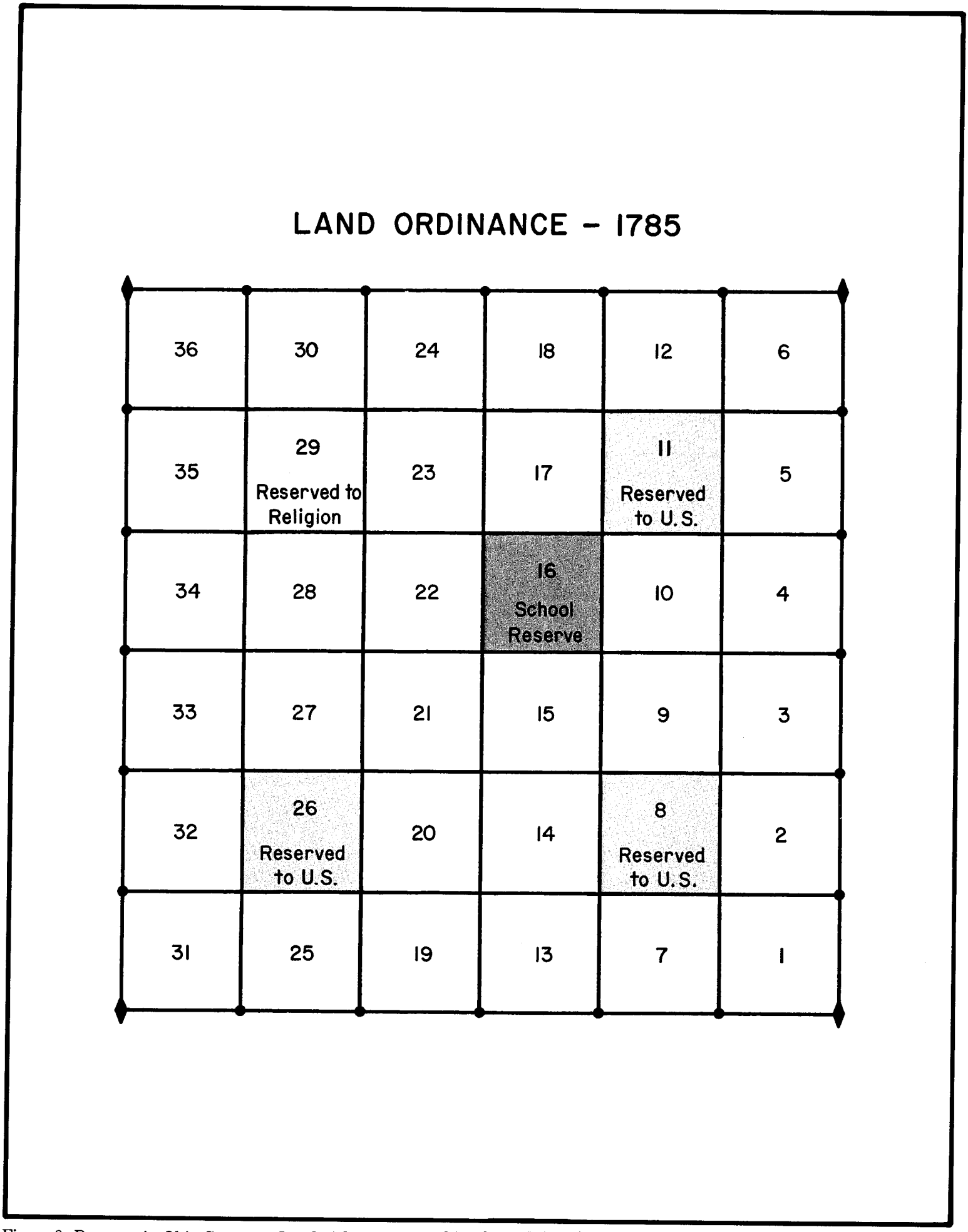


Figure 8. Reserves in Ohio Company Lands (plus two townships for a University).

on the plats to show the location of the lots, it was up to Martin to have it actually located by survey. Lot 26, reserved by Congress, bordered Lot 20 on the west. No rules existed for the subdivision of the townships. The easiest course was to stub in from the nearest corner on the township line, the method used in most such cases, which revealed a large flaw in the original procedures under the Ordinance.

The Ohio Company of Associates

The first organizers of the Ohio Company were General Rufus Putnam and Benjamin Tupper, who advertised for prospective investors in Massachusetts in 1786 and 1787. After $250,000 had been subscribed and the company organized, they sent a committee of three to apply to Congress for a private land purchase in Ohio. The petition was presented to Congress in July 1787 by Putnam, Samuel Parsons, and Manasseh Cutler, who proposed to purchase 1,500,000 acres, survey it, and sell the land to settlers. With some debate and negotiations, a contract was signed by Cutler and Winthrop Sargent on October 27, 1787. Sargent was Secretary of the Ohio Company and had surveyed in the Seven Ranges. The purchase price of $1 per acre was reduced to 67 cents by allowance for poor land. The payments were made in military warrants and public securities (bonds and certificates) which had greatly depreciated in value. It is estimated that the Ohio Company actually paid less than 12 cents per acre, if reduced to specie. The terms of the contract called for $500,000 down, a like amount when the surveys were completed and the balance in six equal payments, with patent to issue after one million dollars had been paid. The details of the Ohio Company Purchase need not be gone into here, but eventually the company received about 964,000 acres and Congress donated another 100,000 acres to encourage settlement on the frontier and hold the land against the Indians.

The lands were to be surveyed into townships and lots in accordance with the Land Ordinance; the costs of the survey, etc., were borne by the company. The east boundary of the purchase was the west boundary of the Seven Ranges; the new surveys were to be an extension of the Seven Ranges surveys. Lot 16 in each township was reserved for schools, Lots 8, 11, and 26 were reserved to Congress, and Lot 29 was reserved for the support of religion (see Fig. 8). The religion reservation had been deleted in the Land Ordinance but was restored in the contract with the Ohio Company and later in the Symmes Purchase. The only obligation of the government was to survey the north boundary of the purchase, to be an east-west line, from the Seven Ranges to the Scioto River, which would enclose the one and one-half million acres (plus enough to cover the reserved lands) north of the Ohio River.

Rufus Putnam was made Superintendent of Surveys for the Ohio Company. He and his contingent arrived at the mouth of the Muskingum River on April 7, 1788, where they founded the town of Marietta. They soon began the surveys of the township and range lines.

In the fall of 1788, Thomas Hutchins, Absalom Martin, and Israel Ludlow began the survey of the exterior boundaries of the Ohio Company Purchase. Hutchins determined the latitude at the mouth of the Scioto River, meandered up the Ohio for 12 miles and then left for Pittsburg and other work. Hutchins died April 28, 1789, without ever returning to Ohio. The Congress did not appoint a new Geographer. Ludlow continued the meanders of the Ohio River up to the southwest corner of the Seven Ranges, while Martin meandered up the east bank of the Scioto. Martin halted work in late 1788. In 1789, Ludlow ran the limiting north boundary of the purchase west from what is now the northeast corner of the Donation Tract to the Scioto and then meandered downstream to connect with the Martin meanders. It isn't known how Ludlow monumented the northern line, but it is certain that he blazed it. The area encompassed by this "Ludlow line" and the Ohio, Scioto, and Seven Ranges was computed and found to contain sufficient land to satisfy the Ohio Company and the proposed Scioto Company purchases; however, the Scioto Company never came to be.

Putnam employed Martin, Ludlow, Ebenezer Sproat, John Matthews, Anselm Tupper, all of whom had worked on the Seven Ranges, and others to conduct the surveys. At first the surveyors were in business for themselves, charging individual surveying fees, as was the custom in the States at that time, but this proved unsatisfactory at best, and Putnam began a contract system. The contracts were for the survey of given townships and subdivisions at a stated price per mile. Putnam would eventually continue the contract system whem he became Surveyor General of the United States.

The township boundaries and section lines were surveyed in the same general manner as the Seven Ranges. The lines were run with a compass without correction for magnetic variation in the free style used in the original Thirteen States. Measurements were made with the only measuring tool available, the Gunter's chain. Corners were monumented with wood posts or corner trees, with bearing trees to witness them, and the lines were blazed. But the work was executed with the objectives of speed and low cost and was no better than could be expected under the circumstances. The range lines have bearings of up to N. 4° E.-S. 4° W., with the township lines about the same amount from cardinal directions. Distances between section corners may exceed, or be less than, 80 chains by as much as 5 chains, in actual measure.

The Ohio Company had over 800 subscribers or stockholders. Using a complicated formula derived by the company, each stockholder was entitled to receive a total of 1,173.37 acres of land in 7 different sizes of tracts. The sixth and seventh tracts were for 640 acres and 262 acres, respectively. To meet the odd acreage of 262 acres, a given township would be divided according to the plan shown in Fig. 9. By that division, 22 shareholders would receive their 640-acre and 262-acre allotments in the township. Remembering that 5 lots were reserved, Lots 8, 11, 16, 26, and 29, and taking out 9 lots to be divided into nearly 262-acre fractions, 22 lots and 22 fractions were accommodated for 22 stockholders' sixth and seventh tracts. The stockholder might receive a deed for Lot 1 and Fraction No. 1 in the township. Approximately 37 townships were surveyed in this manner. Other townships were subdivided into 160-acre quarter sections and the remainder into small tracts and town lots. Theoretically, each stockholder eventually received title to his full share one way or another.

Thus, the Ohio Company Purchase was the proving ground for subdivisions of a township at that stage of development. Plats were made of these townships but no field notes are known to exist. The company was not required to file plats

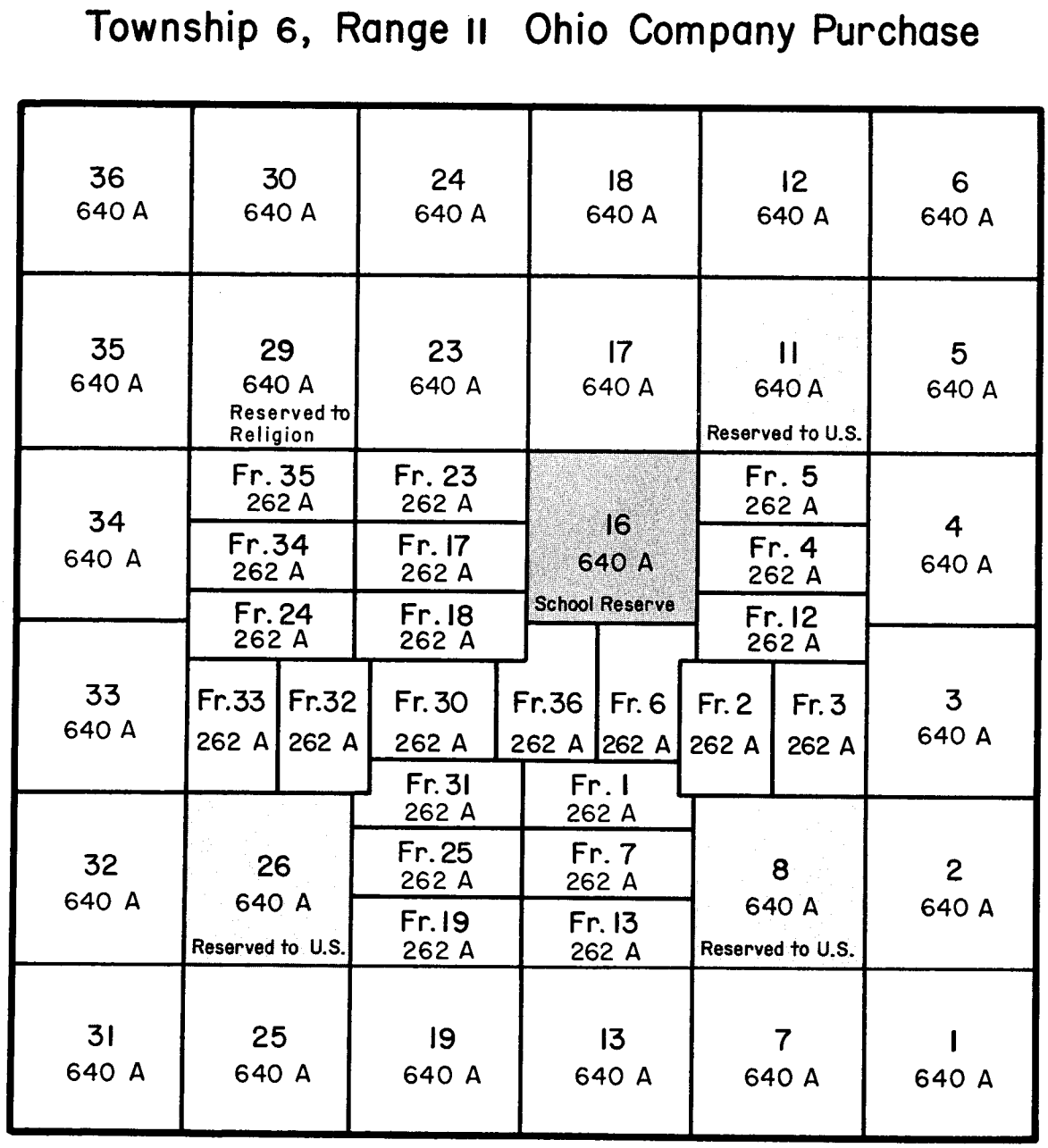


Figure 9. A Typical Township Subdivision in the Ohio Company Purchase.

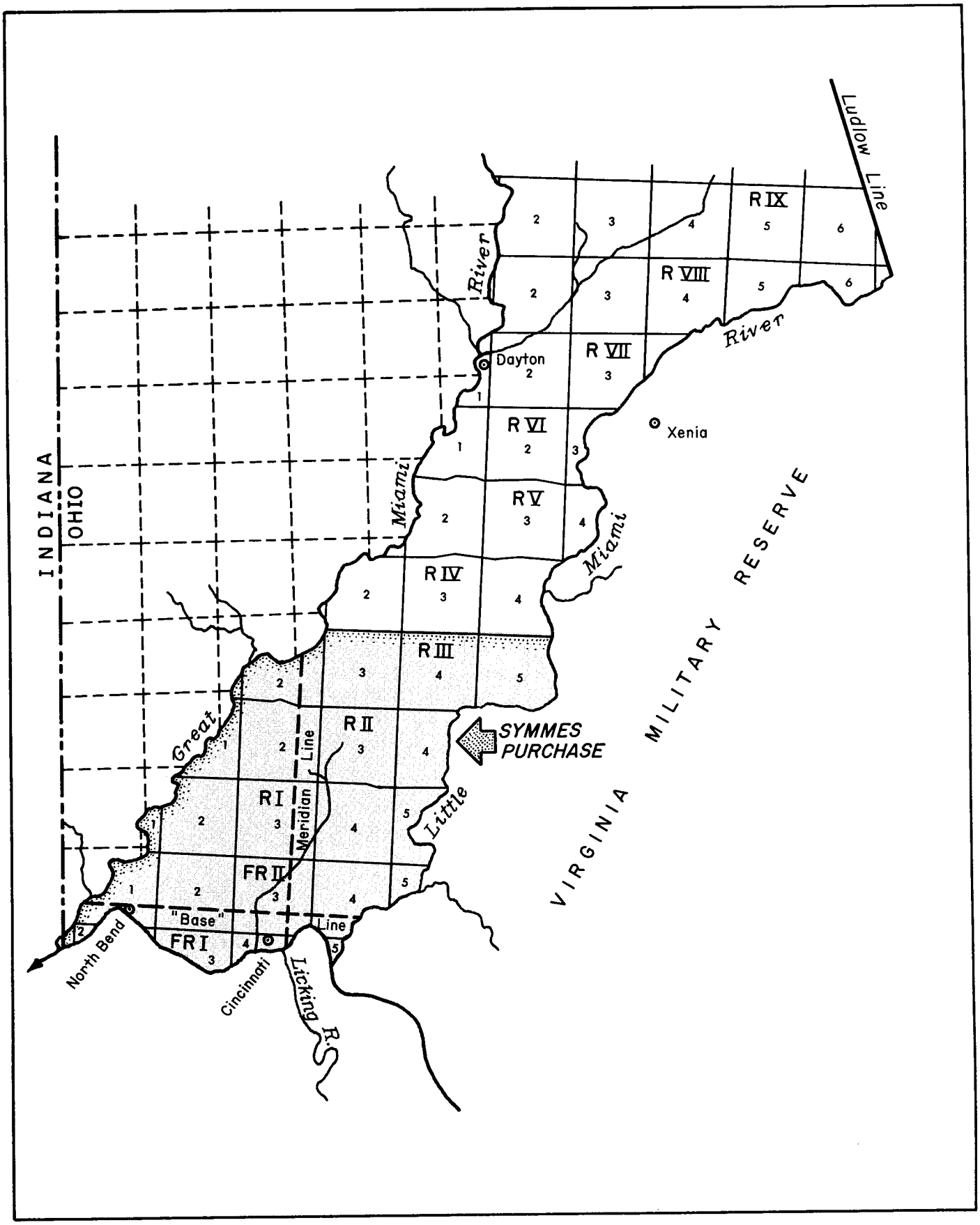


Figure 10. The Symmes Purchase and Between the Miamis Survey.

and field notes with the Board of Treasury. In later years when the government sold the reserved lands, the lack of these records created some difficulties for the Surveyors General when they were required to locate the reserved lots within these townships.

The Donation Tract

The Ohio Company had originally proposed to donate 100 acres of land to anyone who would settle within the purchase and aid in protecting the lands against the Indians. But the cost of government and other factors caused financial problems and the company presented these hardships to Congress in 1792; in April, Congress authorized the President to donate 100,000 acres to the company in trust. The Donation Tract was bounded on the north by the "Ludlow line," on the south by the lands patented to the company in the "First Purchase," on the east by the Seven Ranges, and extended far enough west (approximately 21 miles) to include the 100,000 acres. These lands were donated without charge to male settlers in lots of 100 acres and were never subdivided into townships; it indirectly created fractional townships in ranges 8 through 12 of the Ohio River Base surveys.

The only other large tract of significance within the boundaries of the purchase was the two townships reserved for a college. Townships 8 and 9, Range 14, were donated for that purpose and were not subdivided into lots under the Land Ordinance.

The Ohio Company completed most of its business by January 1796 and went completely out of business in 1849.

The Symmes Purchase

John Cleves Symmes, from New Jersey, contributed much of his private resources in support of the Continental Army during the Revolution. He held a large quantity of certificates of indebtedness and wanted to turn them into something of value, namely, real estate. Symmes proposed to purchase the lands between the Great and Little Miami Rivers in southwestern Ohio for about the same terms given the Ohio Company, except that only one township was reserved for an academy. Although Symmes jumped the gun and began settlement before a contract was concluded, which made Congress angry, he finally got a contract for one million acres on October 15, 1788. The east boundary of the tract was supposed to be parallel to the Great Miami, beginning at a point 20 miles up the Ohio from the mouth of that stream. It was impossible to determine a boundary of that description so Symmes began in late 1788 to survey all the lands between both Miami rivers. Symmes' principal surveyor, Israel Ludlow, ran an east-west base line between the Miamis through what is now Fractional Range 2, setting corners every mile. Symmes directed the assistant surveyors to run lines north and south on a magnetic meridian from each of Ludlow's mile posts, setting corners at one-mile intervals on the meridional lines but not to tie across with east-west lines. The purchasers would have to pay for surveying the east-west lines. By this scheme, Symmes would only pay the cost of surveying half the section lines but all four corners would have been established by him. The townships were not numbered in reference to Ludlow's base line, but it ran east-west and the ranges were thus numbered north from the Ohio River. The first townships on the Ohio are fractional and are called "Fractional Range 1." The second row is called "Fractional Range 2," with the third and first full townships called just "Range 1," followed by Range 2, Range 3, and so on. The townships are numbered east from the Great Miami River. The Between the Miamis surveys are the only place in the United States where ranges are numbered north-south and the townships are numbered in an east-west direction (see Fig. 10).

Gross distortions resulted when the purchasers hired surveyors to run the east-west lines to form the north and south boundaries of the sections tying between the corners established on the meridional lines. The supposed northwest corner of a section might be 15 to 20 chains or more, north or south of the northeast corner of the same section. The longitudinal distances between corners were also grossly in error. A purchaser of a full section might have 100 acres more or less than he was to pay for. This type of distortion was clearly in violation of the Land Ordinance which said that the east-west lines should cross the north-south lines at "right angles as near as may be." The numbering of the ranges north-south was also technically in violation of the Ordinance. Even though many purchasers already occupied their lands according to the original corners, Symmes ordered his surveyors to carefully rerun the meridian line which intersected the Ohio opposite the mouth of the Licking River in Kentucky and set new corners every mile. He called this new line a "standard." The purchasers were to then run east-west lines from the new corners on the standard and set their section corners at intersections with the old meridional lines, which created even more conflicts and problems. Eventually the Ohio Supreme Court ruled that the original corners controlled, regardless of the distortions.

Symmes began to run into financial difficulties and couldn't pay for the lands he had contracted to purchase. He also had his surveyors at work north of the land he had paid for and was in effect selling land he did not own. Symmes eventually received patent to the lands as far north as the north boundary of Range III. The government in later years honored the claims of purchasers north of that line and patented the lands to them under the *Act of March 2, 1799,* 1 Stat. 728, and supplemental acts.

The Symmes Purchase was so badly managed and the surveys so poor that it effectively killed any further large land sales by Congress. It brought out the need for proper surveys, executed by the government, and the fixing in position, by law, of survey corners and lines once claims were made based on them. Though Symmes had used a base line to begin the surveys, it was not used to control township and range numbers. The use of natural boundaries such as the Ohio and Great Miami Rivers was obviously defective, but for the time being the surveys were locked into what already was the practice. But even as bad as the surveys in the Symmes Purchase were, they proved to be far superior to the metes and bounds system and indiscriminate locations. There are no known field notes and very few plats of the surveys within Symmes Purchase, as most of the records were destroyed when Symmes' house burned at North Bend, Ohio, in 1810. In later years, the Surveyor General was able to find some scattered records which were in the hands of local and county surveyors.

The Virginia Military Tract

When Congress accepted the Virginia Cession on March 1, 1784, a condition in the deed of cession was that the lands north of the Ohio and between the Scioto and Little Miami rivers were reserved to satisfy Virginia military warrants if there was not enough good land in Kentucky to fulfill requirements. The area reserved was to be all the land lying between the Little Miami and Scioto Rivers, north of the Ohio River, and lying east of a line drawn from the souce of the Little Miami to the source of the Scioto. Virginia had granted from 100 acres for a soldier or sailor with less than three year's service to 15,000 acres for a Major General. That state had no idea how much land was needed nor how much was available in Kentucky at that time. Although some locations were made in the tract as early as 1787, they were declared illegal and the area was not officially opened to entry until August 10, 1790.

The military warrants could be located by the original holder or after 1794, he could assign or sell his warrant to someone else. Heirs of the original warrant holder or agents could do the same. Often several warrants were bought by one person and turned in for land in the tract.

Basically the system used in the Virginia Military Tract to survey and convey land was the following: a surveying district was set up usually with natural boundaries, a land office, and a district surveyor. The district surveyors were predecessors of the county surveyors. Upon proof of service in the war, the soldier would be issued a warrant for the stipulated number of acres. He would then go on the land, select a parcel he liked, and come up with a crude description of its location. He would then visit the land office and present his warrant and description. If no conflicting claim appeared likely, the land office would issue him a numbered certificate of entry. Next, he took the entry to the district surveyor who, together with the land office, assigned it a survey number. The surveyor went out and surveyed the tract, usually enclosing the number of acres called for in the warrant, although there was nothing in the laws to require that all of the land in a warrant be surveyed in one contiguous parcel. After survey, the surveyor would prepare a description and plat of the survey, showing its survey number, etc., and would make out the certificate of survey. The claimant paid the expenses of the survey and then presented his certificate of survey, description, etc., to the land office. If all appeared in order, a patent would be issued by the Board of Treasury and later the General Land Office in Washington. Title to the Virginia Military Tract remained in the Federal government until patent was issued, although the surveying and land offices were under the supervision of Virginia.

This then was the procedure in the simplest of cases, often it was much more complicated. There was no method used to tie the surveys together and at any given time it was impossible to find just where one survey was located in relation to others in the same vicinity. The overlaps and gaps or gores were everywhere. The irregularities and errors were sometimes astounding. C. E. Sherman reports (*Original Ohio Land Subdivisions,* page 32, 1925) that Survey No. 15890 in Scioto County was originally returned as containing 458.5 acres, but accurate resurveys by the year 1925 showed that Survey No. 15890 actually encompassed over 1,662 acres. This is surely an extreme case, but even the worst of the rectangular surveys of that time did not approach such gross errors.

The patents for the locations within the Virginia Military Tract are frequently long and complex. One survey contained 118 separate courses and left an unclaimed parcel enclosed within its boundaries (cited by W. E. Peters in his book *Ohio Lands and Their Subdivision,* 2nd ed., 1918). In copying all those courses for a patent, description mistakes could easily occur and probably did.

Surveys were made and patents issued for lands in the tract well into the mid-1800's. Congress passed a multitude of laws concerning lands in the tract, including those pertaining to the boundary line between the headwaters of the Little Miami and Scioto rivers (discussed later), but the final act was passed on *February 18, 1871,* 16 Stat. 416. That act gives to the State of Ohio all the unclaimed and unsettled lands within the Virginia Military District, thought to be about 76,735 acres, without description or benefit of survey. It is entirely possible that some small parcels still exist that are not yet identified.

Other Events During 1785-1796

As has been seen so far, Congress received very little revenue from the public land sales in the Seven Ranges. Settlers just weren't willing to pay $1 per acre, cash, for lands that were almost totally unprotected from Indian attack and then pay for a survey to locate the boundaries before they could start clearing. Instead, they chose to buy from the Ohio Company or Symmes at a lower price on credit at 6 percent interest with the cost of survey, if any, much less and with some measure of protection. In selling large tracts to two private companies, Congress had set up stiff competition which it could not meet.

On January 20, 1790, the House of Representatives called on Alexander Hamilton, Secretary of the Treasury, for a plan of disposing of the public lands. Hamilton submitted his report on July 20, 1790, in which he recommended establishing a General Land Office at the seat of government with subordinate offices or local land offices in the area where land sales would take place, that is, in Ohio and in the Mississippi country south of Tennessee. His plan called for a Surveyor General and Deputy Surveyor's General, sale in lots of 100 acres and upward, sale to land companies, a price of 30 cents per acre payable in gold or silver or in public securities, and 2 year's credit at 6 percent interest, for the townships to be surveyed 10 miles square (but no mention is made of sections, just that lots of different sizes would be located within the townships), and that all surveys would be at the expense of the purchasers or grantees. Hamilton's plan was quite detailed as to methods of handling the sales, etc. Fortunately the Congress did not accept all of Hamilton's ideas and in fact did not act affirmatively on any of Hamilton's recommendations for nearly six more years.

Another factor that deterred further activity in surveying and land sales was the Indians. The Territorial Governor, Arthur St. Clair, had tried negotiating with the Indians without much luck. In June 1790, he decided to go to war, but suffered heavy losses. St. Clair tried again in 1791, and again was soundly defeated by the Indians. In 1793, General "Mad Anthony" Wayne was given command of the Army in the territory and opened a skillful campaign in 1794. The Indians

lost the decisive battle at Fallen Timbers in August 1794. The result was a treaty, signed at Greenville, Ohio, on *August 3, 1795,* 7 Stat. 49, which gave title to the United States for about three-fourths of the present state of Ohio and a small part of Indiana. The Greenville Treaty boundaries will be discussed later in this book.

Analysis of the Period

Although many details were still to be worked out, this period proved beyond a doubt that the rectangular system of townships and ranges was far superior to the indiscriminate location method of disposing of large land areas. The complete simplicity of land description cannot be overstressed. Compare the first patent description, "Lot No. 20, Township 7, Range 4," against the complexity of a many-sided metes and bounds location. There is only one possible location for that section in all of the Ohio River Base surveys which can be easily and quickly spotted on any map of sufficient scale. Theoretically, it can also be divided by aliquot part description down to a parcel the size of this page and that small piece could only be situated in one place in the whole country. This huge advantage must have been obvious to anyone concerned with land surveys and sales, even Alexander Hamilton. It would be a few years and arguments later before the six-mile-square township was fixed as the final unit. Ten-mile townships were never adopted but five-mile townships would be used for special reasons only.

The details of execution, monumentation, subdivision, and sales were still in an evolutionary stage in 1796, but the foundation was laid. Indian title had been extinguished, the country was at peace at home and abroad, the economy was looking up, the Ohio Company and Symmes had about run their course and the public lands were there with settlers ready and willing to buy, given the chance. The time was ripe for the next step.

THE PERIOD 1796 — 1812

Act of May 18, 1796

Congress debated but failed to pass legislation on the public lands question from 1789-1792. A scandal involving the Ohio Company, the questionble activities of Symmes, and the final defeat of the Indians caused action in January 1796. Finally the *Act of May 18, 1796,* 1 Stat. 464, was approved, a milestone in any history of the public land surveys, and at the time was the instructions for the conduct of those surveys. An analysis of the act by section is appropriate here.

Sec. 1. A *Surveyor General* shall be appointed. He shall engage *skillful surveyors* as his *deputies*. He shall survey the lands *northwest* of the Ohio River and above the mouth of the Kentucky River (in Kentucky) in which Indian title has been extinguished (Greenville Treaty). He shall frame *regulations* and *instructions* for his deputies and they shall take an *oath* (to do proper work) and he may *remove* (fire) them *for negligence* or *misconduct.* (Hopefully this would give the Surveyor General the power to achieve properly executed surveys.)

Sec. 2. The lands not already surveyed or patented (in the Seven Ranges, Ohio Company, Symmes Purchase) and lands not being appropriated for military bounties (Virginia Tract and U.S. Military Reserve) are to be divided into townships six miles square by *north-south lines* run according to *true meridian* (restoring that requirment) and by lines crossing them at right angles (east-west), *except* where the *Indian boundary* or *navigable rivers* make full townships impossible. (Only the Greenville treaty line, Ohio, Scioto, Great and Little Miami Rivers and private land claims created fractional townships as referred to in the act.) The corners of the townships and the section corners will be distinctly and differently marked. (The appropriate numbers, township, range, and section so that a purchaser could find his land.) *One-half* of the townships, taken *alternately*, shall be subdivided into *sections* (first use of that term), by running through the townships *parallel lines* at the end of *every two miles,* with section corners at every mile on all lines surveyed. (This was another economy measure.) The sections will be numbered beginning with *number one* in the *northeast corner* of the township, proceeding west and east alternately (the method still in use, but no one knows why the new numbering system was adopted). Bearing trees will be taken at each corner and all lines will be plainly blazed (the common practice). The lines will be measured with chains containing two perches of 16½ feet each, subdivided into 25 equal links, adjusted to a standard to be kept for that purpose. (This specifically calls for a Gunter's chain and leaves no doubt that accurate measurements are to be made.) The Surveyors are to keep detailed field notes (vital for mapping information) and return them to the Surveyor General for permanent records. The Surveyor General will make *three plats;* one for his office, one for use at the place of sale, and one for the Secretary of Treasury; he will make out a *description* of the township for the use of the officers making sales, and will give a *description* on *the plat* of the lands and the *corner monumentation.* (The field note books were kept by the Surveyor General and only descriptive notes went to Washington and the land offices.)

Sec. 3. Reservations: *36 contiguous sections* surrounding a *salt spring* east of the Scioto are reserved (this spring is located in section 29, T. 7, R. 18, and the 36 sections are in Tps. 6 and 7, R. 19, and Tps. 6 and 7, R. 18, where Jackson, Ohio, is now located). If other salt springs are found, the section containing it is also reserved (salt was a vital element to the settlers and no one was allowed to monopolize it). The *four sections* at the center of each township are resreved (sections 15, 16, 21, and 22) except in fractional townships which are less than three-fourths of full size, but the salt reservation applies. (No mention is made of a section 16 school reservation.)

Sec. 4. When seven ranges are surveyed (1) Below the Great Miami, (2) between the Scioto and Ohio Company Purchase, (3) between the Connecticut Reserve and the Seven Ranges, and the plats returned, etc., the sales will be held at Cincinnati and Pittsburg. (This wording had the effect of establishing surveying districts.) The *townships subdivided* will be offered for sale in sections, and those *not subdivided* will be sold at Washington in *quarter townships*. The minimum price is raised to *two dollars* per acre (raised from the old price of $1).

Sec. 5. Provides for notice and advertising of the sales.

Sec. 6. This section is complex and directs that the unsold lands in the Seven Ranges, including lands drawn by the Army, and the lands sold but unpaid for, thereby forfeited, and the townships that were to be sold entire under the Land Ordinance are to be sold. The whole townships are to be sold in quarter township blocks in Philadelphia, reserving the four sections at the center of the township. The townships that were to be sold by sections under the Ordinance are to be sold at Pittsburg, again reserving the four sections in the center of the township. But the reserved lots in the townships already sold under the Ordinance are still reserved, which was very confusing because of forfeited lands, scattering of plats and records of sale, etc. It was really hard to tell whether the old reserves were abolished or the new four-section reserve was added to the old in certain townships.

Sec. 7. This section turned out to be a mistake and wasn't corrected until 1820. It provides for credit purchases under a complicated formula. The highest bidder is to pay 1/20th of the purchase price as down payment, to be forfeited if one-half the price including the 1/20 is not paid within 30 days. If he pays the half, he then has one year to pay the other half. If he doesn't pay the remaining half within one year, he forfeits the half he has paid and the government forecloses. If and when he pays the full amount, he will receive a patent which is to be signed by the President and Secretary of State, the latter to record the patent. Thus, the Secretary of the Treasury was in charge of credit sales but the Secretary of State recorded the patent. Credit sales, forfeitures, and scattering of records caused problems and confusion for the next 40 years or more.

Sec. 8. Provides for recordkeeping by both the Territorial Governor (St. Clair) and the Secretary of the Treasury.

Sec. 9. The wording of this section probably caused more litigation and misunderstanding than any other section of the act. It follows, in full:

> "And be it further enacted, That all navigable rivers, within the territory to be disposed of by virtue of this act, shall be deemed to be, and remain public highways: And that in all cases, where the opposite banks of any stream, not navigable, shall belong to different persons, the stream and the bed thereof shall become common to both."

What isn't spelled out is: What is a navigable river, i.e., how is navigability determined? Non-navigable streams have a common ownership, i.e., if there are different patentees on opposite banks they own the bed in common. But nothing is said about non-navigable lakes, and that caused many problems during the 1800's. This important section of the act is now codified in *43 U.S.C. 931*.

Sec. 10. Provides for the Surveyor General's salary (but no office help) and that the President of the United States may fix the compensation of the assistant surveyors, chain carriers and axe men: provided that the whole expense of surveying shall not exceed $3 per mile for every mile actually run or surveyed. This seems to imply that assistant surveyors and crew members would be hired on a salary, but if so, how would it be possible to assure that the cost of surveying would not exceed $3 per mile? The increase to $3 (the Land Ordinance called for $2) would not assure speed on the part of the surveyors.

Sec. 11. Provides for the fees to be paid the Treasurer or receiver for handling the sales.

Sec. 12. Requires that the Surveyor General, assistant surveyors, and chainmen must take an oath to faithfully perform their duties. The receiver is to furnish a bond as security. These stipulations were an effort to assure honesty in the surveys and money handling.

Act of June 1, 1796, 1 Stat. 490

Passage of this act was anticipated in the *Act of May 18, 1796*. The title is a little misleading, "An Act regulating the grants of land appropriated for Military Services, and for the Society of the United Brethren, for propagating the Gospel among the Heathen."

In the Land Ordinance, the Army was to select townships to satisfy the military bounties granted to the Revolutionary War soldiers by the Continental Congress. None were selected; instead, the Congress agreed to set aside a specific tract to be used to satisfy those outstanding warrants, i.e., the U.S. Military Reserve.

The "United Brethren" were the Moravian missionaries who had established missions on the Tuscarawas branch of the Muskingum River and had converted many Indians to Christianity. These missions were settled Indian towns within the Military Reserve. The missionaries had a strong influence on the Indians and had brought a measure of peace in the area before the Greenville Treaty. Congress granted 4,000 acres for each town to the Moravians in appreciation,

which were outright land grants to be held in trust by the Moravians for the Indians.

Sec. 1. The Surveyor General is to survey the boundaries of the Military Reserve. Beginning at a point on the west boundary of the Seven Ranges, 50 miles south of the northwest corner of those townships (T. 16, R. 7), thence due west to the Scioto River, thence up that river to the Greenville Treaty line, thence northeasterly on the treaty line to the Tuscarawas and up that stream to an intersection with a line run due west from the northwest corner of the Seven Ranges, thence due east along that line to the northwest corner of the Seven Ranges.

The Greenville Treaty line had not been surveyed and what Congress didn't know was that a line run due west from the northwest corner of the Seven Ranges would intersect the Tuscarawas at very nearly the same place as did the treaty line, i.e., "at the Tuscarawas crossing."

The first section of the act goes on to provide that the Military Reserve would be surveyed into townships five miles square, with corners every two and one-half miles on the exterior boundaries, in the same manner as the *Act of May 18, 1796*. It also calls for salt spring reserves, similar to the preceeding act.

The five-mile township was used because it would contain 16,000 acres. All of the military warrants were in multiples of 100 acres. A 23,040-acre township isn't evenly divisible by 100. The salt spring reserve provision was undoubtably an oversight, as the Military Reserve had no sections. Only one salt reserve was ever made; that was the northeast quarter of T. 5, R. 18 (4,000 acres instead of 640).

Sec. 2. The land was to be granted in quarter townships. The plan, which never worked, was that a group of warrant holders would get together and select a 4,000-acre quarter township to satisfy their collective warrants.

Sec. 3. This section of the act provides for selections and time limits.

Sec. 4. All selections were to be completed by January 1, 1800, but that never came to be.

Sec. 5. States that the Surveyor General is required to survey the three Moravian towns of 4,000 acres each.

Sec. 6. Repeats Sec. 9 of the *Act of May 18, 1796,* making all navigable streams public highways.

Although these two acts were passed two weeks apart, they could be considered one overall law. Together, they provide for survey and sale of most of the lands south of the Connecticut Reserve and south and east of the Greenville Treaty boundaries, except the area between the Miami Rivers and those in the Virginia Military Tract. The main features of the acts are:

(1) A Surveyor General is in charge of all the surveying and platting, with rather liberal authority to execute the work under his own regulations and instructions.
(2) The surveys are to be run by the true meridian; all the township lines are to be surveyed and every other section line within alternate six-mile townships, with corners at every mile.
(3) The five-mile townships are to be monumented every two and one-half miles, but the townships will be divided into quarters by protraction and sale.
(4) The maximum price for surveys is raised to $3 per mile.
(5) Sales are to be made with credit allowed, at a minimum price of $2 per acre, up from $1.
(6) The four reserved sections are grouped in the center of the township except the additional salt reserves, and the gold, silver, copper, and lead reserves are dropped, as is the Sec. 16 school reserve.
(7) The system of numbering the sections within a six-mile township is changed to the method still in use.
(8) Most of the land sales are to be held much closer to the land being sold.

Figs. 11 and 12 depict the survey lines to be run, monumentation, protractions, and reservations under the provisions of these acts of Congress. These laws were a great step forward; it was unfortunate that only half the six-mile townships were to be subdivided at all, and those only in two-mile blocks.

The Greenville Treaty

The Greenville (or Greeneville) Treaty signed at Greenville, Ohio, on *August 3, 1795,* 7 Stat. 49, was to affect the continuation of the land surveys for over 20 years and therefore must be included in any history of the public land surveys.

In 1794, General Wayne had defeated the Indians in battle and therefore could force them to comply with previous treaties. Twelve Indian tribes subscribed to the provisions of the treaty. The boundaries of the main body of land ceded were: beginning at the mouth of the Cuyahoga River where it entered Lake Erie and where Cleveland, Ohio, is now located, thence up that river to the portage between the Cuyahoga and Tuscarawas branch of the Muskingum (the portage trail is now a street in Akron, Ohio), thence along the portage to the Tuscarawas, thence down that branch to the crossing place above Fort Lawrence (this crossing place was where the Sandusky Indian Trail crossed the Tuscarawas), thence on a straight line westerly (about S. 70° W.) to the beginning of the portage near where Lorimies Store had stood (this portage was between the Great Miami and St. Mary's Rivers; Lorimies Store, a trading post, had been burned by the Indians), thence westerly (about N. 81° W.) to Fort Recovery, thence southwesterly (about S. 11° W.) to the Ohio River at a point opposite the mouth of the Kentucky River. All lands south and east of that described boundary were ceded to the United States. North and west of the line the government received 16 other small reserves, from 2 to 12 miles square, the most notable of which is the 12-mile square reserve on the Miami River (Maumee River) of Lake Erie near where Toledo, Ohio, is now located. Though not spelled out in the 1796 acts of Congress, it would become the duty of the Surveyor General to survey the treaty line and the 16 reserves.

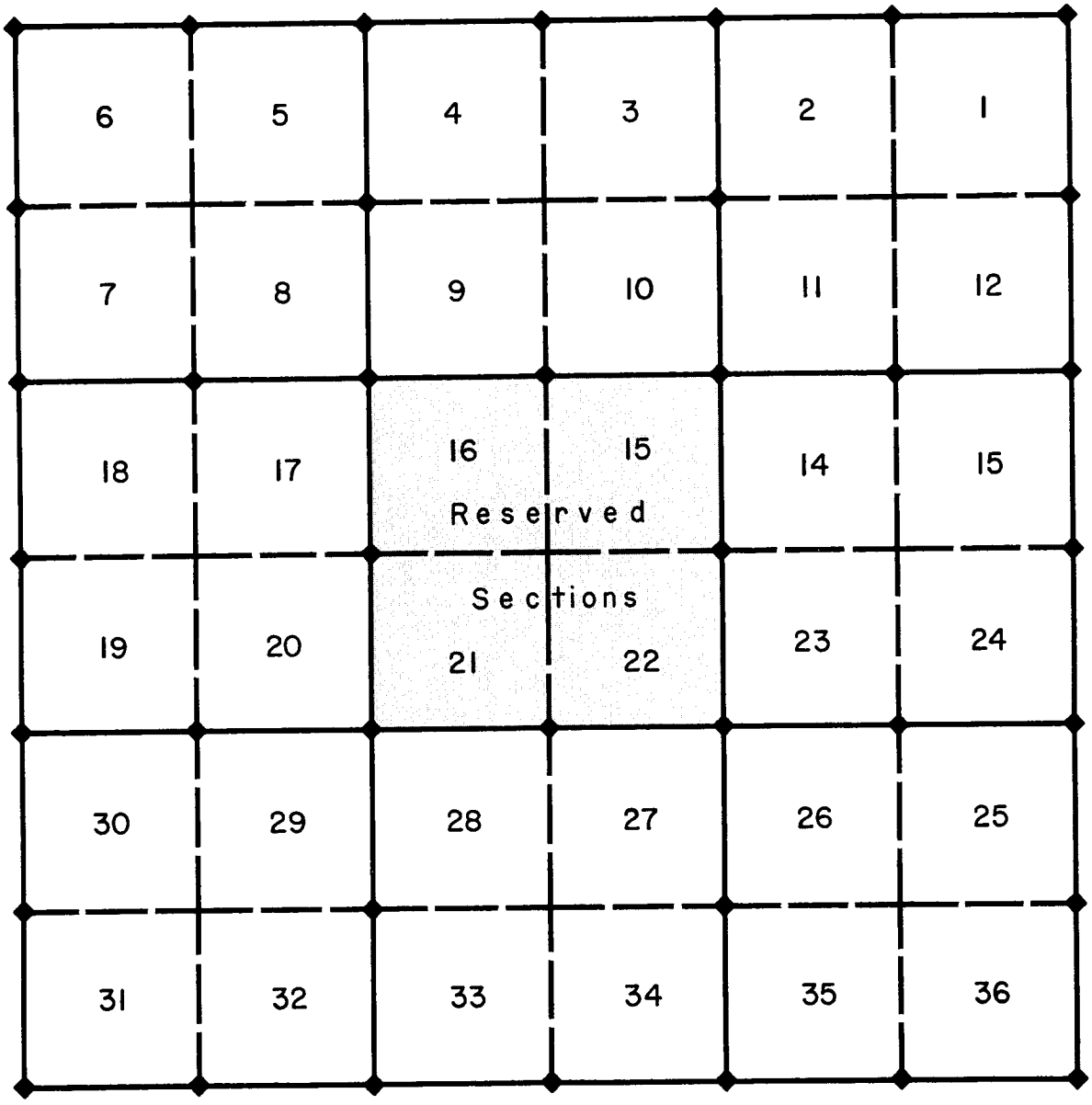


Figure 11. Township Survey and Subdivision under the Act of May 18, 1796.

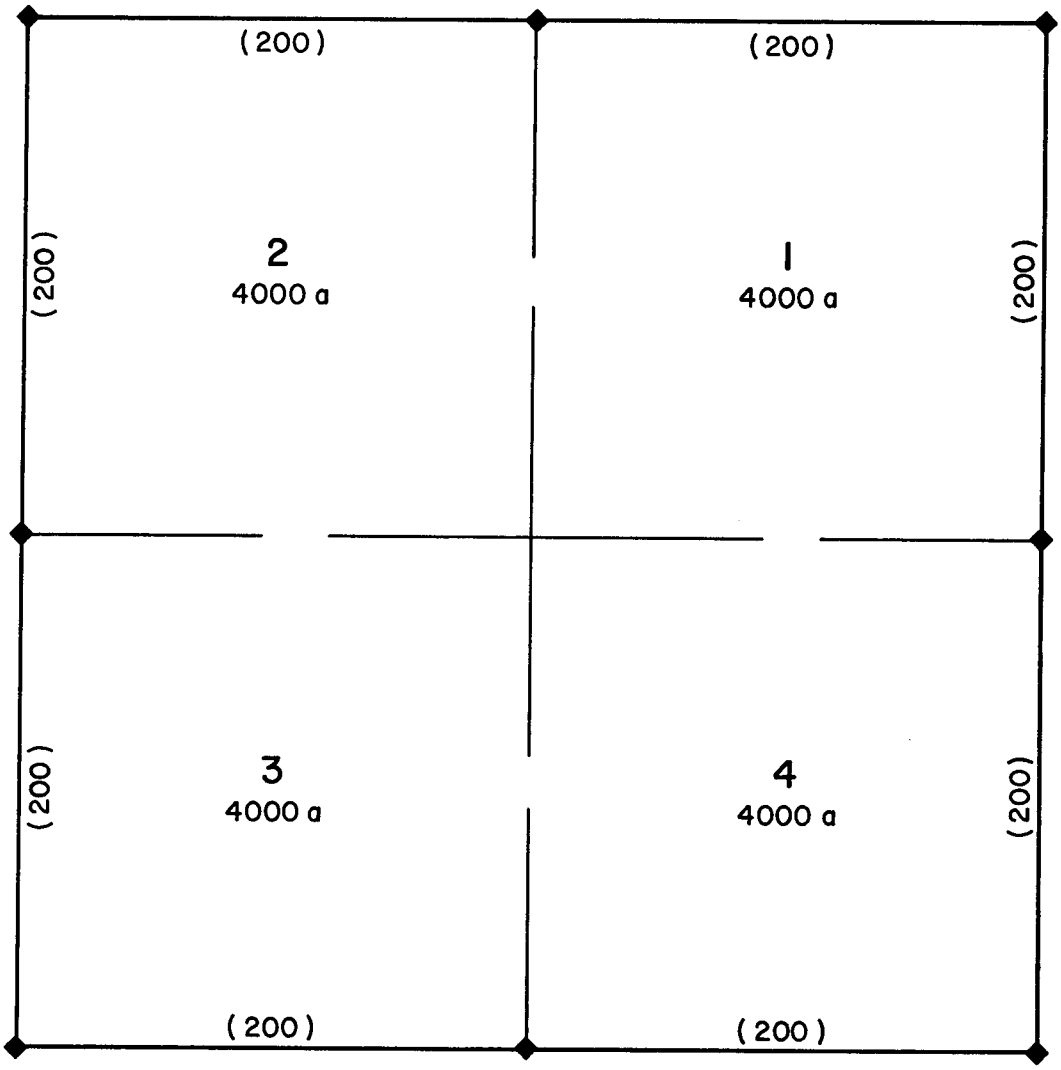


Figure 12. Survey of 5 Mile Townships in the U.S. Military Reserve under the Act of June 1, 1796.

The Connecticut Western Reserve

In her deed of cession dated September 13, 1786, Connecticut retained the strip of land lying north of 41° north latitude and extending 120 miles west from the west boundary of Pennsylvania. Connecticut owned those lands and until 1800 had political jurisdiction over them.

During the Revolutionary War, the British burned the towns of New Haven, Greenwich, Norwalk, Fairfield, and New London in Connecticut. The sufferers of these depredations appealed for relief and assistance in compensation for their losses. In 1792, the Connecticut Legislature granted this group 500,000 acres at the west end of the reserve, which was called the "Firelands." In 1796, Connecticut sold the remaining three million acres of the reserve to the Connecticut Land Company, but the Indian title to the reserve had not been extinguished at that time. Clear title was not obtained until the Greenville Treaty in 1795 and the Treaty of Fort Industry in 1805.

Surveys were begun by the company in 1796. In that year, Seth Pease, a company surveyor, ran the south boundary along the 41st parallel west to the Cuyahoga River. The Connecticut Land Company then subdivided their lands into five-mile-square townships, which were then subdivided into lots of various acreages and sizes. Most of the lots are rectangular, not square in shape. After the Treaty of Fort Industry, the south boundary of the reserve was continued to a total of 120 miles. The Firelands were also subdivided into five-mile-square townships; these were subdivided into quarter townships with the southeast quarter numbered 1, the northeast quarter numbered 2, the northwest quarter numbered 3, and the southwest quarter numbered 4. The townships in the entire Connecticut Reserve, including the Firelands, are numbered north from the south boundary and west from the Pennsylvania line. Thus the south boundary is a base line and the east boundary a meridian of reference. The surveys in the Connecticut Company (eastern) part of the Reserve run very near the true meridian. All of the meridional township lines in the Firelands, the 20th thru 24th range, were deliberately run north parallel to the Pennsylvania line which would theoretically yield a true bearing of about N. 1° 30′ W. In fact, the meridional lines in the Firelands are closer to N. 2° 30′ W. The west and south boundaries of the reserve were later investigated and checked by Jared Mansfield, the second Surveyor General, and these errors were discovered, but no attempt was made to correct the boundaries. Mansfield recommended that they be left as is regardless of the errors because trying to correct them would cause a great deal of trouble and litigation. Fig. 13 shows the layout of the Connecticut Reserve, adapted from C. E. Sherman (*Original Ohio Land Subdivisions,* opposite page 80, 1925). This is one more incident of private surveyors determining the boundaries of the public lands.

Public Land Surveys Resume — 1797

Rufus Putnam, appointed Surveyor General under the new law on November 5, 1796, was born in Sutton, Massachusetts, on April 9, 1738. As a young man he was apprenticed as a millwright, was self-educated and joined the Army during the French and Indian War in 1757. In 1760, he returned to Massachusetts, settled in Braintree, married, raised nine children, practiced surveying, and built mills as well as farming. He rejoined the Army during the Revolution as a Lt. Colonel and was promoted to Brigadier General in the Army Engineers. He was Surveyor General in Maine after the war and also helped organize the Ohio Company. He directed the surveys of that company, became a judge in 1790 and Brigadier General in the regular Army in 1792, fighting the Indians in the Northwest Territory. President Washington wanted Simon DeWitt (who had been Geographer along with Hutchins before 1785) to be Surveyor General but DeWitt declined and the job went to Putnam. Though Putnam was not well educated, was deficient in mathematics, and was to allow poor surveys to be executed, he was probably the best man for the job. He knew the country, was highly respected in the territory, and could draw a large number of experienced surveyors in a short time to execute the work.

On January 25, 1797, Putnam wrote to Oliver Wolcott, Secretary of the Treasury, requesting instructions for conducting the surveys; he suggested a contract system with deputy surveyors but needed authority for contracting and how to conduct the financing. Wolcott replied on March 11, 1797, giving Putnam authority to obligate the government through contracts. Funds for payment of the deputies, for which he had to account, were allotted to Putnam, and copies of the contracts were to be sent to Wolcott.

Putnam established his office in Marietta, Ohio, in March 1797. With these details worked out, Putnam's first order of business was the Greenville Treaty line and the boundaries of the Military Reserve. Early in 1797, he contracted with Israel Ludlow to survey the Greenville Treaty line. And the contract system of public land surveys, which endured until 1910, was underway.

After delays waiting for an Indian and an Army escort, Ludlow began the Treaty line in June 1797. He ran a random line from Lorimies Store northeasterly toward Fort Lawrence, which intersected the Tuscarawas at 153 miles, 20 miles south of the crossing place. Ludlow then calculated a true line back and ran S. 70° 50′ W. He blazed the line and set a post every mile. This true line intersected Lorimies Creek, 23½ chains upstream north from the intended place. Ludlow reported these facts to Putnam and hoped that the Indians wouldn't complain about the 23½ chain miss. Ludlow temporarily suspended the survey of the treaty line. No attempt was made to correct back for the 23½ chain miss and that jog was left in the treaty line. But more importantly, it is the first known record of a major survey line of the public land surveys being run random and true. Although the Greenville Treaty line from the Tuscarawas Crossing to Lorimies Creek is far from being a straight line and was certainly not a rhumb line, it was a first major step in establishing some measure of limits of closure.

Military Reserve Surveys

Putnam divided the U.S. Military Reserve into five districts and made the west boundary of the Seven Ranges a meridian line and south boundary of the reserve a base line. The townships were numbered north from the south boundary and west from the Seven Ranges. Townships 1 through 4, north, ranges 1 through 6, west, were the southeast survey district. The remaining townships in ranges 1 through 6 were the northeast district. Townships 1 through 4, ranges 7 through 12, were the south middle district; the remaining

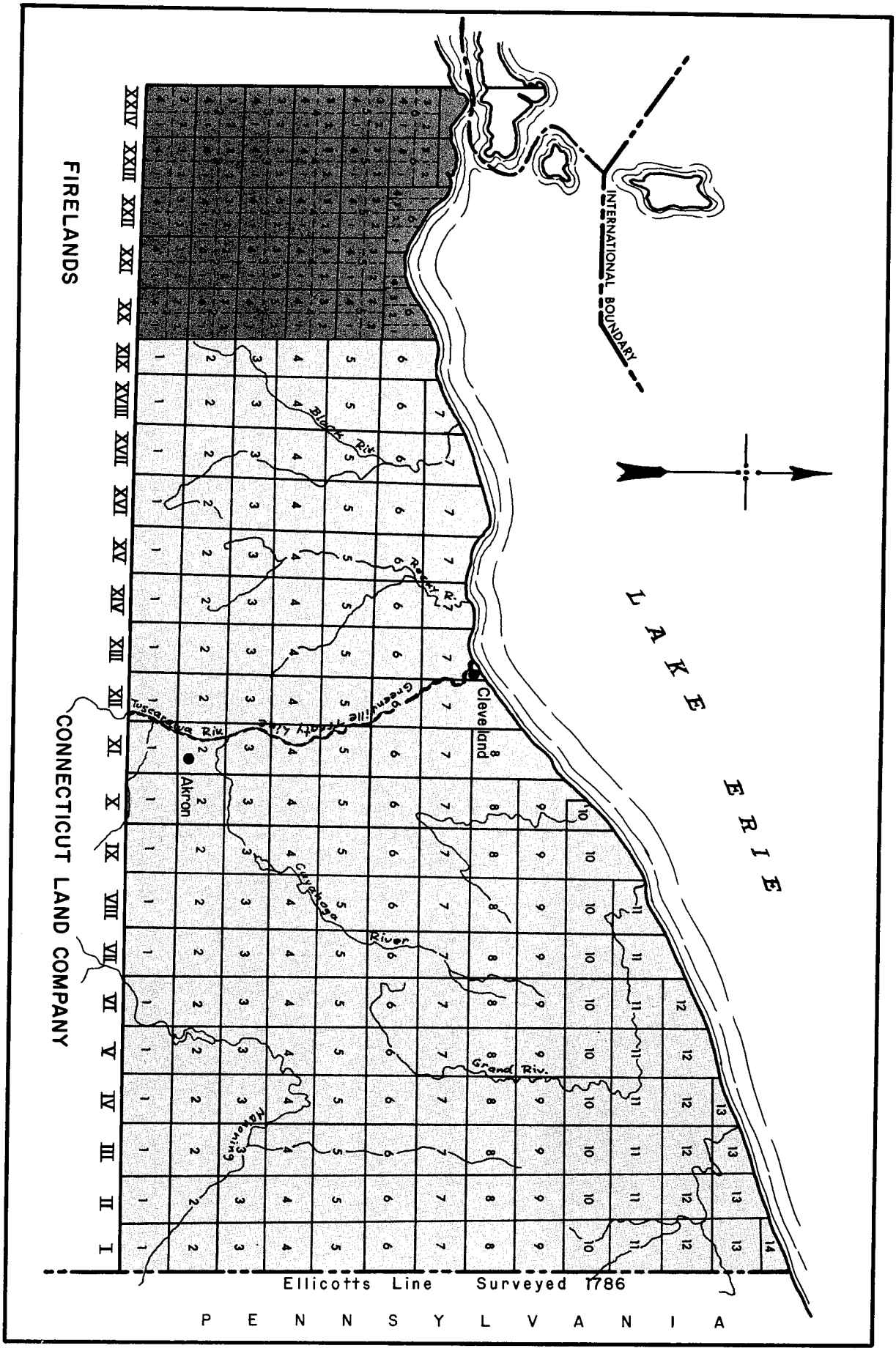


Figure 13. The Connecticut Western Reserve.

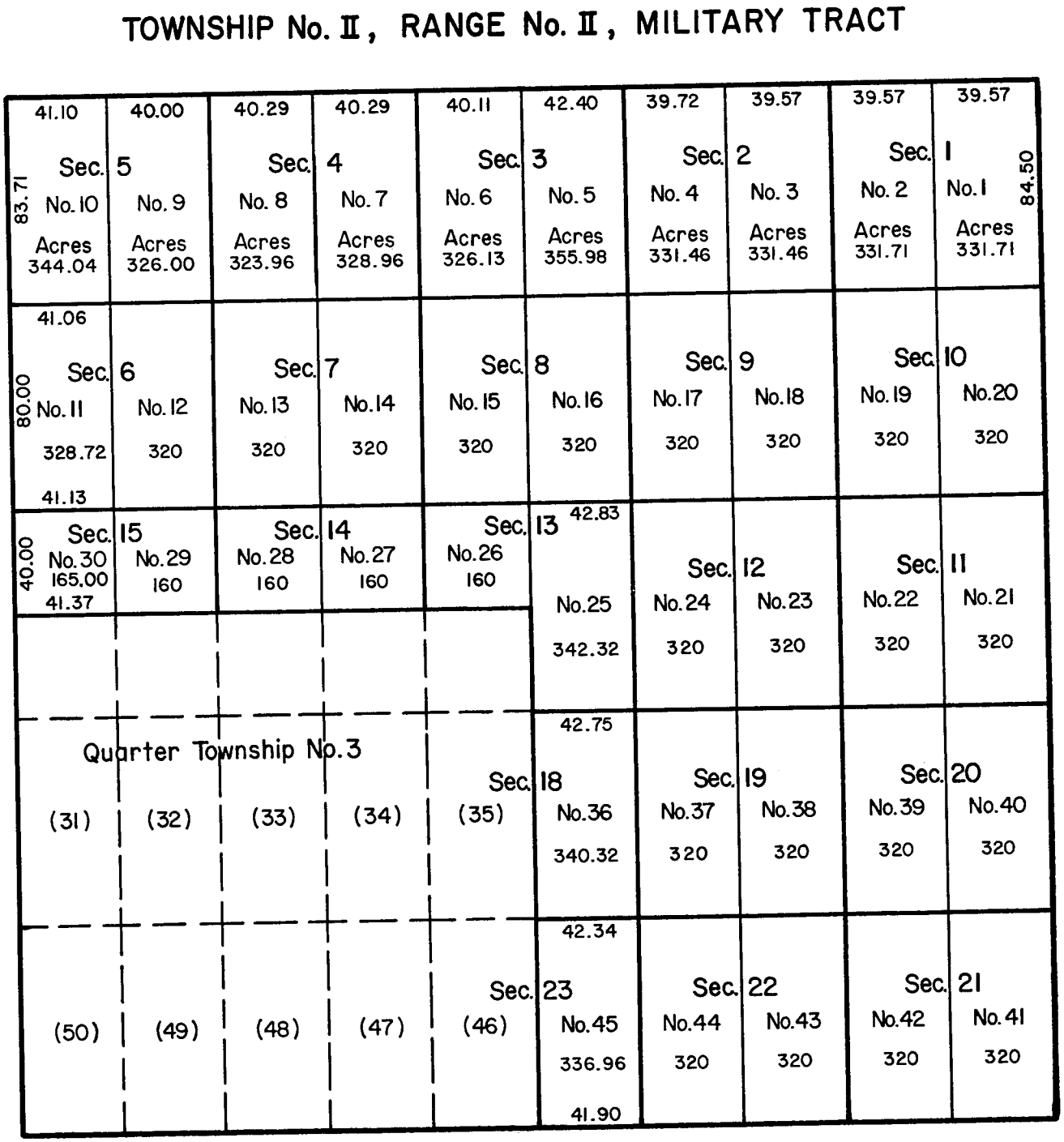


Figure 14. Township Partially Subdivided in U.S. Military Tract.

townships in ranges 7 through 12, the north middle district; and all of the townships west of range 12 were the western district.

On May 9, 1797, Putnam contracted with Zachius Biggs and Absalom Martin for the survey of the north boundary of the reserve, which extended from the northwest corner of the Seven Ranges, west to the Muskingum River (Tuscarawas Branch), and for the survey of the east boundary (along the Seven Ranges), and the south boundary, west from the Seven Ranges to the Scioto River. Lastly, the contract called for Martin and Biggs to survey the township and range lines in the northeast and southeast districts. Putnam ordered these men to run the meridional lines parallel to the west boundary of the Seven Ranges and to run the latitudinal lines at right angles or perpendicular to the meridional lines. His reasoning was to avoid the "many slips of land" that would result along the Seven Ranges and Ohio Company Purchase surveys if he tried to run all the new survey lines according to the true meridian. The true meridian requirement in the new law was ignored in surveys in the Military Reserve and in the Ohio River Base surveys south of the reserve and east of the Scioto River.

Biggs completed his work in late 1797, but Martin did not finish until 1798. Putnam finally received Martin's notes and plats on November 13, 1798. The contract price for these boundaries and township lines was $3.00 and $2.50 per mile, respectively.

On May 30, 1797, Putnam swore in his son, William Rufus Putnam, as a deputy surveyor. They traveled up the Muskingum and surveyed the three Moravian tracts called for in the *Act of June 1, 1796*. He sent the plats of Shoenbrun, Gnadenhutten, and Salem to the Secretary of the Treasury, Oliver Wolcott, on July 22, 1797, which were the first official returns of surveys made under the new law. Putnam surveyed those towns immediately so that the boundaries would be marked for Martin and Biggs when they ran the township boundaries in the northeast district.

On July 12, 1797, Putnam contracted with George and John G. Jackson for the survey of the township lines in the south middle district. John Jackson was a minor from Virginia. On July 22, 1797, Putnam contracted with John Mathews for the surveys in the north middle district. These men proceeded with those contracts immediately. When Ludlow completed the first leg of the Greenville Treaty line in September, he contracted for the western district of the Military Reserve and completed it by March 1798. Ludlow complained to Putnam of the tedious chore of preparing the township plats and field notes. The field surveyors had to prepare a fair plat and field notes of their surveys. Putnam hired his son William as a clerk at a $500-per-year salary to prepare the plats to be sent to the Treasury and land office and also to do all of the other clerical work required. Putnam reported that all of the surveys in the U.S. Military District were completed on February 2, 1799. When some of these townships were later subdivided and patented, they were subdivided in the manner indicated in Fig. 14.

Putnam later complained of the poorly executed work in the four eastern districts and praised Ludlow's work in the western district. The surveys in the 12 eastern ranges were indeed very poorly executed and were to create many problems in the years to come.

The Six-Mile-Square Townships

In 1798, Putnam contracted with six deputy surveyors for the surveys of the six-mile-square townships and necessary subdivisions of them. Alternate townships were to be subdivided into two-mile squares. All the townships south of the Military Reserve, east of the Scioto and west and north of the Ohio Company Purchase were surveyed parallel to the Ohio Company Purchase and the Seven Ranges. The true bearings of the lines in that large block are up to N. 4° E. Putnam divided the area into six surveying districts, with each surveyor assigned to a certain block of townships. As the districts closed against each other, very large jogs occurred in the township or range lines. Putnam received much criticism for these and the Military Reserve surveys, but his letters indicate that he considered this system of continuing the existing pattern a lesser evil than if he had tried rectifying the pattern to the true meridian.

In early 1798, Putnam contracted with Israel Ludlow for the surveys west of the Great Miami and for the remainder of the Greenville Treaty line which was virgin territory with no existing surveys. Putnam ordered Ludlow to run a true meridian line due north from the mouth of the Great Miami River and to survey two ranges of townships before completing the Greenville Treaty line. Ludlow ran the meridian line due north and tied into Fort Recovery, then meandered down the Ohio River to a point opposite the mouth of the Kentucky River. He also surveyed some of the townships west of the Miami in 1798, all of which were numbered north from the Great Miami and east from the meridian line. In 1802, that line became the state boundary between Ohio and Indiana. In 1799, Ludlow completed the Greenville Treaty line from Lorimies Store, not from the end of the line he had run from the Tuscarawas, to Fort Recovery and, after computing a true line from there, to the Ohio River. By the end of 1800, Ludlow completed the township boundaries and required subdivisions west of the Great Miami south and east of the treaty line. The townships in that area are all numbered north from the Great Miami and Ohio Rivers. The ranges are numbered east and west from the meridian line (state boundary). Although the remainder of the state line (run north from Fort Recovery) was later called the First Principal Meridian, the portion run by Ludlow in 1798 is not designated by that name. The surveys west of the Great Miami in Ohio and Indiana were generally well executed. An attempt was made to run the true meridian; the lines do not diverge more than about N. 1° W. Putnam and Ludlow had thus perhaps unwittingly established the beginnings of the present system of identifying townships and ranges.

On July 27, 1799, Putnam contracted for the survey of the townships north of the Seven Ranges and Military Tract, south of the Connecticut Reserve and east of the Muskingum or Tuscarawas. Ebenezer Buckingham was assigned the western district, Zachius Biggs had the central district, and John Bever had the eastern district of three ranges. These were six-mile-square townships and were numbered in a continuation of the Ohio River Base or Seven Ranges system — with two exceptions. Numbering west from the Pennsylvania boundary was continued through the seventh range. The eighth range was numbered range 8 but was numbered north skipping the area within the Military Reserve. The most northerly township against the south boundary of the reserve

was township 8. Township 9 would theoretically be within the reserve, but the number 9 was given the township immediately north of the reserve. Hence T. 9, R. 8 is immediately west of T. 17, R. 7, then comes T. 9, R. 9 which is fractional against the Tuscarawas branch. It was later made a full township. T. 10, R. 9 was fractional and T. 11, R. 9 also slightly fractional. At that point the Tuscarawas is flowing about S. 45° E. and Buckingham numbered the two fractional townships in range 10, north from the Tuscarawas branch of the Muskingum. Though later surveyed into complete townships, those two are identified as Townships 1 and 2 N. range 10 W. of the Muskingum River Base. The only known instructions that Buckingham had from Putnam are contained in the contract, and the contract does not indicate that this procedure was to be used to number the townships (see Fig. 15).

All three contracts require that the range lines were to be surveyed parallel to the Pennsylvania boundary. Putnam was obviously confronted with a dilemma. The law required the lines be run by the true meridian and to be six-miles square. The convergency of meridians just would not allow the six-mile-square provision. Putnam was not proficient enough in mathematics to be able to devise a system to correct for convergency, and even if he had been, neither he nor his deputies had precise instruments with which accurate surveys could be executed. And the maximum price of $3 per mile for surveys would not have covered the expenses involved. Putnam attempted to hold to the six-mile-square requirement and ignored the true meridian provision. The townships north of the Seven Ranges were completed in November 1799, the sections are numbered according to the *Act of 1796*.

As a result of the lack of an overall plan and adequate map control, an anomalous township identification occurred along the Scioto River in Ranges 21 and 22. The boundaries of these ranges were surveyed by John Mathews, Thomas Worthington, Elias Langham, and Ebenezer Buckingham in 1799. A large easterly bend in the Scioto River prevents a continuous extension northward of the range lines from the Ohio River. It apparently seemed logical at the time to number the townships north from the Scioto, but the surveyors did not get together and decide on a plan; apparently each devised his own numbering for the townships in his contract. The result is a confusing duplication of township numbers in Ranges 21 and 22, as shown in Fig. 16. These are the townships referred to in the *1973 Manual of Surveying Instructions*, Section 3-7, as the Scioto River Base surveys. They are another indication of the speed with which the surveys were being made, without adequate supervision, planning or control.

By the beginning of 1800, Putnam and his deputies had completed almost all the surveys provided for in the *Acts of May 18 and June 1, 1796*. This huge task had been accomplished in just three years. It had taken the same amount of time to survey the first seven ranges. Corners had been set at one-mile intervals on all the boundaries of the six-mile-square townships, alternate townships were subdivided into two-mile-square blocks with one-mile monumentation, the Military Reserve was surveyed, and the Greenville Treaty line run. The Congress had demanded speed and economy and they got it. If the surveys were somewhat crude and the plats not too well made, at least the work was done. During those three years, Putnam had pleaded for an additional clerk to help out with the office work but did not receive approval to hire one. He was swamped with work and had no real chance to check any of the surveys in the field. Though he was disappointed with some of the field work, except that of Ludlow, he was powerless to do much about it, however, his troubles were just beginning. Congress passed the *Act of March 2, 1799*, 1 Stat. 728, to provide for surveys and preemption sales to certain settlers on the lands north of the Symmes Purchase between the Miami Rivers. Some surveys there were already wretchedly executed and Putnam hadn't yet started work in that area with government surveyors.

Act of March 1, 1800, 2 Stat. 14

Under the plan anticipated by the *Act of June 1, 1796*, the Secretary of the Treasury was to combine land warrants and patent off the U.S. Military Reserve in quarter township blocks, with individual lots to cover each warrant protracted on the plats. This plan didn't succeed for several reasons and it was also discovered that the townships were far from square, contained more or less than 16,000 acres, and some of the quarter township corners were far from being at midpoint between township corners. The *Act of March 1, 1800*, was intended to solve some of these problems. Sec. 1 of the act declares that all corners established in the Military Reserve are the true corners regardless of the errors. It directs that the townships are to be subdivided into quarters by running straight lines from one quarter-township corner to the opposite quarter-township corner, the way a normal section is subdivided today. It also fixes the quantity or area returned in each quarter township by the Surveyor General as the legal quantity. Sec. 3 of the act excludes navigable rivers from being included in the quantity of land charged to a warrant lot, which has also been continued through to the present. As nearly as possible, lots of 50 or 100 or more acres were to be protracted with parallel lines within the quarter townships. The 100-acre lots were supposed to be 40 chains long and 25 chains wide, usually lying east-west, if the actual original survey and subdivision allowed an orderly layout. This act attempted to deal with the large errors in the original surveys; most importantly, it fixed the original corners in position, established a precedent for subdividing, and held the areas to be what the Surveyor General reported. The purpose was to stop potential litigation.

The *Act of May 7, 1800*, 2 Stat. 58, divided the Northwest Territory into the Ohio Territory and the Indiana Territory. The territorial boundary was the Greenville Treaty line from the Ohio to Fort Recovery and then due north to Canada, but Sec. 5 of the act provided that when a State was erected, the boundary would run due north from the mouth of the Great Miami, i.e., Ludlow's meridian line, which came to be in 1802.

The Act of May 10, 1800, 2 Stat. 73

This act is an amendment of the *Act of May 18, 1796*, but in reality is the next major step in the evolution of the rectangular system of surveys. Credit sales and lack of adequate surveys were already causing problems. Settlers couldn't afford to buy quarter townships or even full sections. Some had tried, making down payments, but then couldn't meet the ensuing payments and they had to forfeit. With most of

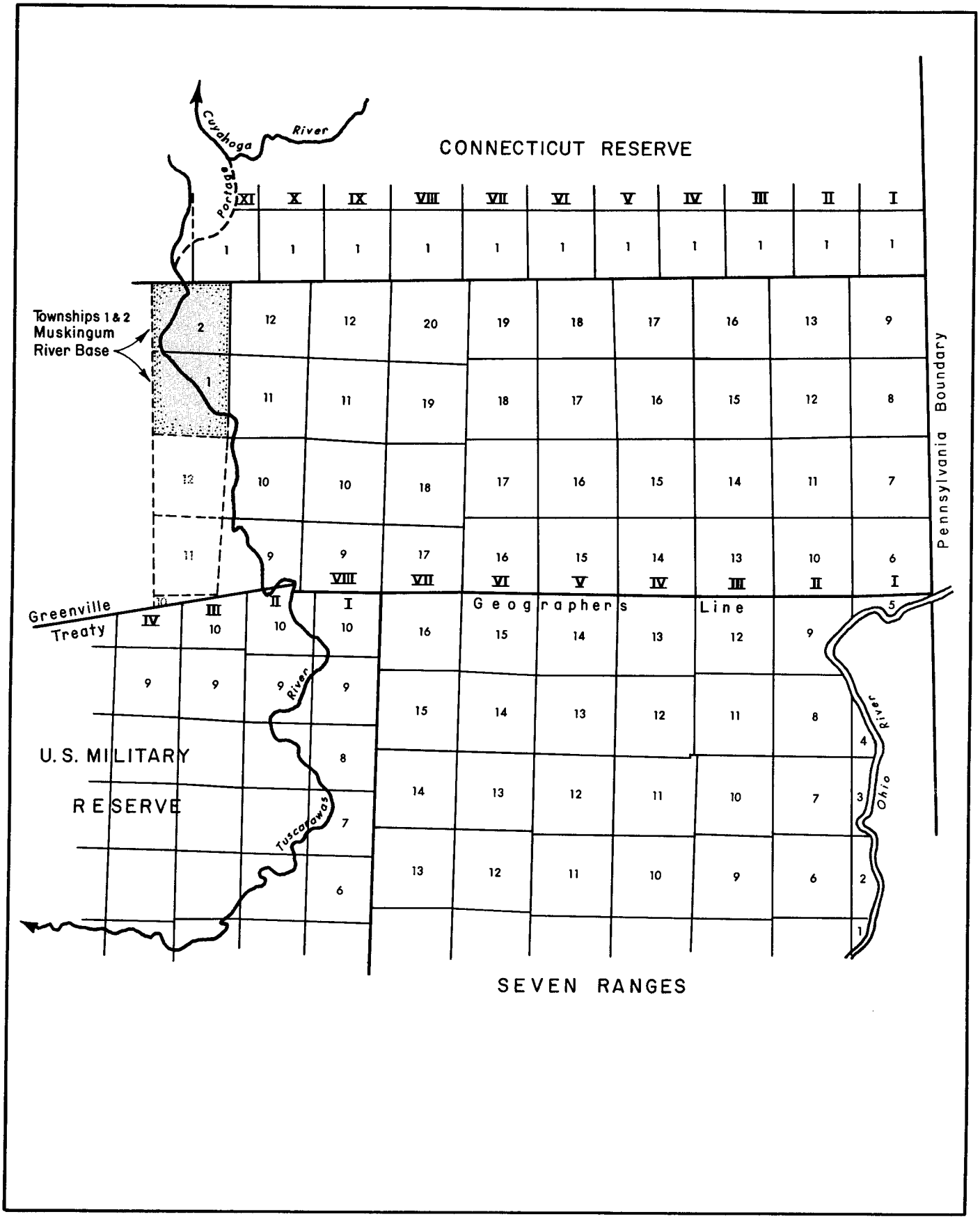


Figure 15. Townships 1 and 2, Range 10, Muskingum River Base.

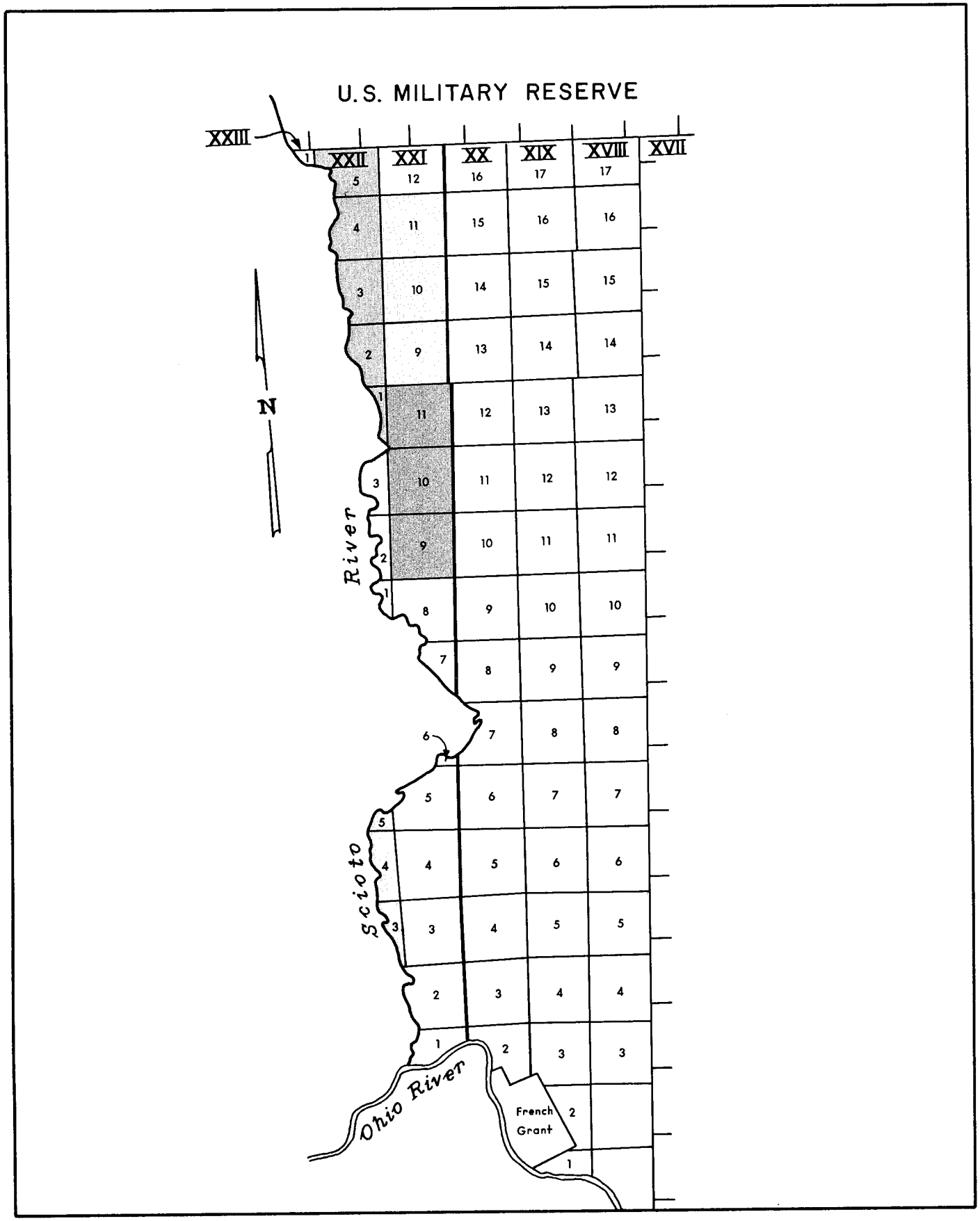


Figure 16. Duplicated Township Numbers, Ranges 21 and 22, Scioto River Base.

the section lines only protracted on paper, the purchaser still had to pay to have his boundaries surveyed on the ground, and each surveyor took the shortest route, stubbing in from the township boundaries. With large errors existing in the original surveys, boundary disputes were multiplying, which was the very thing the rectangular system was supposed to prevent. Also, remote places of sale and poor recordkeeping discouraged potential buyers. The Congress took the next step and put into effect another of the recommendations made by Hamilton in 1790.

Secs. 1 and 6. These sections established local land offices and the offices known as the Register and Receiver. The Register handled the sales, entries, etc., and the Receiver was responsible for the payments. Both the Register and the Receiver were paid on a fee basis.

Four land offices were established: at Cincinnati, Chillicothe, Marietta, and Steubenville, with designated areas of responsibility. All were situated fairly near the lands that were up for sale and buyers had only relatively short distances to travel to the place of sale.

Sec. 2. The Surveyor General is required to furnish copies of the survey plats to the land offices, called the "land office copies" and were used to sell the land, record entries, and for the public to examine. A copy of the plat was also sent to the Secretary of the Treasury. The "three plat system" — the original plat kept by the Surveyor General, one copy to the land office and another copy sent to Washington, D.C. — remains in effect to this day.

Sec. 3. This section affected the Surveyor General the most because it called for the subdivision of certain townships into sections and half sections. The following is a complete copy of this section of the act:

"Sec. 3 *And be it further enacted,* That the surveyor-general shall cause the townships west of the Muskingum, which by the above mentioned act are directed to be sold in quarter townships, to be subdivided into half sections of three hundred and twenty acres each, as nearly as may be, by running parallel lines through the same from east to west, and from south to north, at the distance of one mile from each other, and marking corners, at the distance of each half mile on the lines running from east to west, and at the distance of each mile on those running from south to north, and making the marks, notes, and descriptions, prescribed to the surveyors by the above-mentioned act: And the interior lines of townships intersected by the Muskingum, and of all the townships lying east of that river, which have not been heretofore actually subdivided into sections, shall also be run and marked in the manner prescribed by the said act, for running and marking the interior lines of townships directed to be sold in sections of six hundred and forty acres each. And in all cases where the exterior lines of the townships, thus to be subdivided into sections or half sections, shall exceed or shall not extend six miles, the excess or deficiency shall be specially noted, and added to or deducted from the western and northern ranges of sections or half sections in such township, according as the error may be in running the lines from east to west, or from south to north; the sections and half sections bounded on the northern and western lines of such townships shall be sold as containing only the quantity expressed in the returns and plats respectively, and all others as containing the complete legal quantity. And the President of the United States shall fix the compensation of the deputy surveyors, chain carriers, and axemen: *Provided,* the whole expense of the surveying and marking the lines, shall not exceed $3.00 for every mile that shall be actually run, surveyed and marked."

To understand this section of the act requires some background explanation and analysis:

The *Act of May 18, 1796,* directed that only half the townships were to be subdivided in two-mile-square blocks, the other unsubdivided half was to be sold by quarter townships without any interior subdivisional lines being surveyed. The unsubdivided townships lying west of the Muskingum were now to be subdivided into sections and protracted half sections, by running parallel lines every mile from east to west and from south to north, with all section corners established and quarter corners on only the east-west section lines. The parallel lines provision was included because it was well known that the range lines were actually surveyed parallel to the west boundary of the Seven Ranges and Ohio Company Purchase boundaries, and not by the true meridian. The townships intersected by the Muskingum and all townships east of that river, which were designated for sale by sections but were subdivided by alternate section lines, were also to be subdivided in the same manner, by parallel section lines. The excess or deficiency of land was to be placed in the sections along the north and west boundaries of the township being subdivided. All sections except those against the west and north boundaries were declared to contain the full legal quantity, i.e., 640 acres. The Surveyor General had to return the area of the northern and western sections, based on the distances obtained in the field; those sections were sold containing the acreage returned on the plats. Thus the plats returned by the Surveyor General were the sole basis of the acreage in a section, and the amount to be paid was at the rate of $2 per acre. Regardless of what a later survey might have found the acreage to be, the plat returned by the Surveyor General determined the legal quantity, no refunds were made, nor any additional charges made.

The last sentence of this section is perplexing. The President was to fix the compensation of the deputy surveyors, chain carriers, and axemen, but the whole cost could not exceed $3 per mile. This was a repeat of the same statement in the *Act of May 18, 1796.* But the surveys were being executed by deputy surveyors under contracts with the Surveyor General and the President had not and never would fix their compensation. This clause may have been repeated to allow for direct hire of the surveyors on a salary if the contract system failed to do a proper job.

This act did not apply to the five-mile townships in the

Military Reserve. Fig. 17 indicates the theoretical subdivisions and monumentation within the affected townships, with all section lines surveyed.

The theory was good; survey all the section lines, fix by law the acreage to be paid for, sell half sections at $2 or more per acre on credit, and everyone should have been satisfied, however, the problem was in the surveys. The township lines had already been surveyed and most of the adjoining townships had been partially subdivided. If lands had already been sold in the adjoining townships, the corners there couldn't be corrected. Congress had already fixed the corners by law in the Military Reserve and in the lands north of the Symmes Purchase so that precedent was established.

Putnam took the only course of action he could think of; he had his surveyors run north parallel to the east boundary and west parallel to the south boundary of the township, setting a second or even third set of corners on the exterior boundaries of the township. Where it was possible to correct the old corners, they did so, but most of the townships subdivided under this act have double corners entirely around the exterior boundaries.

This system would not work, however, in most of the townships in the Seven Ranges. In those townships, many individual sections had been sold at random without benefit of government-surveyed section lines. Local surveyors had located the sections by running lines in from the exterior boundaries. The purchasers occupied and possessed the land based on the corners thus established. The *Act of May 10, 1800,* couldn't be complied with, without radically changing the established location of the alienated sections. Putnam suggested solutions based on honoring the existing corners, but neither he nor the Secretary of the Treasury could completely defy the present law and Congress did not act on this situation until Sec. 7 of the *Act of May 1, 1802;* 2 Stat. 179.

Another unanswered question was: Where should the quarter-section corner on the east-west lines of the sections along the west boundary of the township be placed? Should they be set at 40 chains, which is the practice today, or at midpoint between section corners? During the remainder of Putnam's term in office, they were set both ways, some at 40 chains with the excess or deficiency in the last half mile, while others where the mile was near normal, were set at midpoint. The acreage was shown on the plat for each half section.

Sec. 5 requires the purchasers to pay a surveying fee of $6 per section. It does not say who is to receive the money, so presumably it was paid into the Treasury.

Sec. 15 of the act authorized the Surveyor General to lease the reserved sections within the townships. It isn't known why Congress added that burden on the Surveyor General instead of on the Registers and Receivers of the land offices.

On October 8, 1800, Wolcott wrote to Putnam authorizing the hire of an additional clerk at $500 per year; the letter also gave Putnam a few instructions about the surveys, but very little. The problems were left for Putnam's solutions.

Act of February 18, 1801, 2 Stat. 100

This act directs the Surveyor General to subdivide into half sections the fractional townships in Ranges 16 through 22, situated against the south boundary of the Military Reserve. The lands were granted to refugees from Nova Scotia who had aided the Americans during the Revolution. It left unanswered how the sections were to be subdivided when the section was fractional against the military boundary, which caused some problems. Normal townships were subdivided in the manner as indicated in the *Act of May 10, 1800,* as shown in Fig. 17.

Act of May 1, 1802; 2 Stat. 179

The original contract with John Cleves Symmes was for one million acres of land. Symmes could not pay for that much land and eventually received patent to only the area as far north as the north boundary of Range 3, minus the Congressional reserves. Much of the surveying in the Symmes Purchase, including the north-south standard line, had been done by Israel Ludlow. Symmes had sold lands north of his patent boundary. The purchasers had made a down payment to Symmes and occupied the land based on questionable surveys, and they claimed they had entered into purchase contracts with Symmes in good faith and should receive title to their lands.

Congress passed the *Act of March 2, 1799,* 1 Stat. 728, granting these settlers a right of preemption on their claims and allowing them credit toward the purchase price of $2 per acre for the reasonable amounts they had paid for surveys. They were to apply to the Surveyor General for a government survey of their lands. Upon receiving the application, the Surveyor General was to survey the outlines of the tract or tracts and determine the acreage to be paid for.

Putnam did not receive any applications for surveys under that act. In 1801 when the Secretary of the Treasury, Albert Gallatin, inquired about the matter, Putnam replied on October 6, 1801, and January 7, 1802, that he had not done any work between the Miami Rivers, that no one had applied, and that the boundary of the Virginia Military Tract was undetermined. The Virginia warrant holders were locating claims north of the source of the Little Miami. Putnam didn't know where that boundary should be. On March 11, 1802, he told the Secretary that Ludlow had informed him the north boundary of the Symmes' patent had never been surveyed and that Putnam didn't know what Symmes had actually received.

On May 1, 1802, Congress passed the act which extended preemption to the settlers between the Miami Rivers, "either within or without the limits of Ludlow's survey." The Ludlow's survey referred to was the work done by Ludlow for Symmes. On April 30, 1802, Congress had passed the *Ohio Enabling Act* and they wanted all the lands owned by the government outside the Greenville Treaty line surveyed.

The passage of these acts was anticipated by Putnam. On May 3, 1802, he contracted with Israel Ludlow, Levi Whipple, and Levi Barber for the survey of the townships between the Miami Rivers and the boundary line of the Virginia Tract. Ludlow began the survey of the Virginia Tract boundary at a spring acknowledged to be the source of the Little Miami. He ran a line on a magnetic bearing of N. 20° W. about 42 miles to an intersection with the Greenville Treaty line. (If Ludlow's line was extended, it would fall a considerable distance east of the source of the Scioto.)

Ludlow also corrected some of the surveys and established the north boundary of the Symmes Purchase. The section lines established by or for the settlers in the two ranges of

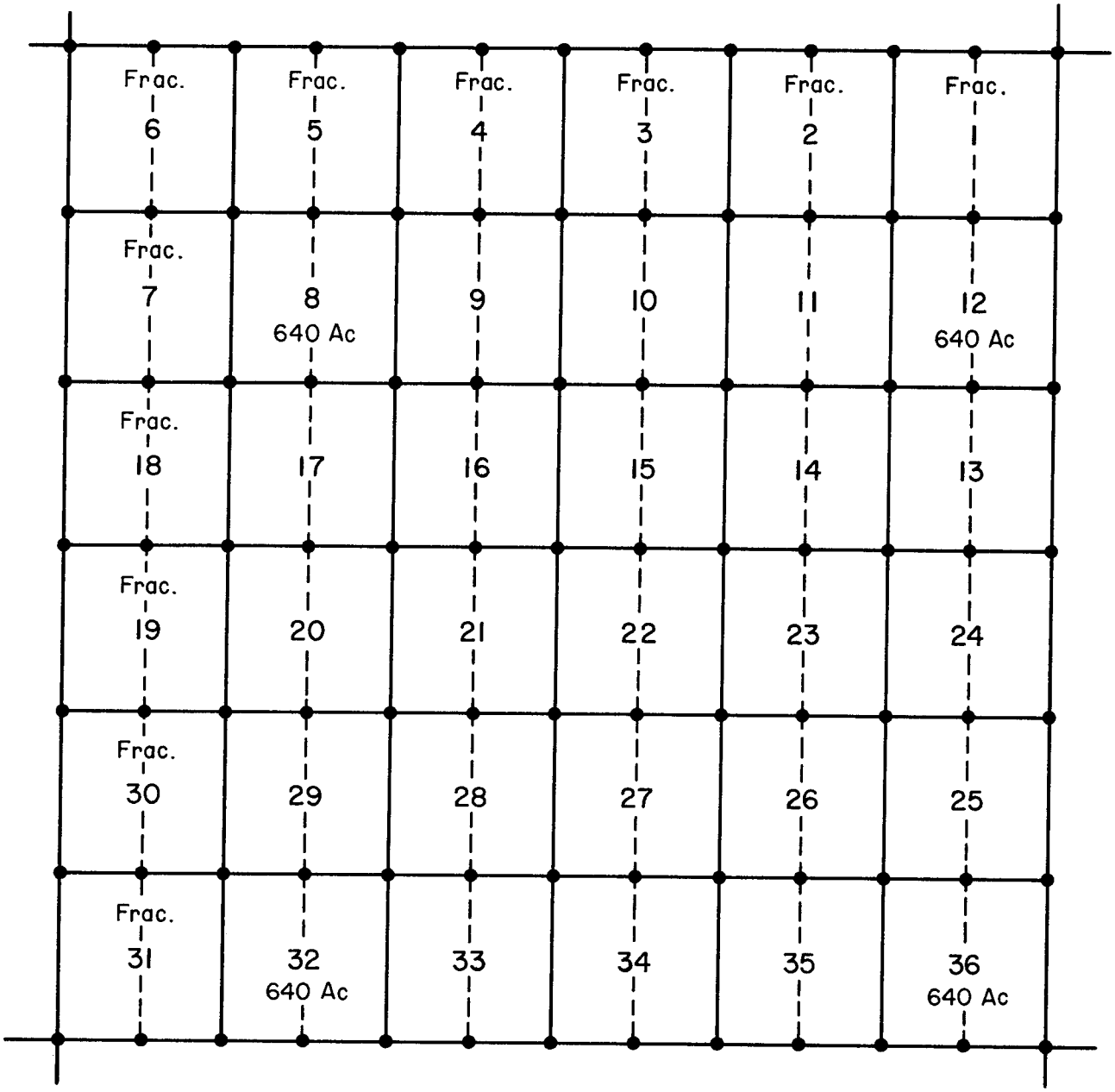


Figure 17. Plan of Survey and Monumentation under the Act of May 10, 1800.

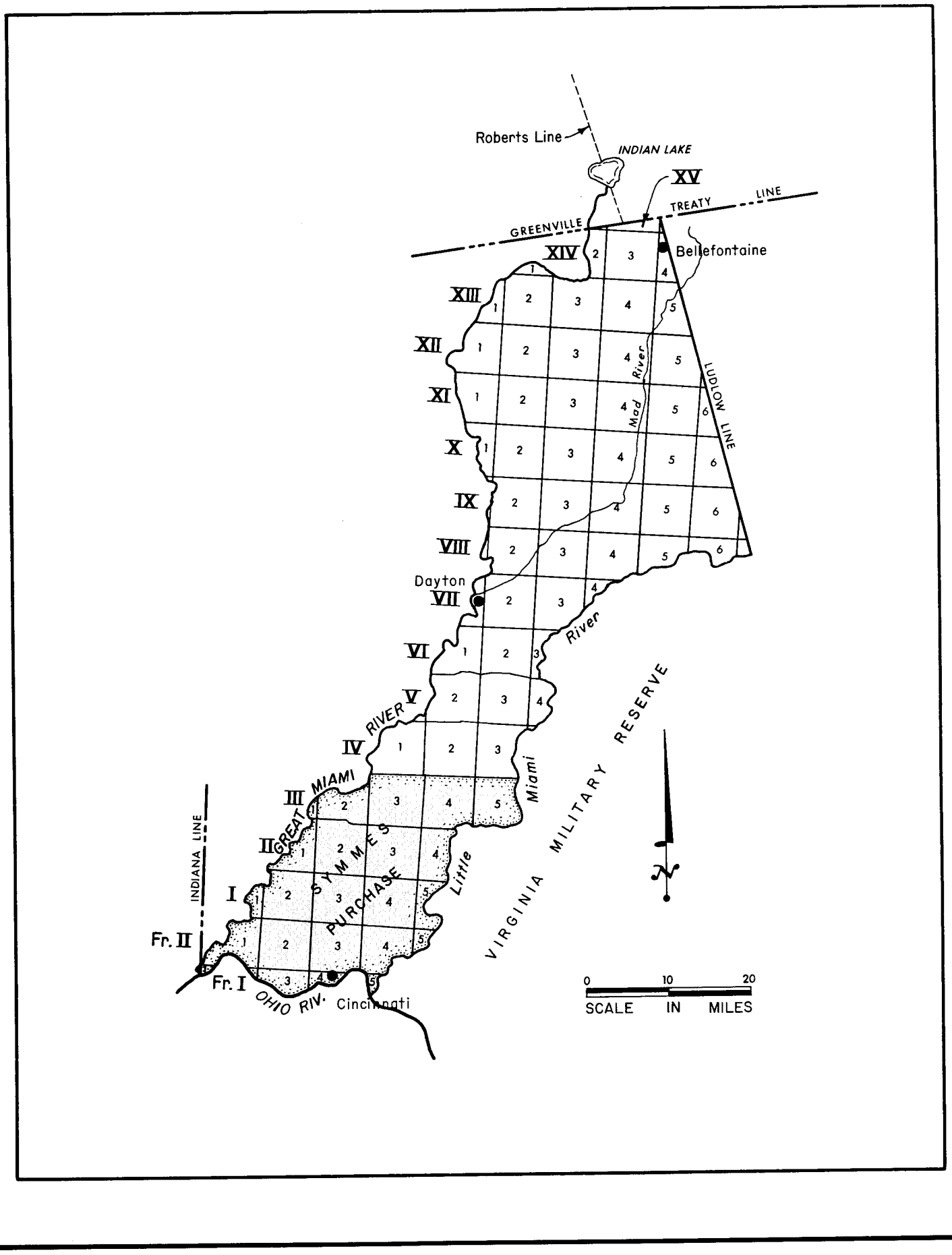


Figure 18. Between the Miamis.

townships north of the Symmes Purchase were honored by the surveyors but their new lines straightened up the work between Ranges 6 and 7. They did not try to run the township lines by the true meridian; instead they continued the pattern established by Symmes and also continued the section numbering according to the *Land Ordinance of 1785*. They closed the townships north of the Little Miami against Ludlow's boundary line of the Virginia Tract. The sections in Ranges 4, 5 and 6 are greatly distorted due to the settlers locations and the law which honored them in place (see Fig. 18).

The claimants in the Virginia Military Tract didn't honor the Ludlow boundary and filed claims west of it. On *March 23, 1804,* 2 Stat. 274, Congress declared the Ludlow boundary as the boundary of the Virginia Tract, provided that Virginia recognized the line within two years. Virginia didn't and even claimed the boundary should be a line from the *mouth* of the Little Miami to the source of the Scioto, which was ridiculous. In 1812, Congress and Virginia commissioned Charles Roberts to survey a line from the source of the Little Miami to the source of the Scioto. He ran his line on a magnetic bearing of N. 24° 30′ W., from the same spring that Ludlow had used as the source of the Little Miami. Roberts extended his line about 11 miles past the Greenvile Treaty line, missed the source of the Scioto, turned N. 75° 05′ E. and ran about two miles to what he considered the source of the Scioto. Roberts did not correct his line back to the Little Miami, so his random line was his actual boundary line.

Claims between the Roberts and Ludlow line were filed by both Virginia warrant holders and by public land purchasers. On *April 11, 1818,* Congress passed an act declaring the Ludlow line the boundary. In 1824, the U.S. Supreme Court held that the Roberts line was correct. The Federal government ended the matter by purchasing the Virginia claims west of the Ludlow line, south of the Greenville Treaty line. North of the Treaty line the Roberts line is the boundary of the Virginia Military Tract. This conflict brought out quite clearly that indefinite natural boundaries were a source of trouble.

Sec. 6 of the *Act of May 1, 1802,* provided for the survey of the Vincennes Tract on the Wabash River in the Indiana territory to be surveyed according to the *Act of May 10, 1800,* i.e., all section lines surveyed with quarter corners on the east-west lines; and raised the maximum price to $4 per mile for surveying. It also said that the surveys were to be made by persons appointed by the President of the United States, not by the Surveyor General, and that two plats would be furnished by the surveyors. It can only be guessed why the Surveyor General didn't have jurisdiction over the Vincennes surveys. Thomas Jefferson had become President in 1801 and was a Democrat-Republican, whereas Putnam was a Federalist of the Washington-John Adams administrations. The surveys under Putnam had been executed rapidly and cheaply but were generally poorly executed. Indiana was new country and Congress and Jefferson wanted a better job done there but didn't feel that Putnam could do that job; he was, after all, 64 years old and "set in his ways."

Sec. 7 of the act deals with the problem in the Seven Ranges. The lines of any section sold before May 1, 1800, were to be surveyed in a manner consistent with the lines already located on the ground. Those sections sold after May 1, 1800, are to be where the Surveyor General locates them and, if the purchaser doesn't like it, within six months he could withdraw his application and apply it to some other vacant section. Gallatin had written to Putnam on September 25, 1801, explaining that settlers in the Seven Ranges would be injured in many instances if those Seven Ranges townships were surveyed according to the third section of the *Act of May 10, 1800*. The surveys in the Seven Ranges were distorted and fragmentarily subdivided. Putnam and Gallatin discussed the situation and the result was Sec. 7 of the *Act of May 1, 1802*. An illustration of the problem to be solved is shown by a sketch plat sent to Gallatin by Putnam on June 10, 1802. Fig. 19 is a sketch of Putnam's plat of Township 6, Range 3, in the Seven Ranges. Lots 1 through 6 had been sold at New York and located on a meridional line run north from the corner of Lots 1 and 7 on the south boundary. The east-west lines had been run west from corners on the east boundary. Lots 7, 13, 23, and 24, sold at New York, were located in a similar manner. By holding the lots sold at New York fixed as already surveyed, holding the original corners on exterior boundaries, and then correcting for the large errors in the boundaries, Putnam came up with the plan illustrated. The purchasers of lots sold at Steubenville after May 1, 1800, could take those lots or not as they should choose. This instance is given here to illustrate a very early example of what is today called an "Independent Resurvey," whereby a claimant's location in good faith is honored and the remaining public lands surveyed as nearly as possible on a normal rectangular plan.

Congress passed the *Appropriation Act of May 1, 1802,* which included money to hire a clerk in the Surveyor General's office, $39,296.90 for surveys, and survey of the Vincennes Tract. Putnam did not begin the surveys in Indiana; for his remaining year in office he confined surveying activities to township subdivisions and surveys in Ohio, which was admitted to the Union on November 29, 1802. The first governor of the new state was Edward Tiffin, who would become Surveyor General in 1814. Gallatin notified Putnam by letter dated September 21, 1803, of his dismissal from office and named his replacement, Jared Mansfield. Putnam later complained that the change was for political reasons and he was no doubt partially correct, but he had done his job, was 65 years of age, and a new man was needed to extend the rectangular surveys into the vast country to the west in the Louisiana Purchase just acquired from France. There can be little doubt that Thomas Jefferson wanted someone who could direct the surveys on the accurate rectangular plan he had advocated since 1784. Jefferson and Mansfield were old friends and Mansfield was capable.

Before closing out Putnam's term of office, three other acts of Congress passed during his tenure are important to mention.

Act of March 3, 1803, 2 Stat. 210

This act granted Section 16 in each township to the state of Ohio for support of schools. Lieu lands were granted for those already sold or otherwise reserved. The Section 16 school grant was to continue to be made to each State until 1850.

Surveys in Mississippi

The *Act of March 3, 1803,* 2 Stat. 225 made land grants and donations to settlers in the lands south of Tennessee, includ-

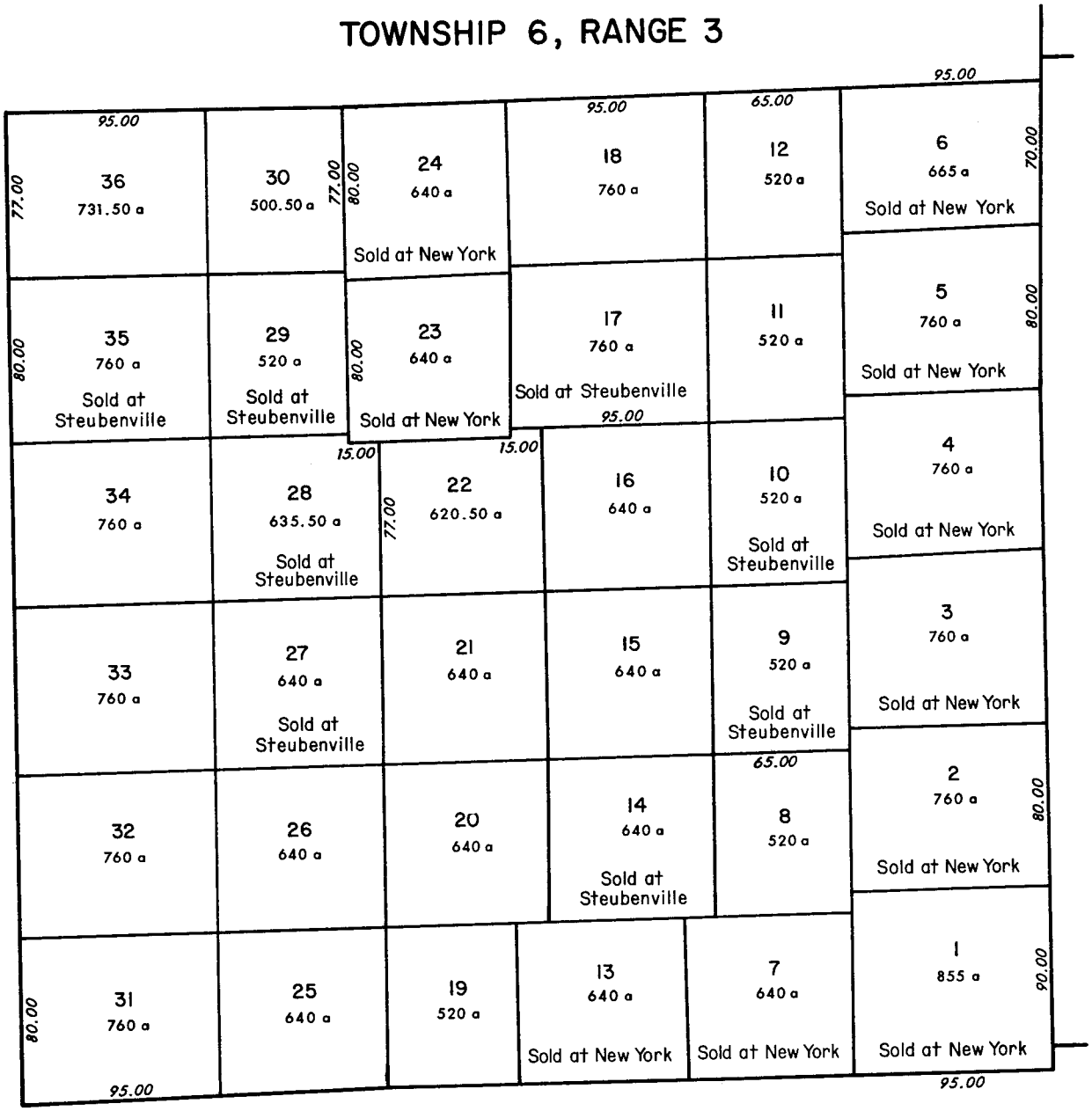


Figure 19. Township 6, Range 3, Seven Ranges Plan of Survey under Section 7, Act of May 1, 1802.

ing the Mississippi Territory, which had been created by the *Act of April 7, 1798*, 1 Stat. 549. It provided for the establishment of two land offices, Registers and Receivers, a board of land commissioners to handle private land claims, and how the claims were to be recognized. Sec. 10 of this act established the office of Surveyor of Lands South of Tennessee. The public land surveys were to be made the same as in Ohio, allowing a maximum of $4 per mile for surveying by deputy surveyors, and private land claims were to be surveyed by deputy surveyors paid by the claimants.

Isaac Briggs, was appointed "Surveyor of the Lands South of Tennessee" about April 1, 1803. Gallatin wrote to Briggs on April 8th, directing him to begin the surveys in Mississippi and to purchase instruments. He was to run a meridian line from a monument on the south boundary of the United States and lay off townships to the east and west thereof in ranges numbered east and west and townships numbered north from the boundary. These townships could only extend north to the then Indian boundary. Briggs established his office at Washington, Mississippi Territory, in August 1803.

In 1799-1800, Andrew Ellicott had surveyed the Line of Demarcation between the United States and Spanish Florida along the 31st parallel; he began the line at the Mississippi River and ran east. The first 21 miles were carefully surveyed. Ellicott then ran a compass line and at various intervals made latitude observations, measured a falling to the true parallel, and then corrected the compass line back, moving his mile posts to the true line. The Ellicott line was the south boundary of the United States referred to by Gallatin.

On July 25, 1803, Gallatin wrote instructions to Briggs concerning the private land claims. The following is part of that letter:

> "Sir,
>
> Although by my letter of the 8th April, ult. you were generally instructed to divide the whole of the two tracts to which the Indian title has been extinguished into Ranges & Townships, yet, as that mode may present some difficulties which might induce you to prefer another, I have thought it necessary to repeat particularly that a deviation from that plan would be attended with great confusion in the several offices connected with yours and particularly in this Department. But, although the whole country shall without exception be divided into regular Ranges & Townships, the lands for which Certificates shall have been granted by the Commissioners must nevertheless be surveyed in conformity to such Certificates. It will only result that a person will often have a part of his tract in one and the remainder in another Township & that the tract will be returned by you as consisting of two or more Sections lying contiguous but in different Townships. But as a single patent will nevertheless issue for the whole tract, neither inconvenience nor additional expense will be experienced by the party. The outlines of all of the Townships must, however, be surveyed at the expense of the United States, though running amongst lands for the expense of surveying which Individuals must pay, and. . ."

The use of the term "Sections" to designate the private land claims was unfortunate because all the private land claims in the lands south of Tennessee were labeled and called sections thereafter. As a result, a township may contain over 100 sections; this caused a great deal of confusion, which will be seen later.

On December 12, 1803, Briggs reported to Gallatin that he had started a meridian line at Washington, Mississippi, and had two deputies extend the line due south; they intersected Ellicott's line near the 19th-mile post. They then remeasured a part of Ellicott's line and found unacceptable errors in the distance between mile posts. Briggs then had two meridian lines surveyed due north, one from the 18th-mile post and another from a point "6 miles and 12 perches" east of that mile post. He proposed to use the line which ran over the smoothest country as his "Basis Meridian." Gallatin replied that he was sorry to hear Ellicott's measurements were so poor and gave Briggs permission to use his best judgment, but Briggs did little or nothing with the rectangular surveys during the next two years.

Act of March 3, 1803, 2 Stat. 236

Sec. 5 of this act directs that all of the unappropriated lands in the U.S. Military Tract were to be subdivided into sections according to the *Act of May 10, 1800*. Putnam had his surveyors subdivide those five-mile townships into 25 sections, with number 1 in the northeast corner and number 25 in the southwest corner in the manner used since 1796. Few of the townships were whole, most had military warrant lots within them, and in some, quarter townships had been taken up, the result being many half sections were against the alienated lands (see Fig. 14).

1803 — Jared Mansfield Takes Office as Surveyor General

Jared Mansfield was born on May 23, 1759, at New Haven, Connecticut. He was expelled from Yale in 1777 for misconduct but was later readmitted and received a degree in 1787. He taught school thereafter and was rector of an advanced school in New Haven from 1796-1802. In 1802, he wrote his *Essays, Mathematical and Physical* in the subjects of algebra, geometry, calculus, and astronomy, which brought him immediate notoriety. He was appointed acting Professor of Mathematics at the Military Academy at West Point and served in that position until his appointment to the office of Surveyor General in July 1803; along with his new job he received the rank of Lt. Colonel in the army. He visited New Haven and then travelled to Ohio, arriving in Marietta where he officially took the oath of office on November 3, 1803. In July, he had written to the Secretary of the Treasury, Albert Gallatin, inquiring on how to acquire from London, England, a list of instruments including an astronomical clock, astronomic zenith sector, astronomic quadrant, transits, sextants, and other items. He repeated these requests again in December and in later years and eventually purchased a few of the instruments at his own expense. Jefferson and Gallatin had in Mansfield a well-educated man and an acknowledged mathematician. It was during Mansfield's tenure of office that the rectangular system of surveys was developed into a system closely approaching that in use today.

Act of March 26, 1804, 2 Stat. 277

This was the first major act affecting the public land sur-

veys after the surveys were extended to the Mississippi Territory and Briggs and Mansfield took office.

Sec. 1. Extends the Surveyor General's authority to all the lands north of the Ohio and east of the Mississippi River, to which Indian title had been extinguished or "shall hereafter be extinguished." At that time, west of Ohio, only the Vincennes Tract and a few thousand acres of French claims had been cleared of Indian title by the *Fort Wayne Treaty of June 7, 1803,* 7 Stat. 74. But the Federal government made no pretense that all the lands would not eventually be acquired from the Indians and everybody knew it, except maybe the Indians themselves. The Surveyor General was also made responsible for surveying the Indian boundary lines "as have not yet been surveyed." Thomas Freeman had already surveyed the boundaries of the Vincennes Tract in 1803. The Surveyor General was to determine with the approval of the President, using astronomical observation, the positions of such places as were necessary for the "Correctness of the Surveys." This was clearly aimed at Mansfield's abilities in astronomy; unfortunately, Mansfield didn't have his astronomical instruments, and Congress did not bother supplying them.

Sec. 2. Establishes three new land offices at Vincennes, Detroit, and Kaskaskia and Registers and Receivers to man them. Those three communities were the centers of the French settlements and therefore the location of most of the private land claims north of the Ohio River.

Sec. 3. Deals with the French claims, evidences, etc.

Sec. 4. Makes the Registers and Receivers land commissioners to handle the claims.

Sec. 5. Makes the reservation of section 16 for schools, three townships for a college, and salt springs. It also provides for land sales and patenting procedures.

Sec. 6. Provides "that all the navigable rivers, creeks, and waters, within the Indiana territory, shall be deemed to be, and remain public highways." The addition of "creeks and waters" in this act is perplexing. It was not in the *Acts of May 18, 1796 and March 3, 1803*. Does it mean that all creeks and waters are declared navigable, or does it mean that all navigable creeks and waters, including lakes, are public highways? Probably the latter. But who is to determine whether a creek is navigable? The result was that all streams large enough to be used as a means of travel through the territory were meandered by the surveyors, creating many more fractional sections than had been created in Ohio.

Secs. 7 and 8. Deal with the lands and preemptions between the Miami Rivers sold by John Cleves Symmes.

Sec. 9. Provides for sale of fractional sections.

Sec. 10. Provides that the public lands will be offered for sale in half sections or in quarter sections. If sold in half sections, the dividing line is to be run "due north and south; and the half sections shall be divided into quarter sections by lines running due east and west." The purchaser is to pay for the subdivision of any section bought by quarter or half section. The problem with these provisions was the due north and south and due east and west wording. If the section boundaries weren't "due" north and south or "due" east and west, subdividing in that manner would be an impossibility. And no quarter corners had been established on any of the north-south section lines. How are the quarter corners on those lines to be established and who is to pay for the cost of that work? About half the six-mile-square townships in Ohio had been subdivided by alternate section lines. If a man bought a quarter section in one of those townships, how was it to be surveyed?

Sec. 12. This section placed the reserved sections up for sale. These were the three or four sections in each township reserved by Congress for future disposal. All the other public lands both north of the Ohio and south of Tennessee were directed to be sold in quarter sections. Congress used the expressions "north of the Ohio" and "south of Tennessee" because at that time there was an undetermined amount of public land in Tennessee; by this wording, the public lands in Tennessee were excluded from these laws.

Sec. 13. This section is complex and divides responsibility for the surveys. The entire section follows with certain points emphasized:

"Sec. 13. And be it further enacted, That whenever any of the public lands *shall have been surveyed* in the manner directed *by law,* they shall be *divided* by the Secretary and the Treasury into convenient *surveying districts,* and a *deputy surveyor* shall, with the approbation of the said secretary, be *appointed by the surveyor-general for each district,* who shall take an oath or affirmation truly and faithfully to perform the duties of his office; and whose duty it shall be to *run and mark* such *lines* as may be *necessary* for *subdividing* the lands surveyed as aforesaid, *into sections, half sections* or *quarter sections,* as the case may be; to *ascertain* the *true contents* of such *subdivisions;* and to record in a book to be kept for that purpose, the surveys thus made.. The surveyor-general shall furnish each deputy surveyor with a copy of the plat of townships and fractional parts of townships contained in his district, describing the subdivisions thereof, and the marks of the corners. Each

deputy surveyor shall be entitled to *receive from* the *purchaser* of any tract of land, of which a line or lines shall have been run and marked, by him at the rate of *three dollars for every mile* thus surveyed and marked, before he shall deliver to him a copy of the plat of such tract stating its contents. The *fees* payable by virtue of former laws *for surveying* expenses shall, after the first day of July next, *be no longer demandable* from, and paid by the purchasers. And *no final certificate* shall thereafter be *given by the register* of any land-office *to the purchaser of any tract of land, all the lines of which shall not have been run,* and the *contents ascertained* by the *surveyor-general* or his assistants, *unless such purchaser shall lodge with the said register a plat of such tract, certified by the district surveyor.*"

An analysis of the section is necessary. After the surveys have been made according to law, the lands surveyed will be divided into surveying districts and a district surveyor will be appointed, who is to subdivide the lands in his district into sections, half sections, and quarter sections. Nearly half the six-mile townships in Ohio had only the alternate section lines surveyed, but plats had been made showing the remaining section lines protracted and each section containing 640 acres. The act now says the district surveyor will subdivide and determine the true contents of the subdivision. Whose plat is to be believed, that by the Surveyor General or that by the district surveyor? In no two cases would they ever agree. The district surveyor will receive a fee of $3 per mile, fixed rate, from the purchaser, before he gives the purchaser a plat. Magnanimously, Congress then says the purchaser doesn't have to pay the old surveying fee of $6 per section or $3 per half section. Then the act says that the Register is not to issue a final certificate to any purchaser until all his boundary lines have been surveyed and the contents ascertained by the Surveyor General (who has already said a section contained 640 acres) or by the district surveyor.

Sec. 14 through 17. Pertains to salaries, fees, patents, etc., not affecting the surveys.

Sec. 18. Appropriates $20,000 to carry the act into effect.

Mansfield met the challenge head-on; he divided the lands in each land office district into surveying districts of 25 to 36 townships and appointed a district surveyor for each. He instructed them to subdivide the "four section" blocks into sections by running true lines from the south section corner to the north section corner and likewise from east to west. Where the true lines intersected, the unset section corner was to be established. This was the same method used to subdivide the five-mile townships in the Military Tract into quarter townships. All quarter-section corners were to be established at midpoint between section corners, and sections were to be subdivided in the same way. Fig. 20 is an illustration of Mansfield's instructions. All lines were to be run on a random, then were to return establishing the true line and necessary corners. If a section was to be subdivided into quarters, the necessary old lines would be retraced and quarter-section corners established at midpoint.

The purchasers complained bitterly. For example, referring to Fig. 20: if a man bought the northwest quarter of Section 34, he could not get a final certificate until he paid the district surveyor for running six miles of line or even eight miles if the surveyor charged him for the two miles of retracements. The government had already paid once for having those miles run, so why should the purchaser pay again? And what if another purchaser had applied for the east half of Section 34? Would he have to pay for five, maybe six, miles of surveying which had already been paid for by the purchaser of the northwest quarter? The available records don't reveal the answers to those questions and complaints about surveying fees, except to state that the district surveyor could not charge twice for the same lines.

On July 26, 1804, Gallatin wrote instructions to Mansfield about the rates to be charged. The rates varied from $1.50 up to $18.00 for the first interior quarter-section corner within a four-section block.

Mansfield did insist, however, that the contents of a section or quarter section had to be based on the surveys and plats made by the Surveyor General, regardless of what area the district surveyor might find in the field. He insisted that if his plats returned 640 acres in a section, then a quarter-section contained 160 acres regardless of what errors were found in the original surveys. Mansfield thought it impractical, if not impossible, to resurvey and recalculate the areas of the sections in all the old surveys, though he did leave some latitude for such procedure in exceptional and specific cases. Mansfield was so firm in this stand that his views soon became law.

On August 20, 1804, Mansfield sent to Gallatin a copy of his *Plan of Instructions for the District Surveyors,* which were for subdividing, etc. On September 11, he informed Gallatin of his impending trip to Vincennes where he would personally supervise the beginning of the rectangular surveys in that tract. On September 29, he wrote to Gallatin and mentioned his *Plan of Instructions for the Deputy Surveyors.*

In 1972, Thomas A. Tillman, editor of the 1973 *Manual of Surveying Instructions,* identified a copy of Mansfield's *General Instructions to Deputy Surveyors* among archival records on file in the Michigan Historical Commission Archives. Mansfield had hired his nephew, John Mansfield, as one of his clerks. The undated and unsigned copy of *General Instructions* are in John Mansfield's distinctive and beautiful handwriting. Perhaps Mansfield had his nephew prepare several copies of those instructions, with the dates and signature to be filled in when they were actually given to a deputy, probably when a contract was signed. So Jared Mansfield was responsible for the first known written instructions to the deputy surveyors, which eventually evolved into the *Manual of Surveying Instructions.*

Mansfield personally attended to and directed the establishment of the Second Principal Meridian and Base Line in Indiana. He had his own sextant, with which he determined the latitude and longitude of the mouth of the Great Miami, the west boundary of Ohio. At Vincennes he made astronomic observations of the corners of the Vincennes Tract and found that Freeman had run the north boundary on a magnetic bearing of N. 78° W. instead of true bearing and that the average magnetic declination was 6° 45′ E. Therefore the boundaries, as described in the Fort Wayne Treaty, were that much in error.

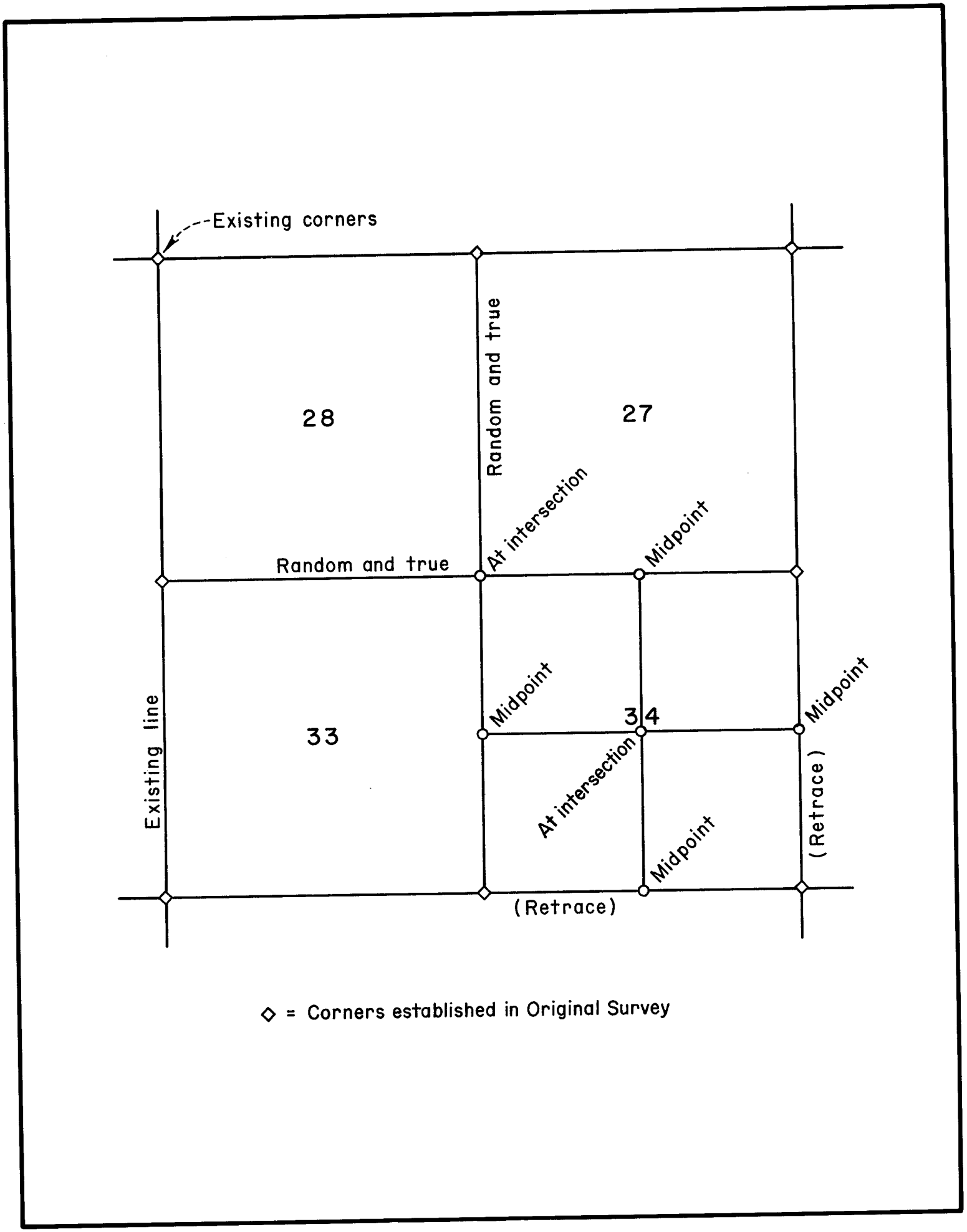


Figure 20. Survey of Sections Originally Surveyed under the Act of May 18, 1796.

The following is extracted from a letter written by Mansfield to Gallatin on October 26, 1804, while he was working on the Vincennes surveys:

"This estimate (of survey cost) is made from a plan which I had drawn for the survey of the Tract, according to Mr. Freeman's map. The courses of his lines, were put down with a variation of 12° from the true meridian. On examination, they were found to deviate 12° from the *magnetical* meridian, instead of the *true*. This mistaken amount of the Variation of the Compass, which by accurate observations is found to be 6°45′ East, has deranged my first plan, and obliged me to form a new one, whereby the number of Ranges and Townships are altered, the Quantity of Territory being the same; but varied in the designation of its parts.

The whole expense is estimated at the maximum price of $3 per mile; but as I pay only $2½ to the Deputy Surveyors, if no additional expenses arise, for the correctness of the work, there would be saved to the United States $2654, and that in a country where surveying is the most difficult, and expensive to the Deputies. As some compensation for their reduced wages, I have engaged to pay them, if they should have occasion for money, as fast as their work may be correctly executed. At present I have no credit with the Receivers, but for the balance of that of last year, at Chillicothe, amounting perhaps to $1200.

I send you enclosed a copy of my last plan for surveying this territory. You will perceive, that I have not considered this as an isolated tract; but have had regard to its connection with the old surveys (in Ohio) and the surrounding country, according to one general and uniform system. For this purpose I have ascertained a meridian, which I conceive to be at a proper distance from the one, which forms the Western boundary of the State of Ohio, and which lies near the Eastern extremity of the Tract, as a *Directive,* from which the Ranges on each side of it may be counted. This in the General Map, may be called the 2nd Meridian. One meridian, viz. that which is the Western Boundary of the State of Ohio, would have been sufficient if the surveys could have been made in regular progression from it Westward; but it would be impossible, in this discontinued Tract, without more data than I am in possession of, to determine its exact position in relation to the surveyed country, so as to estimate the intermediate ranges which may actually arise. Hence the necessity of a new series of ranges and townships.

When the lines drawn according to this plan, are extended, the fractional townships and sections will vanish; but there will be no inconvenience; as I conceive, in selling them as fractional, if the boundaries run by Mr. Freeman be distinctly marked.

The territory between this and the Ohio, in the opinion of everyone a most excellent, and valuable tract, may be surveyed by mearly extending the lines of our present survey to the River.

The townships would not then, as heretofore, be numbered from the Ohio, but from the *Baseline,* which I have caused to be run for the purpose of surveying here. This I account an advantage, as it would present an uniformity of numbers in the adjacent townships of different ranges, and the mind would at once derive from the general plan, a correct idea of their position, as well as of the meanders of the River."

Fig. 21 is an outline sketch of the Vincennes Tract, the Second Principal Meridian and Baseline. The first rectangular surveys in the tract were made by Ebenezer Buckingham. The beginning point of Mansfield's new numbering system was located outside the Vincennes Tract and was not physically established until those lands were acquired from the Indians. The townships were numbered north and south from the baseline, east to the Greenville Treaty line and Ohio boundary (which was designated the First Principal Meridian), and west through Range 14.

Mansfield's plan of closing the fractional townships against the tract boundary was followed, but the lines were continued and extended outside the tract when the Indian lands were acquired. That plan was not always adhered to, however, and some jogs occurred at Old Indian treaty boundaries.

While at Vincennes, Mansfield also found large areas of open prairie country. He proposed that these areas either not be surveyed for the time being, as settlers wouldn't buy without trees to build cabins, or that the corners be monumented with stones or posts and mounds of earth. This method of monumentation was later made the usual practice.

Mansfield also instituted the practice of surveying the private land claims, but extending the section and township lines on through them, instead of stopping the rectangular system lines at the claim boundaries. This method gave continuity to the surveys and made the calculation of fractional areas easier and more accurate.

Gallatin approved of Mansfield's new baseline and meridian numbering system. In November 1804, he ordered Mansfield to run a Third Principal Meridian due north from the mouth of the Ohio River for the base of surveys in the new acquisition from the Sac and Fox Indians (November 3, 1804), the lands ceded by the Kaskaskia tribe on August 13, 1803, and the French claims at Kaskaskia, on the Mississippi River below St. Louis. The Third Principal Meridian surveys were begun in 1805. Mansfield intended to extend the baseline of the Second Principal Meridian west to the Mississippi River but, due to unceded Indian lands, that work could not be done directly. While the baselines of the Second and Third Principal Meridians are almost on the same latitude, the surveys had to be run in a roundabout and piecemeal manner and relative positions calcuated, which were partly based on the Indian boundary surveys and partly on astronomic observations.

Mansfield returned to Marietta in December 1804, having spent nearly two full months at Vincennes personally attending to the establishment of the rectangular surveys in that area.

Act of March 26, 1804, 2 Stat. 283

This act divided the Louisiana Purchase into the Territory of Orleans and District of Louisiana. The land south of the Mississippi Territory and south of the 33rd parallel, west of the Mississippi River were named Orleans Territory. The

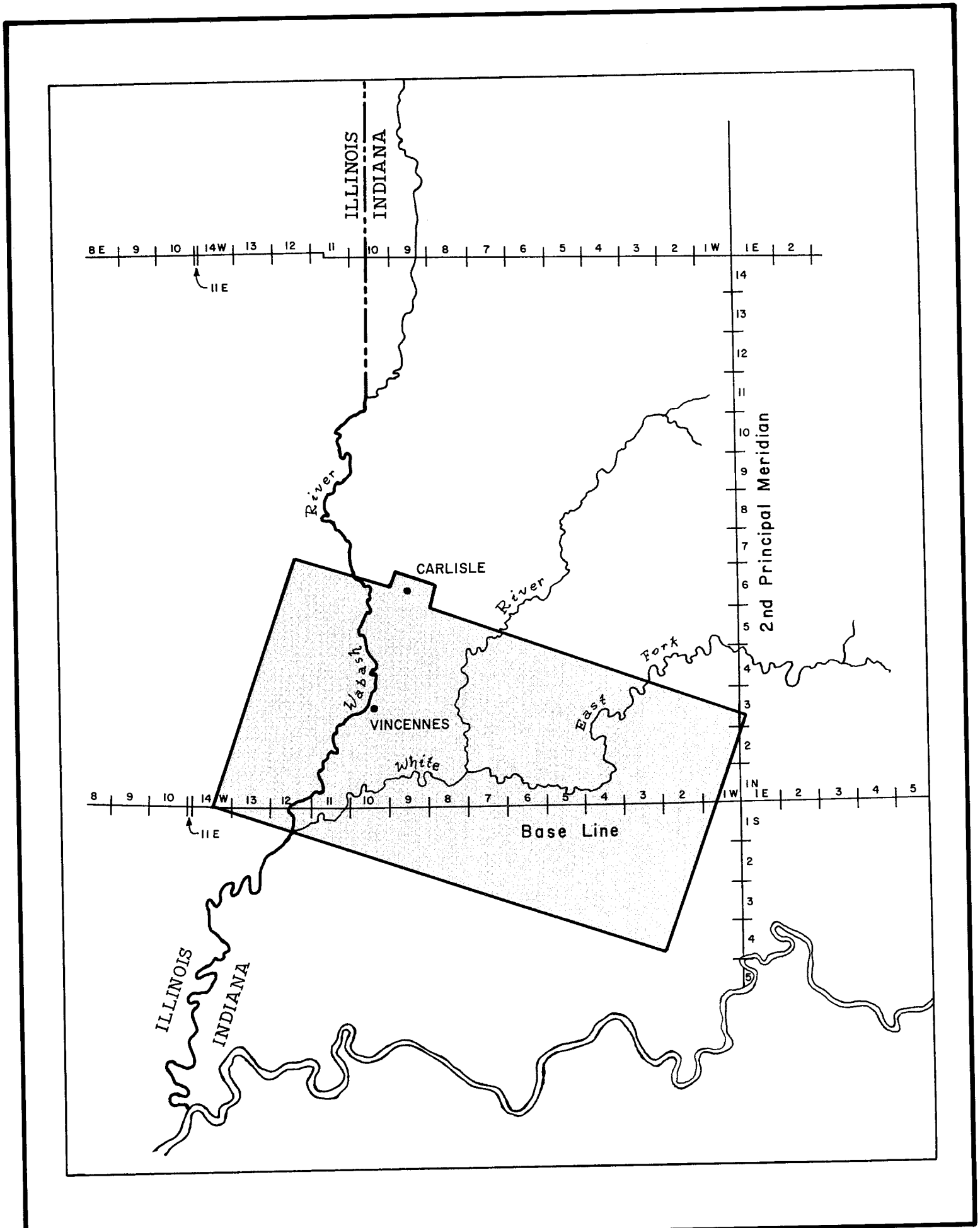


Figure 21. Vincennes Tract and Second Principal Meridian.

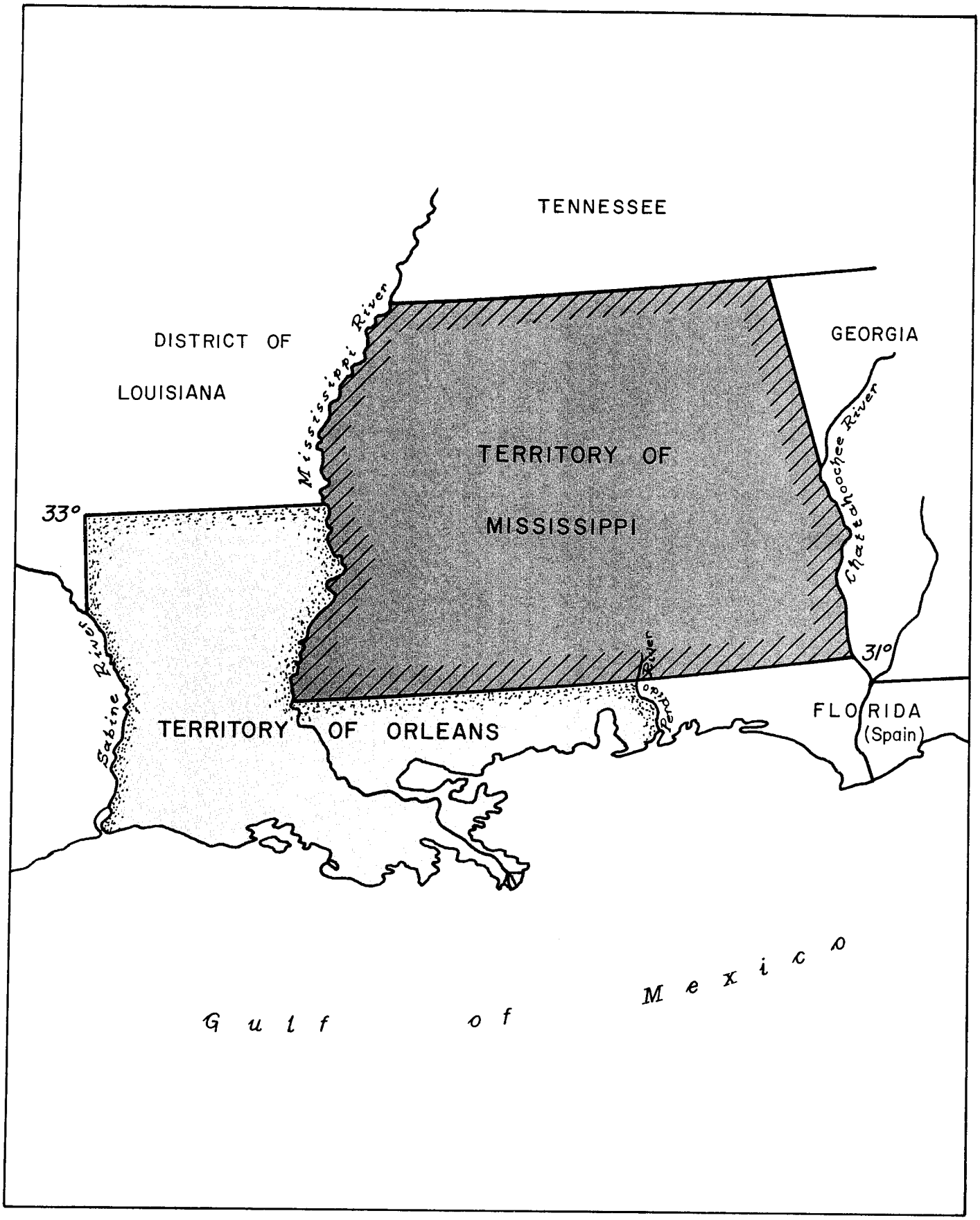


Figure 22. Territories of Mississippi and Orleans, 1804.

remainder of the vast purchase was called the District of Louisiana. Sec. 14 of the act provides in part:

> "And that if any citizen of the United States, or other person, shall make settlement on any lands belonging to the United States, within the limits of Louisiana, or shall survey, or attempt to survey, such lands, or to designate boundaries by marking trees, or otherwise such offender, shall,. . . forfeit a sum not exceeding one thousand dollars, and suffer imprisonment not exceeding twelve months. . ."

These stiff penalties were supposed to halt squatters' activities and to prevent the marking out of false private land claims. In fact, they did neither and false land claims would be a big problem for the land commissioners and deputy surveyors for years to come.

Act of March 27, 1804, 2 Stat. 303

This act added the Georgia cession lands to the Territory of Mississippi and extended the public land surveys to the additional territory.

Fig. 22 indicates the boundaries of the Mississippi and Orleans Territories as they were claimed by the United States after passage of this act.

Act of January 11, 1805, 2 Stat. 309

This act divided the Indiana Territory and created the Territory of Michigan; the south boundary of the Michigan Territory is described as a line drawn east from the extreme southern end of Lake Michigan until the said line intersected Lake Erie. The State of Ohio would later protest that line and create a boundary dispute wherein Michigan and Ohio nearly went to war. The so-called "Toledo Strip" eventually went to Ohio and part of the Michigan Meridian surveys are therefore in Ohio.

Act of February 11, 1805, 2 Stat. 313

The provisions of this act of Congress, now codified in Title 43 of the United States Code, are still the statute law of the land and brought the public land surveys to the basic system still in use, even though some of the provisions are obsolete. The entire act as taken from Volume II, Statutes at Large, follows:

Chap. XIV—An Act concerning the mode of surveying the Public Lands of the United States. (a)

STATUTE II.
Feb. 11, 1805

Act of May 18, 1796 Ch. 29. Mode of surveying public lands north of the Ohio.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the surveyor-general shall cause all those lands north of the river Ohio, which by virtue of the act, intitled "An act providing for the sale of lands of the United States, in the territory northwest of the river Ohio, and above the mouth of the Kentucky river," were subdivided, by running through the townships, parallel lines each way, at the end of every two miles, and by marking a corner on each of the said lines, at the end of every mile; to be subdivided into sections, by running straight lines from the mile corners thus marked, to the opposite corresponding corners, and by marking on each of the said lines, intermediate corners as nearly as possible equidistant from the corners of the sections on the same. And the said surveyor-general shall also cause the boundaries of all the half sections, which had been purchased previous to the first day of July last, and on which the surveying fees had been paid, according to law, by the purchaser, to be surveyed and marked, by running straight lines from the half-mile corners, heretofore marked, to the opposite corresponding corners; and intermediate corners shall, at the same time, be marked on each of the said dividing lines, as nearly as possible equidistant from the corners of the half section on the same line: Provided, that the whole expense of surveying and marking the lines, shall not exceed three dollars for every mile which has not yet been surveyed, and which shall be actually run, surveyed, and marked by virtue of this section. And the expense of making the subdivisions, directed by this section, shall be defrayed out of the monies appropriated, or which may be hereafter appropriated, for completing the surveys of the public lands of the United States.

Corners to be marked.

Half sections purchased before July 1, 1804, to be surveyed and marked.

Whole expense of survey not to exceed three dollars per mile. How the expense of making the surveys is to be paid.

Sec. 2. And be it further enacted, That the boundaries and contents of the several sections half sections, and quarter sections of the public lands of the United States, shall be ascertained in conformity with the following principles, any act or acts to the contrary notwithstanding:

Principles upon which the boundaries and contents of the public lands are to be ascertained.

1st. All the corners marked in the surveys, returned by the surveyor-general, or by the surveyor of the land south of the state of Tennessee, respectively, shall be established as the proper corners of sections, or subdivision of sections, which they were intended to designate; and the corners of half and quarter sections, not marked on the said surveys, shall be placed as nearly as possible equidistant from those two corners which stand on the same line.

2d. The boundary lines, actually run and marked in the surveys returned by the surveyor-general, or by the surveyor of the land south of the state of Tennessee, respectively, shall be established as the proper boundary lines of the sections, or subdivisions, for which they were intended, and the length of such lines, as returned by either of the surveyors aforesaid, shall be held and considered as the true length thereof. And the boundary lines, which shall not have been actually run, and marked aforesaid, shall be ascertained, by running straight lines from the established corners to the opposite corresponding corners; but in those portions of the fractional townships, where no such opposite corresponding corners have been or can be fixed, the said boundary lines shall be ascertained, by running from the established corners, due north and south, or east and west lines, as the case may be, to the water-course, Indian boundary line, or other external boundary of such fractional township.

Boundary lines run and marked by the surveyor south of the Tennessee River to be the proper boundaries of sections.

Boundary lines not actually run to be ascertained.

3d. Each section, or subdivision of section, the contents whereof shall have been, or by virtue of the first section of this act, shall be returned by the surveyor-general, or by the surveyor of the public lands south of the state of Tennessee, respectively, shall be held and considered as containing the exact quantity, expressed in such return or returns: and the half sections and quarter sections, the contents whereof shall not have been thus returned, shall be held and considered as containing the one half, or the one fourth part respectively, of the returned contents of the section of which they make part.

Surveys to be returned.

Sec. 3. And be it further enacted, That so much of this act entituled "An act making provision for

Part of a former act repealed.

the disposal of lands in the Indiana territory, and for other purposes," as provides the mode of ascertaining the true contents of sections or subdivisions of sections, and prevents the issue of final certificates, unless the said contents shall have been ascertained, and a plot certified by the district surveyor, lodged with the register, be, and the same is hereby repealed.

APPROVED, February 11, 1805

Act of March 26, 1804, Ch. 35.

Sec. 1. Enacts into law the method of subdividing the two-mile blocks and subdivision of sections which Jared Mansfield had issued to his district surveyors. The question of who is to pay for these surveys is answered — the government will.

Sec. 2. (1) The first clause fixes the corners established by the Surveyor General in position regardless of any errors and requires that any corners of the half or quarter section not established in the original survey must be established at midpoint and on line.

(2) The second clause fixes the lines actually run and marked as the true boundary lines, even if they were crooked, of the section or section subdivision. It establishes the length of the lines returned by the Surveyor General as being the true length. This provision is the basis of single and double proportion as the proper method of restoring lost corners and also fixes the method of subdividing sections, either whole or fractional.

(3) The third clause establishes the quantity or area of land returned as the true quantity and that a half section or quarter section of a full 640-acre section contains 320 or 160 acres. It provides for different areas in fractional sections or in the sections along the north and west boundaries of a township. But they will contain the quantity as returned by the Surveyor General. Mansfield had advocated these principles throughout 1804 and they are now law.

Sec. 3. Repeals the provision that district surveyors could ascertain the area of land in a section or section subdivision and the necessity of such a survey before a final certificate could be issued, which returned full authority and responsibility to the Surveyor General. The ill-thought-out provision in the *Act of March 26, 1804,* Sec. 13, lasted less than a year; Mansfield had never honored it anyway.

The most important parts of this act are:

(1) All section lines will be surveyed and all quarter corners on those lines established.
(2) The corners set by the Surveyor General are unchangeable.
(3) The lines marked by the Surveyor General are unchangeable.
(4) The lengths of the section lines are unchangeable.
(5) The quantity or area of a section or fractional section is unchangeable. Of course, the Surveyor General, i.e., the government, could correct or change a survey up until such time as private rights were acquired based on the survey; however, that fact was established by case law in the courts.

Act of March 2, 1805, 2 Stat. 324

Sections 7 and 8 of this act extend the authority of the surveyor of the lands south of Tennessee to cover all the Mississippi and Orleans Territories, and the system of rectangular surveys is extended to cover all the lands in those territories. On *March 3, 1805,* 2 Stat. 331, the District of Louisiana was changed to the Territory of Louisiana.

Act of March 3, 1805, 2 Stat. 343

This act extends the public land surveys to the lands in the Indiana Territory in Illinois and Indiana ceded by the Kaskaskias and the Sac and Fox Indians in 1803 and 1804, and to the lands south and east of the Vincennes Tract ceded in November 1804. Indian cessions would be very frequent during the ensuing years, and laws were passed extending the land surveys to them. The rectangular surveys would proceed in an orderly fashion only so far as Indian cessions would allow. Many of the Indian boundary lines in these early cessions were surveyed by surveyors under contract with the Surveyors General.

1805 — A Busy Year

During 1805, the rectangular surveys were extended in Ohio and Indiana. As already noted, the Third Principal Meridian was run north from the mouth of the Ohio River and the Second Principal Meridian surveys extended into Illinois to determine the Third Principal Meridian Baseline.

In letters to Gallatin from Isaac Briggs dated February 10, 1804, and December 31, 1804, Briggs complained of the low maximum price for surveys ($4 per mile) and that his deputies had been ruined trying to survey at that price. Apparently these deputies were Charles DeFrance and George Davis who helped him run the two trial meridian lines of the Washington Meridian in 1803. Between 1803 and 1805, Briggs had done nothing more with the rectangular surveys in the lands south of Tennessee; however, some private land claims may have been surveyed.

On February 20, 1805, Gallatin wrote to Briggs urging him to get the rectangular surveys underway. On March 13, 1805, Gallatin again wrote to Briggs, referring to the *Act of February 5, 1805*. That letter follows:

Sir,

"I have the honour to enclose an Act concerning the mode of surveying the public lands of the United States, which although principally intended to palliate the errors made in the surveys north of the Ohio, contains certain general principles, in relation to the mode of establishing corners and running interior lines, which apply to all of the public lands.

Permit me earnestly to repeat my request that you would take immediate measures for running the township lines & for executing generally all of the surveys within the tracts lying in the Mississippi Territory to which the Indian Title has been extinguished. The Legislature has fixed the price at four dollars per mile;

that price will not be enhanced; and although very great correctness cannot be attained for that price in that part of the Country; it is our duty to carry the law into effect, and all that can be expected is that the surveys will be as correct as can be done at that rate. You will also perceive from the enclosed act that the principal object which Congress has in view is that the corners and boundaries of the sections & subdivision of sections should be definitively fixed; and that ascertainment of the precise contents of each is not considered as equally important. Indeed it is not so material either for the United States or for the individuals, that purchasers should actually hold a few acres more or less than their surveys may call for, as it is that they should know with precision, and so as to avoid any litigation, what are the certain boundaries of their tract. It is true that you will not be able to complete your work in that scientifick manner which was desireable, & that it will not be possessed of that merit, in a geographical point of view, which your abilities enable you to give it. But those are only secondary though very desireable objects: and it is of primary importance that the land should be surveyed and divided, as well as it can be done, so as at least to connect the whole work, to ascertain the claims affirmed by the Commissioners, and enable Government to dispose of the vacant lands. I hope, therefore, considering the time which during your absence has been already lost, that you will not fail to take the necessary measures for carrying, without any further delay, the law into effect."

As can be seen, Gallatin was telling Briggs to "get on with the job and don't worry about the accuracy." Judging from the resulting quality of the work, that is what Briggs had his deputies do.

On March 16, 1805, Isaac Briggs reported that he had engaged Gideon Fitz and John Dinsmore to make surveys in Washington County, now in Alabama; these would have been the first surveys from the St. Stephens Meridian. It isn't known for certain who selected the initial point, but it is a stone monument set by Andrew Ellicott on the west side of the Mobile River on the Line of Demarcation approximately 206 miles east of the Mississippi River. The St. Stephens Meridian was run north from that point. Ellicott's Line of Demarcation is the baseline. The field notes and plats of these surveys were destroyed when the Surveyor General's office at Florence, Alabama, burned in 1827; the existing records are copies, and it is uncertain whether Fitz or Dinsmore started the St. Stephens Meridian surveys, but they were started in 1805, and Fitz surveyed T. 1 N., R. 1 W., St. Stephens Meridian.

On April 3, 1805, Mansfield wrote to Gallatin and discussed the *Act of February 11, 1805*. His primary concern was the subdivision of fractional sections — the second clause of Sec. 2 of the act said that fractional sections were to be subdivided by running due north and south or east and west from the quarter-section corners to an intersection with the boundary, which made the section fractional. He advocated that this procedure wasn't proper unless the section boundaries were on a true cardinal bearing and that the subdivisional lines would have to be run parallel to the established section boundaries or mean courses would have to be adopted. This method of subdivision was adopted by Mansfield as following the intent of the law and is the present-day practice.

On May 10, 1805, Mansfield reported that he had moved his office and records to Cincinnati, asked whether the Indian boundaries had been surveyed yet, and stated that he needed the astronomic instruments he had ordered two years before. On May 24, he wrote to Gallatin advocating that a new baseline be run west from near the mouth of the Wabash River (this plan wasn't accepted), and that surveys should be made by only one surveyor in a given district because mixing up the surveyors resulted in poor relationships or closures of the section lines. This last suggestion was made a standard practice for many years.

On June 12, 1805, Gallatin authorized Briggs to make necessary private land claim surveys prior to the Commissioners granting a certificate to the claimant. Briggs was to tie the claims together and tie in the township lines at the same time if possible. This was putting the cart before the horse, in a sense, because if the claim wasn't confirmed, who would pay for the survey?

On July 2, 1805, Gallatin instructed Briggs on the survey of private land claims in the Orleans Territory, which is now mainly the State of Louisiana, and instructed him to establish a baseline and meridian along the 31st parallel, west from the Mississippi River to the longitude of Natchitoches, and south of the Red River to the "seashore," the Gulf of Mexico. This was the Louisiana Meridian survey's baseline and meridian. The initial point was to be "some distance west of the Mississippi River." Briggs took no immediate action in that matter.

On *July 4, 1805,* 7 Stat. 87, the Treaty of Fort Industry was concluded with the Indians, ceding all the lands in the entire Connecticut Reserve and south of the reserve to the Greenville Treaty line. The Connecticut Company then extended the survey of the 41st parallel westward.

In 1805, Mansfield had the Twelve-Mile Square Reserve of the Greenville Treaty on the Miami of the Lake (Maumee River) surveyed by Deputy Surveyor Elias Glover. This reserve was surveyed into four regular townships, independent of any other survey system, which were numbered clockwise with number one in the southwest corner of the tract. The private land claims within these townships were not surveyed until 1816.

In September 1805, Mansfield wrote to Gallatin stating that purchasers complained loudly if, upon survey, a quarter section was less than 160 acres but said nothing if it contained more. He suggested that the patents be issued with a statement that the quarter section contained 160 acres, more or less, without warrant as to the exact acreage, which was not adopted directly. On credit patents, acreage was not given at all. On cash entry patents, the statement "containing ____ acres as shown on the official plat of survey" was added to the description.

As previously noted, Isaac Briggs surveyed the Washington Meridian in 1803, however, the record isn't clear as to who actually surveyed the Meridian line (the field notes indicate Charles DeFrance), but the initial point was near the 24-mile post on Ellicott's Line of Demarcation. In late 1805, Briggs contracted with Deputy Surveyors George Davis and

Gideon Fitz for the first township surveys of the Washington Meridian.

Fitz surveyed west and north from the initial point, while Davis did the work to the east and north. The field notes of T. 1 N., R. 5 E., Washington Meridian, executed by Davis, were approved December 23, 1805, by Isaac Briggs. The field notes of T. 1 N., R. 1 E., also by Davis, were approved January 20, 1806, by Seth Pease. The conclusion is that Pease, who had surveyed in the Connecticut Reserve, had replaced Briggs as Surveyor of the Lands South of Tennessee.

The surveyors in the south were hampered in the initiation and extension of the rectangular system because of the many private land claims. They had difficulties in getting descriptions of those claims from the Board of Land Commissioners, comprised of the Register of the Land Office and two other appointees.

Act of February 28, 1806, 2 Stat. 352

This act extends the authority of the Surveyor General to include the entire Territory of Louisiana and states that he is to appoint a principal deputy surveyor who is to be responsible for the surveys and supervision of the appointed deputy surveyors in that territory. The principal deputy was to be paid on a fee basis of 25 cents per mile for examinations, while the deputy surveyors were to be paid not more than $3 per mile for the fieldwork. The commissioners of private land claims were to tell the principal deputy what private claims were to be surveyed.

Mansfield recommended and finally appointed Silas Bent to be Principal Deputy in the Louisiana Territory, now comprised of Missouri and Arkansas, and other States. Bent established his office in St. Louis; in the ensuing years he had great difficulty with the land commissioners and the private land claim surveys.

Under the wording of this act, Mansfield appointed both the principal deputy surveyor and the deputy surveyors, paying them at a stated rate-per-mile surveyed. For private land claims, the deputies received $3 per mile, paid by the claimant, which was a modification of the more rigid contract system used by his predecessor, Rufus Putnam. The District Surveyors were appointed by Mansfield; however, they received their entire payment from the settler who hired their services but could not charge more than $3 per mile.

Acts of April 21, 1806, 2 Stat. 391-396

(1) The first of these acts provides for the appointment of two principal deputy surveyors in the Orleans Territory, one for each of the two land office districts in that territory. These principal deputies were to receive a salary of $500 per year, plus fees of 25 cents per mile for recording and examining private land claim surveys.
(2) The second act provides for private land claim surveys in the Vincennes and Kaskaskia districts.
(3) The third act provides for regular clerk hire by the Surveyor General.

The Orleans Territory was divided into two land districts:

(1) The portion lying east of the Atchafalaya River and Grand Lake, including the island of New Orleans, was called the Eastern District, with a land office at New Orleans.
(2) The remainder of the territory was called the Western District, with the land office at Opelousas. Briggs appointed Gideon Fitz Principal Deputy of the Western District.

The Years 1806-1807

In 1806, Mansfield began the surveys of lands between the Connecticut Reserve and U.S. Military Tract. He investigated the south boundary of the Connecticut Reserve as surveyed and found it slightly erroneous in both alinement and measurement. Rather than disrupt land titles and surveys within the reserve with a resurvey, he accepted that boundary line and used it as a northerly baseline for the surveys south of it. The township lines were surveyed from north to south, with the fractional townships against the north boundary of the Military Tract. The Townships were numbered north from the Ohio River and ranges west from the Pennsylvania boundary. Mansfield reported these surveys completed in August 1807.

Silas Bent, the Principal Deputy at St. Louis, was having problems with the private land claims, especially the spurious type. The *Act of March 26, 1804,* 2 Stat. 283, was aimed at discouraging the practice of marking out false claims by providing for stiff penalties. Most of the claims were based on French or Spanish titles and grants made before 1803.

Since the claimant only had to prove his claim and pay for surveying and a few other small fees, a private claim was almost free land. Unscrupulous individuals were making tommyhawk claims by blazing lines on trees and claiming the land within the blazes. Bent wrote to Mansfield that he was proving or disproving the date of the blazes by the annual ring count on the overgrowth, which he believed was the most infallible method of dating a claim to prove its authenticity. This method of dating a line blaze wasn't new; Alexander Holmes had used it in 1799 when retracing the north boundary of the Seven Ranges in Ranges 1 and 2 to identify bearing trees blazed in 1785 and 1786. Mansfield reported these facts to Gallatin on October 22, 1806, and annual ring count has been used since to determine the age of a blaze on a tree.

On May 22, 1807, Mansfield wrote a lengthy report to Gallatin pertaining to the surveys in the Vincennes District and report that the surveys there had been performed by different surveyors in rough country; as the lines progressed the sections "had begun to be twisted from true squares to the figure of a "rombus" (rhombus, meaning a parallelogram, from Latin). To correct these errors, he had his best surveyor run another east-west baseline between townships 4 and 5 south from which the range lines were to be run south to the Ohio River. He went on to explain that due to sickness, lateness of season and other factors, this procedure was not entirely successful.

This second east and west line 24 miles south of the baseline was the first known use of a correction line, or what is now known as a "Standard Parallel." Mansfield's stated intent for using the procedure was to correct for both the accumulating distortion in the surveys and for the widening of the ranges due to convergency of meridians.

The report goes on to state that for the most part, the township corners had been made to coincide (they were com-

mon), the lines were all run with proper allowance for magnetic variation, and that a new baseline (standard parallel) should be run every 30 or 40 miles to correct for convergency of meridians. The report goes on to state in part:

> "As many entire sections and entire quarter sections have been laid off in each township, as could be made limiting the whole to 36 sections, and the division of the entire sections into quarters is made by placing the Quarter Section corners equidistant from the corners of the sections, so that the actual subdivision may be effected even by the purchasers of Quarters without any danger of interference.
>
> . . .
>
> The contents of the subdivisions could not be conveniently place on the map; but as the sections are generally of the legal quantity, or of 640 acres, I have thought it best to make out a list of those only which varied from this quantity, especially as the Quarters of the latter are generally unequal divisions of the whole section, and ought particularly to be noted; whereas those of the former are uniformly equal parts of an entire section, or 160 acres each."

From this wording it would appear that Mansfield was placing the excess or deficiency in the last half mile, going into the west and north boundaries of the township, and was trying to devise a simple method of platting, still showing the quantity in the fractional quarter sections, i.e., by making a list. This method was adopted and the plats of that period contained a list of the fractional parts of sections and their areas. The list method continued until 1832.

On May 8, 1806, Gallatin again wrote to Isaac Briggs, instructing him to start the rectangular surveys in the western part of the Orleans Territory. The following extract is from that letter:

> "You will use every possible endeavor to have as much of the public lands in the western district of the Territory of Orleans surveyed during this year as is practicable. It is the wish of the legislature that the public lands in that quarter should be offered for sale; and, I will add, that that object is intimately connected with the welfare, and even the safety of that newly acquired territory; for it is the only portion where any great increase of American population can take place, and I need not comment on the importance of this object. It may, indeed, in this instance be found necessary to sacrifice the scientific correctness which would otherwise be desirable to the dispatch which is indispensably necessary."

The letter again instructed Briggs to use the 31st parallel of latitude as the baseline west of the Mississippi River and a meridian line far enough west of the Mississippi that it would not be interfered with by the river. The baseline was to extend only as far west as the meridian of Natchitoches to prevent any interference with the Spanish claims of territory further west.

Gideon Fitz was the Principal Deputy of the Western District of Orleans so he may have entered into the contracts. At any rate, contracts were given to Deputy Surveyor John Cook for the baseline and Thomas Owings for the meridian, south from the baseline to the Gulf of Mexico. Cook began at Ellicott's line on the east bank of the Mississippi River, shot the line across, and began the survey of the Louisiana Baseline in late 1806. The first post was designated "48 mile," the next "47 mile" and so forth. The zero-mile post was 48 miles west of the river, which was reached in 1807. Cook ran the baseline west for 84 miles. Owings then began the meridian survey at the initial point and ran south. John Dinsmore, another deputy, began at the initial point and ran the meridian north for 86 miles.

During 1807, some 18 other deputies were at work and surveyed approximately 100 townships from the Cook, Owings, and Dinsmore lines. They immediately discovered gross errors in the Cook baseline and Owings meridian line. In 1808, extensive resurveys were done. The baseline was resurveyed east from the initial point. The length from the river was found to be only 47 miles and ended up approximately 1,200 yards north of where Cook had crossed the Mississippi River. Owings' work on the meridian line was just as bad; apparently Cook and Owings had taken literally the remark in Gallatin's letters that it might be "necessary to sacrifice the scientific correctness" in favor of speed.

It was many years and many thousands of dollars later before the mess created by Cook and Owings was straightened out, if it ever really was. In the 1873 Commissioner's Report, the problems created still had not been cleared up, and it is from that report where most of this information was obtained.

On March 30, 1807, Gallatin instructed Seth Pease, the new Surveyor of the Lands South of Tennessee, to begin the rectangular surveys in the Chickasaw Cession, in what is now Alabama. The baseline was to be the 35th parallel, the south boundary of the State of Tennessee. The initial point on the state boundary was at the vertex of a triangular-shaped tract in the cession. The records indicate that this initial point was established by Deputy Surveyor Thomas Freeman in late 1807. Freeman ran the Huntsville Meridian south. The baseline is the south boundary of Tennessee. All townships of the Huntsville Meridian system are numbered south, and east or west of the meridian.

The *Act of March 3, 1807,* 2 Stat. 445, again attempted to deal with the spurious marking of private land claims in the Orleans and Louisiana Territories. It also strictly prohibited squatting on the public lands and provided for the U.S. Marshal and even military force if necessary to remove squatters. Congress passed several antisquatter laws, none of which proved to be entirely effective. Squatting continued and Congress later in effect allowed it by passing selective preemption acts for the existing squatters, saying each time that the practice was thereafter prohibited, and then in a year or two, passing another limited preemption act.

The Years 1808-1812

During this period, no major advancements were made in the development of the rectangular system of land surveys. The Surveyors General, Principal Deputies and the field surveyors were engaged in extending the existing rectangular systems and surveying some Indian boundaries as cessions occurred. But a large percentage of their efforts went into surveying the private land claims. Congress enacted only a few laws during these years which affected the rectangular system and then only indirectly.

The *Act of February 3, 1809,* 2 Stat. 514, divided the Indiana Territory. The new Indiana Territory included the area which is now basically the State of Indiana. The new Illinois Territory included all the remaining public lands east of the Mississippi River, in what remained of the old "Northwest Territory."

The *Act of April 30, 1810,* 2 Stat. 590, provided for land sales and land office districts in Indiana Territory. Sec. 6 of the act directs that a tract of land in Illinois Territory on the Ohio River, including Shawneetown, be laid off into town lots, streets, and avenues under the direction of the Surveyor General. Minimum price of the town lots was to be $8 each, no more than two sections were to be subdivided, and the town lots were not to exceed one quarter acre each. This is the first known townsite fully surveyed by the Surveyor General. Mansfield had Shawneetown surveyed in 1810. This act put the government into the townsite survey business, which has continued on an intermittent basis up to the present time.

Thomas Freeman was appointed Surveyor of the Lands South of Tennessee by President Madison. His commission was forwarded to him by Gallatin on September 10, 1810.

The *Act of March 3, 1811,* 2 Stat. 662, was a deviation away from the rectangular system. It applied only to lands "adjacent to any river, lake, creek, bayou, or water course," in the Orleans Territory. The two principal deputy surveyors were authorized and instructed to lay out tracts along those waters with 58 poles frontage and 465 poles in depth. This deviation from the rectangular system of surveying and sale of public lands was in deference to the French settlers who opposed the regular rectangular system of surveys and wanted to buy land by their traditional method of five arpents frontage and 40 arpents depth, or 200-square arpens in area. This provision (Sec. 2) for deviation of the mode of surveying was extended by Sec. 5 of the act which allowed a limited preemption of an additional 40 arpents in depth to the rear of the confirmed French claims. The Surveyor of the Lands South of Tennessee, Thomas Freeman, at Washington, Mississippi, issued instructions for the survey of these tracts to his Principal Deputies in June 1811. Fig. 23 is a sketch indicating the general method to be used. The surveyors were to run lines at right angles to the general course of the water course, keep the side lines as nearly parallel as possible and vary their length to provide common corners, and avoid gaps or gores. The actual acreage in a tract would be given but it should be close to 200 arpens in area. The tracts were to be numbered consecutively from some prominent landmark or established corner of the rectangular net.

It isn't known how many of these "French Tracts" were surveyed in what is now the State of Louisiana; only an examination of the township plats in that state would reveal the number. The method did not appeal to the surveyors and did not become a widespread practice because of the extra planning involved and fragmentation of the sections in the rectangular system. Fig. 24 is a copy of T. 9 N., R. 10 E., Louisiana Meridian showing an actual situation. All the French Tracts and private land claims were given section numbers.

The *Act of February 20, 1811,* 2 Stat. 641, enabled the Orleans Territory to become the State of Louisiana. After formation of a government, that State was admitted to the Union April 30, 1812. The Surveyor of the Lands South of Tennessee and his principal deputies continued the surveys there.

Act of April 25, 1812, 2 Stat. 716

This act created a new government bureau within the Treasury Department called the General Land Office (GLO). The chief officer was called the Commissioner of the General Land Office "to superintend, execute, and perform all such acts and things, touching or respecting the public lands of the United States,. . ." A chief clerk was to be appointed who would take the place of the Commissioner in case that position became vacant. The Commissioner was to countersign patents and a multitude of other administrative duties. One flaw in the act was that it did not give clear authority to the Commissioner over the Surveyor General. Because of that omission, the Surveyors General would continue to operate in a semi-autonomous fashion for the next 25 years or more, making their own rules for the execution of the public land surveys, often only at the insistence of the Commissioner. But whatever it lacked, the act established a bureau responsible for the land surveys and sales, which Alexander Hamilton had suggested 22 years earlier. It also got the War Department and the State Department out of the land business.

THE PERIOD 1812 — 1836

Tiffin Takes Office

Edward Tiffin was appointed Commissioner of the GLO on May 7, 1812. Tiffin was born June 19, 1766, at Carlisle, England, and emigrated to Virginia in 1784. He studied medicine at Jefferson Medical College in Philadelphia and began his medical practice there. He moved to Chillicothe, Ohio, in 1798 and set up his medical practice, but in 1799, he was elected to the Territorial Legislature, and in 1803, was elected the first governor of the new State. After four years in that position, he accepted an appointment to serve in the U.S. Senate, which he resigned from in 1809 and returned to his medical practice. In 1812, President Madison persuaded him to take the appointment as the first Commissioner of the GLO.

Tiffin was confronted with the monumental task of organizing the new bureau and bringing order to the widely scattered and chaotic condition of land records, patents, plats, payments, and private land claims. He is credited with bringing all of the records together, as much as was possible, and getting them into a businesslike condition.

On *May 20, 1812,* 2 Stat. 741, Congress directed that the Surveyor General was to survey the western and northern boundary of the State of Ohio, the Indians permitting. This work was not attempted until 1815.

On *June 4, 1812,* 2 Stat. 743, Congress passed the act creating the Missouri Territory which was basically a name change. The new territory included all the lands in the original Louisiana Purchase of 1803, minus the new State of Louisiana.

The *Act of June 13, 1812,* 2 Stat. 748, directed that the principal deputy surveyor in the Missouri Territory was to survey the town lots in 11 different villages and towns in that territory, which included St. Louis and New Madrid. The expenses were to be paid by the government at $3 per mile.

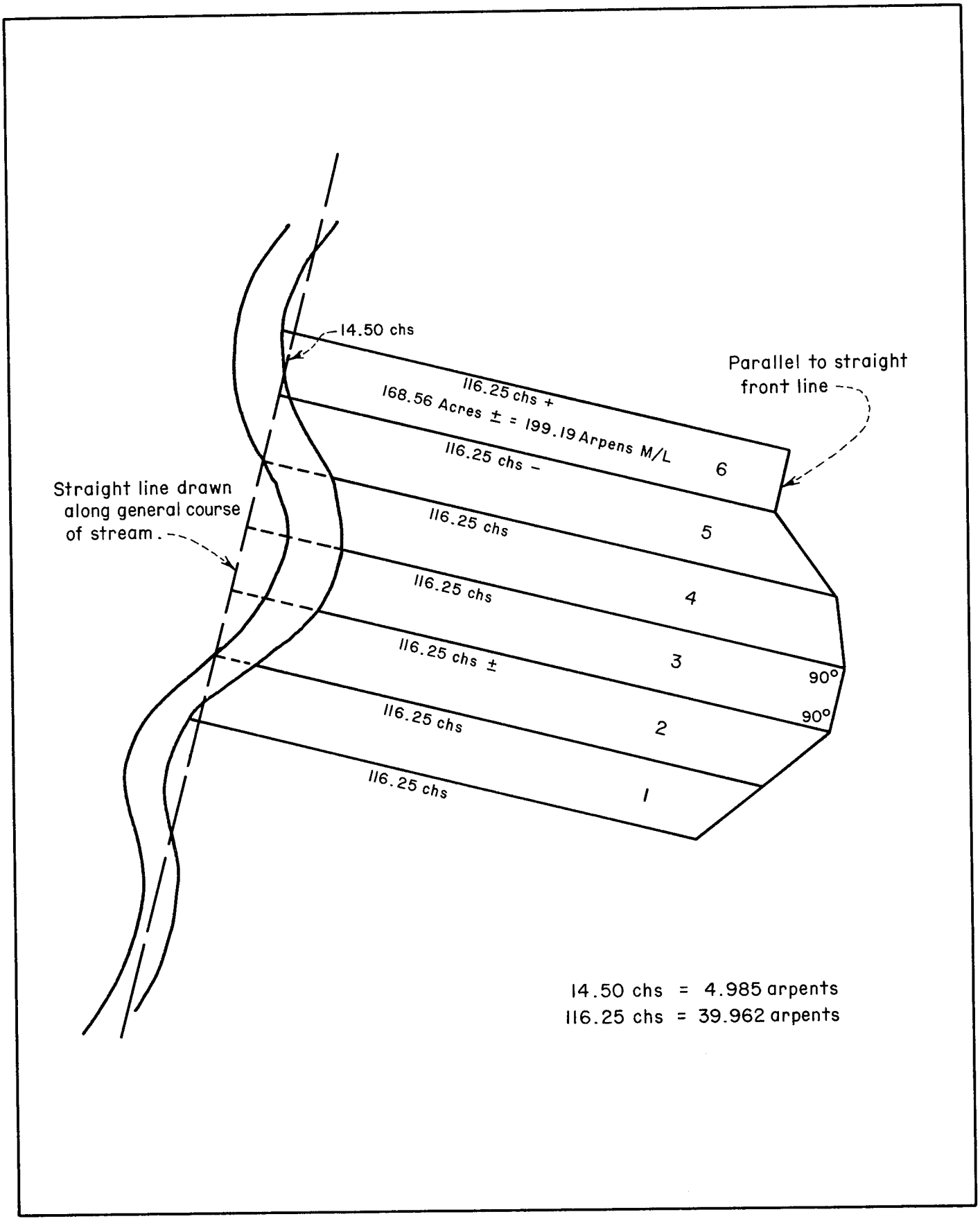


Figure 23. Instructions for Surveying Riverfront Tracts in Orleans Territory.

The principal deputy was also to survey into townships those lands in the territory on which the Indian title had been extinguished. This act thus expanded the rectangular surveys west of the Mississippi in addition to the limited expansion in Louisiana, but the rectangular surveys were not immediately expanded.

On June 12, 1812, Congress declared war with Great Britain, the War of 1812, which temporarily halted most surveying activities. During the next two years, the rectangular surveys were executed in Indiana and Illinois, and private land claims were surveyed but at a reduced rate.

Jared Mansfield accepted an appointment to return to West Point and the Corp of Engineers in the fall of 1812. John Mansfield, his nephew and clerk, had joined the Army so Mansfield hired a new clerk, James Tifson, to replace John on October 14, 1812. Mansfield put the Cincinnati office in order and left for New Haven, but became sick with fever on the journey. The Surveyor General position was vacant for about a month.

Josiah Meigs — Surveyor General

On November 24, 1812, Josiah Meigs was appointed Surveyor General of Ohio, Michigan, Illinois, Indiana, and Missiouri. Meigs was born August 21, 1757, at Middletown, Connecticut, and graduated from Yale in 1778. He then taught school and was admitted to the bar to practice law at New Haven, Connecticut, in 1784. He established a newspaper, the *New Haven Gazette,* and ardently supported Thomas Jefferson and the Federal Constitution. He was appointed professor of mathematics and natural philosophy in October 1794 and served in that capacity until his appointment as Surveyor General.

Meigs took office without benefit of a briefing by his predecessor Mansfield; he was thus uncertain of his duties and authority. He apparently continued the system set up by Mansfield of appointing district surveyors and appointing deputy surveyors under contracts at a fixed price per mile and in platting procedures.

Around August 20, 1813, Meigs appointed William Rector to replace Silas Bent as Principal Deputy in the Missouri Territory. Rector and his brother Nelson had executed many of the rectangular surveys in Indiana and Illinois. William Rector had established the Third Principal Meridian in 1805 and was a surveyor of excellent reputation. Rector immediately suggested establishing a fourth meridian in the Missouri country and he wanted to run the new meridian north from the mouth of the Arkansas River and the baseline west from the mouth of the Ohio River. He needed a rectangular net to tie in the many private land claims surveyed at St. Louis, New Madrid, and elsewhere in the region. Bent had no means of correlating these detached claims and Rector wanted them tied together, using the rectangular surveys for that purpose. Rector was not authorized to begin those surveys until 1815.

On August 24, 1814 the British captured Washington, D.C., and proceeded to burn the public buildings in the city. The GLO was housed in a frame building. Edward Tiffin foresaw the possibility of such action by the enemy and had his clerks and anyone he could muster remove the land office records and stash them in private homes around the city. When the British did burn the building, the records were saved.

The War of 1812 officially ended within a few months with the Treaty of Ghent on December 24, 1814, but for the next two years, the GLO was housed in private homes rented for office space. When a new building replace the old, it too was constructed of wood, just as flammable as the previous one.

Meigs and Tiffin Exchange Jobs

Tiffin wanted to return to Ohio and Meigs was not all that knowledgeable about land surveying. They got together and, with the approval of the Secretary of the Treasury, exchanged offices in the fall of 1814. Meigs was officially appointed Commissioner of the GLO on October 11, 1814; the physical exchange took place by November of that year. This exchange was to prove most fortunate; Tiffin would prove to be a superb Surveyor General, possibly outranking Mansfield in ability and capacity for the job. His first action was to move the office of Surveyor General to Chillicothe, Ohio, his home before going to Washington, D.C. Tiffin would remain Surveyor General for over 14 years, and the rectangular system of surveys would become quite fully developed during his tenure.

1815 — A Busy Year

On *February 4, 1815,* 3 Stat. 201, Congress directed that the lands one mile on each side of the road from the Connecticut Reserve to the Maumee River were to be surveyed parallel and at right angles to the road. Later in the year, Tiffin contracted to have those surveys executed but the Indians would not allow the surveyors to do the work. The lands were never surveyed in accordance with the act.

On *December 16, 1811,* a major earthquake struck the area around New Madrid in the Missouri Territory. Several major aftershocks followed, during 1812. Apparently, one aftershock hit New Madrid on November 10, 1812 and nearly destroyed the town. On *February 17, 1815*, 3 Stat. 211, Congress passed an act allowing any person whose lands had been damaged to take up public lands elsewhere in a like amount to that damaged. No one was allowed to take up more land than was already confirmed to him unless he held less than 160 acres, in which case he could take up to 160 acres; thus an owner of a small city lot in New Madrid could take 160 acres. The limit to any one person was 640 acres. The Principal Deputy Surveyor was to survey the lands claimed under this act, but there were no rectangular surveys as yet in the area, and the claimants could stake their claims wherever they wanted to. This act proved to be a monumental headache for Rector. It has been said that each city lot in New Madrid was parlayed into 160 acres and up to 640 acres in some cases. The New Madrid claims impeded progress of the rectangular surveys for many years to come.

Gallatin had reduced the national debt to about 80 million dollars but the War of 1812 had increased it to approximately 125 million. Congress had designated a large block of land northwest of Detroit to satisfy military warrants for the recent war. Congress again looked to the public lands as a source of revenue, but the lands had to be surveyed first. Expansion of the land surveys was a first order of business in Michigan, Illinois, and Missouri.

On March 9, 1815, Tiffin proposed to Meigs that the sur-

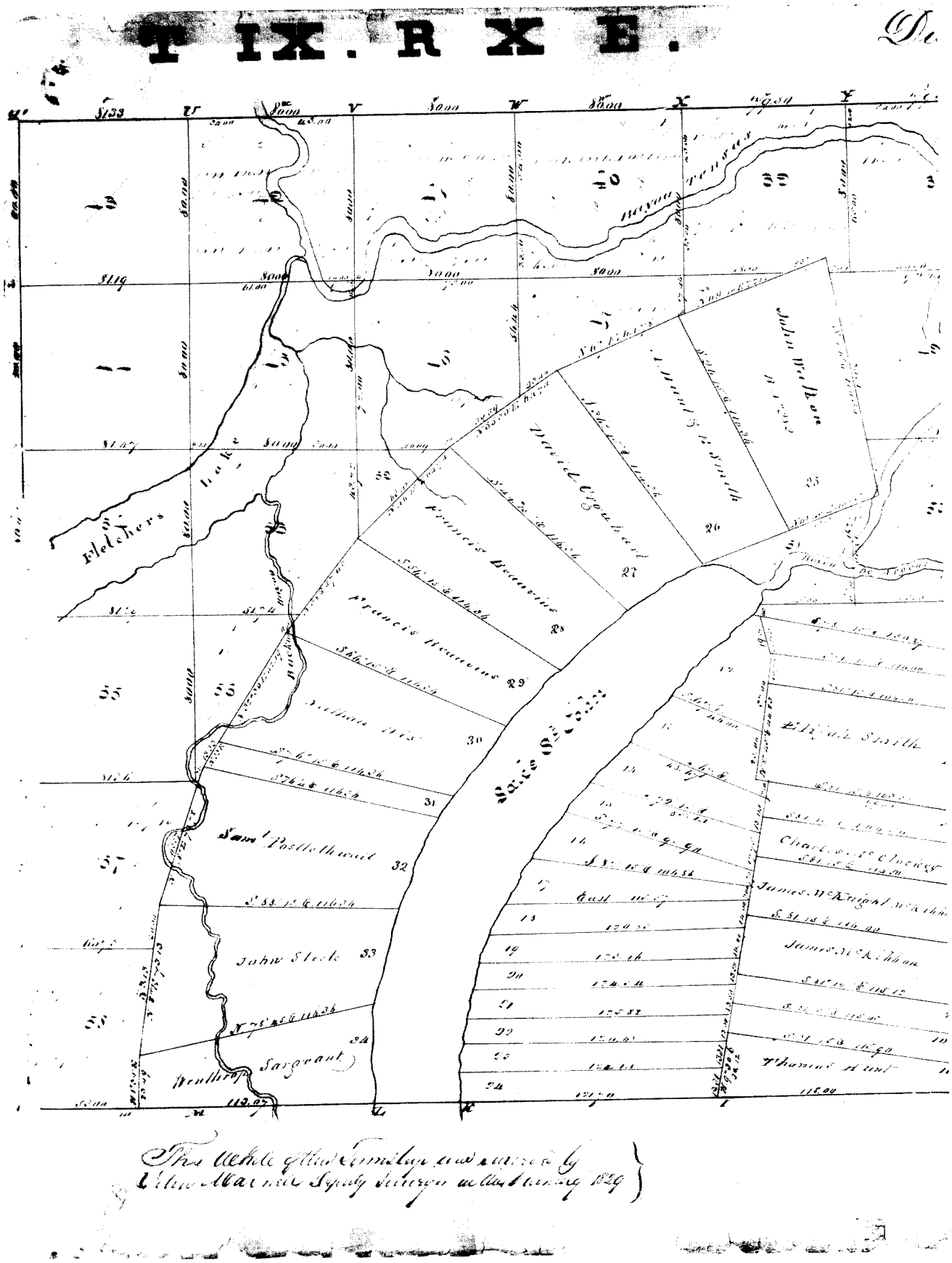
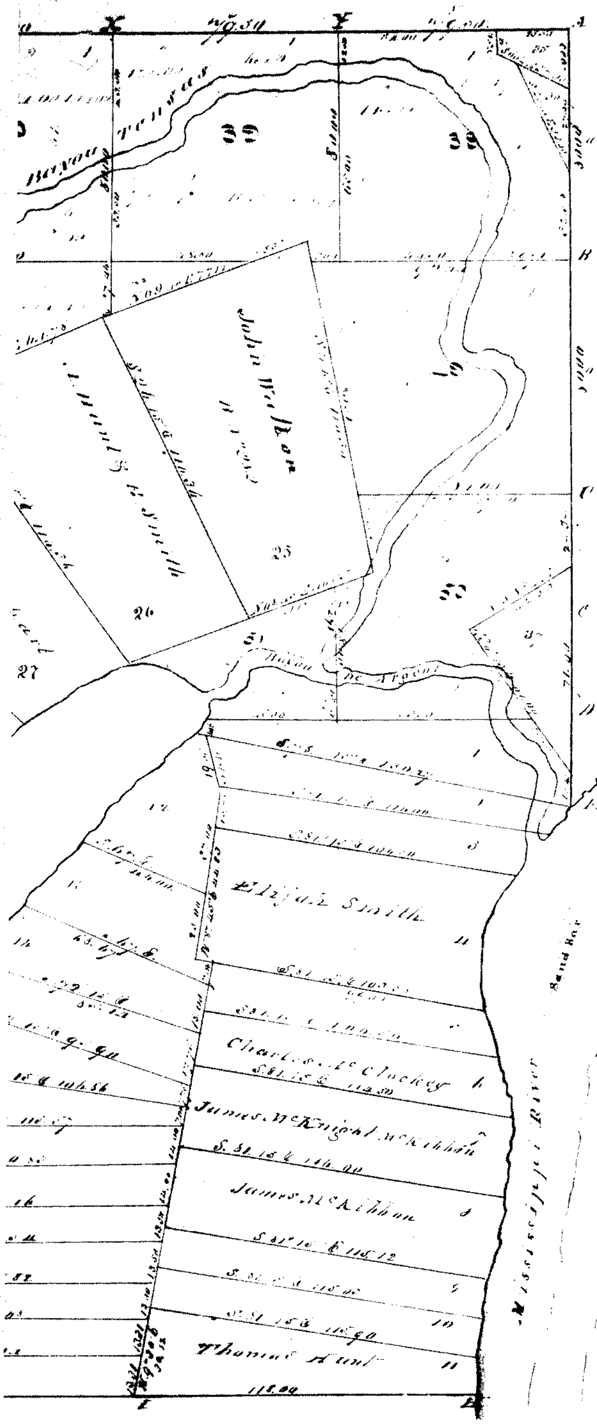


Figure 24. Louisiana Township with Waterfront Tracts.

District North of Red River Louisiana

LOUISIANA
N&E LA. MER.



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Sec	Acres	Sec	Acres	Sec	Acres
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]	143.0[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
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[illegible]	[illegible]	[illegible]	[illegible]		
	2316.94		5506.76		5243.70
					5506.76
					2316.94
					13067.40

Claimants		
[illegible]		[illegible]
[illegible]		[illegible]
James McKnight McKibban	[illegible]	[illegible]
Thomas Hunt	11	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Surveyor General's Office Washington [illegible]

[illegible]

Surveyor General's Office, Donaldsonville, March [illegible]
The above is a true copy of [illegible] Red River Louisiana [illegible] 25483 [illegible]

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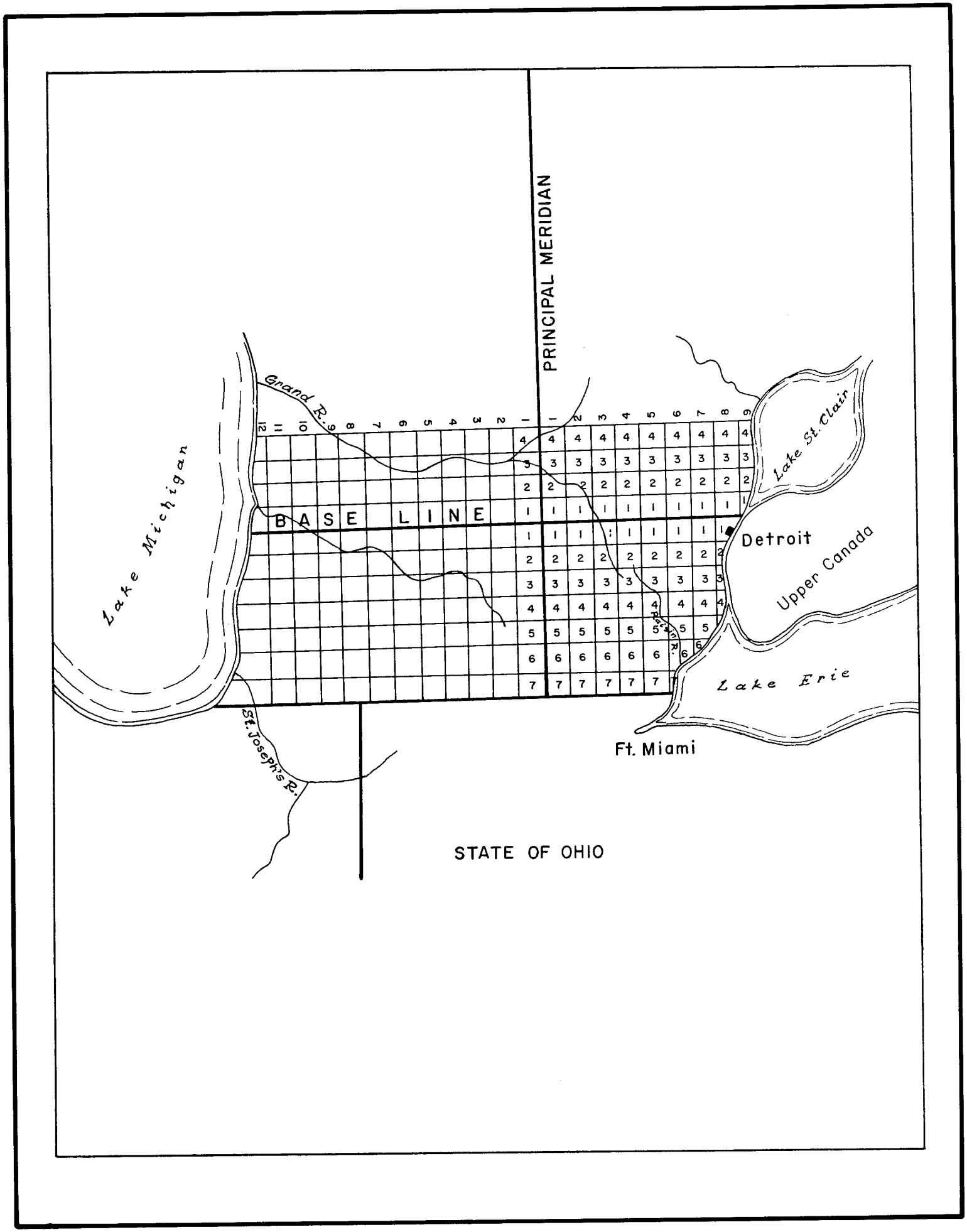


Figure 25. Plan for Surveys in Michigan Territory.

veys in Michigan be started immediately according to the plan shown in Fig. 25. The plan was nearly identical to one proposed by Mansfield earlier. Tiffin also proposed that the Third Principal Meridian in Illinois be extended north to the then Indian boundary, extended as a blank line without marking across the Indian lands until it crossed the Illinois River, then back into public lands and on north, numbering the townships continuously from the baseline, but a new baseline should be run west from the Illinois River. This plan is shown in Fig. 26, which also includes the proposal for Missouri. In Missouri, Tiffin proposed to have a baseline surveyed west from the confluence of the St. Francis and Mississippi Rivers to the Arkansas River, to number the ranges west from the beginning point, and to survey two million acres between the St. Francis and Arkansas Rivers. These two plans and their sketch (Fig. 26) indicate the very rudimentary knowledge available at that time of the positions of natural features in the territories.

Meigs did not comment on the Michigan plan and Tiffin took his silence as approval. But Meigs proposed that a Fourth Principal Meridian be run north from the mouth of the Illinois River, not knowing that it would remain east of the river for a long distance, and that a Fifth Principal Meridian be surveyed north from the mouth of the Arkansas River. Tiffin readily agreed to those proposals.

On April 18 and 28, 1815, Tiffin contracted with Alexander Holmes for the survey of the Michigan Baseline, with Benjamin Hough for the survey of the Michigan Meridian, and with each man to survey the exterior boundaries of four ranges of townships in Michigan.

By a treaty signed at Detroit on *November 17, 1807,* 7 Stat. 105, four Indian tribes had ceded lands north of the Maumee River and east of a line which extended due north from Fort Defiance in Ohio, which included lands around Detroit and much of the land in eastern Michigan.

The Michigan Meridian was run due north from Fort Defiance, and the baseline was surveyed due west from a point on Lake St. Clair. It isn't known why the baseline was begun at that point. The initial point of the Michigan Meridian was established where the two lines intersect. The surveys were begun in late May or early June 1815. Holmes and Hough each ran two parties, using assistance surveyors, and were paid $2.50 per mile. Tiffin contracted for the survey of 46 other townships in Michigan during the summer of 1815.

In May 1815, Tiffin let contracts for the survey of the Fourth Principal Meridian and Baseline in Illinois. Because of the swamps, flies, and fever, the surveys were not started until November 1, 1815. The meridian was begun at the confluence of the Mississippi and Illinois Rivers and run north on a "blank line" for some 72 miles until it crossed to the west side of the Illinois River. From that point, the meridian was run due north and the baseline due west to the Mississippi River. The field notes of the blank line were signed by J. Missinger, Enoch Moore, and J. Milton Moore, Deputy Surveyors, and indicate that the initial point was established November 12, 1815.

Had Tiffin and Meigs known the true course of the Illinois River, it is extremely doubtful that they would have used the mouth of that stream as a beginning point for the meridian. Tiffin contracted for the survey of 72 other townships, "north of the Illinois River," adjacent to that river and the Mississippi during the summer of 1815 and used the township surveys to determine the true course of those streams. Due to the lack of astronomic instruments and men to use them, the township surveys were recognized at a very early date as the best possible means of making accurate maps of the country. Tiffin used the tactic immediately by contracting for exterior township boundary surveys first and later letting contracts for the section lines.

On April 29, 1815, Thomas Freeman, Surveyor of the Lands South of Tennessee, wrote to Meigs concerning the surveys in the Natchez District of the Mississippi Territory. In a letter to Freeman dated March 13, 1815, Meigs was "astonished" to hear that the deputy surveyors had not marked bearing trees at the survey corners in approximately 30 townships. Isaac Briggs, the first Surveyor of the Lands South of Tennessee, had not instructed them to mark trees, only to set posts at the corners and to mark the post. The last portion of Freeman's letter follows:

> Extract from Mr. Briggs Instructions to his deputies whilst Superintending the Survey of the public lands south of Tennessee—
>
> "The lines must be carefully measured and *Well Marked* A Tree standing exactly in the Line, should have a Blaze & four Notches for a Township Line — a Blaze and three Notches for a Section Line on each side of it in the direction of the Line. All Trees within a short distance on each side of your Line should be simply Blazed on the side facing your line.—Plant a strong substantial post at every corner of a Township, and a smaller one at every mile.
>
> "The *West* side of each Township post, exhibits the Number of the Township—The *East* side, the number of Miles from the line of Demarcation—The *South* side The Number of Miles from the Basis-Meridian—and the *North* side—whether it be East or West of the said meridian—
>
> "The *East* side of of every post whether it be the corner Township or Section, exhibits the Number of Miles on the Meridian; and the south side the Number of Miles on the parallel of Latitude."
>
> From the above extract it appears that the numbering of sections in the field was not contemplated—which has arisen perhaps from the impossibility of correctly numbering the sections in a Township containing private claims, as the survey progresses.—Each private claim whether large or small has a separate Number, so that a Township may contain any number of sections from 10 to 100, which cannot be ascertained until the survey of the Township is completed, and a map of it made. The surveyor will then be compel'd, to retravel over his lines, with his map, and transfer the proper Sectional N° from it to the corner Trees, or posts, of sections—This is a severe duty which the surveyors complain of but it cannot be avoided.
>
> I fear I have extended this letter to a troublesome length on this subject not now very interesting"—
>
> I am very respectfully Sir your Ob Serv
>
> Tho Freeman

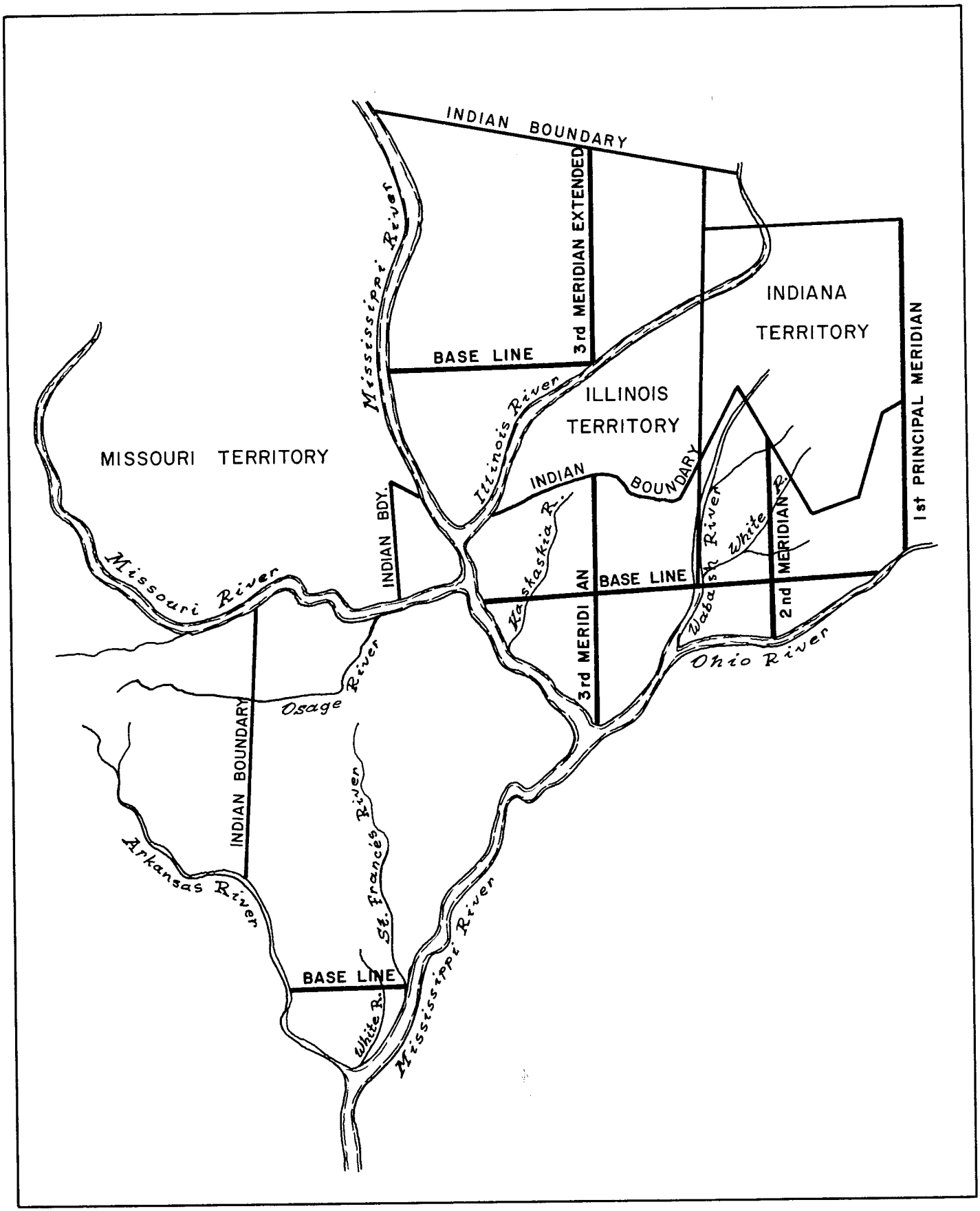


Figure 26. Tiffin's Plan for Meridians and Baselines in Missouri and Illinois.

The policy of identifying the private land claims as sections was unusual and unnecessary. It isn't known just how long that mode of identifying private claims continued. In the north, the claims were given numbers but separately identified from the rectangular sections. The lack of a definite policy and common instructions for all public land surveys was evident and needed correction. The problem and numbering method is shown in Figs. 27 and 28, copies of T. 7 N., R. 2 W., Washingtin Meridian, Mississippi, and T. 4 S., R. 1 W., St. Stephens Meridian, Alabama.

Tiffin's Instructions

General William Rector was the Principal Deputy in Missouri, with his office at St. Louis. He was under the supervision of Tiffin but was responsible for contracting and executing surveys in his territory. On July 26, 1815, Tiffin wrote to Meigs enclosing a copy of the instructions he had prepared for Rector's guidance. These instructions follow:

Instructions for General Rector Principal Deputy Surveyor for the Territory of Missouri

1st. You are required to have surveyed two million acres of land between the Rivers St. Francis, and Arkansas, which have been appropriated by an Act of Congress for Military bounties — (to which I refer you) — The annexed plan, on which these rivers are laid down with the lands lying between them in Ranges and Townships will show you the mode in which it is intended to have these surveys executed.

2nd. Let a standard line be accurately run from the confluence of the Arkansas with the Mississippi due north according to the true meridian so far, that a base line run due west from the mouth of the River St. Francis to the Mississippi will intersect it as laid down on the plan.

2d. Lay off the lands south of this base or east and west line into Ranges and Townships of six miles square by running the north and south lines according to the true merdian and the east and west lines at right angles as near as may be, down to the Rivers Mississippi and Arkansas, and number them both Ranges and Townships as exhibited on the plan.

3d. Let then Townships be subdivided as has been heretofore practiced into Sections, establishing corners for quarter sections corners in the usual mode.

4th. Furnish every surveyor you employ with one of the duplications enclosed, and see that both himself, his chain, and axemen are duly sworn before they proceed to work and return a copy of their sworn oaths to this office.

5th. Furnish every surveyor with a plan of the whole military district and a copy of the instructions enclosed, that each man may be able to comprehend the plan how the surveys are to be executed and know how to attend to his compass and chain, to mark his corners accurately and make his returns in a proper manner.

6th. When work is done and returned to your office, you are to check and see that it is done agreeable to law and the instructions given and return it certified to the Office of the Surveyor General to wit — a copy of the field notes of every Township or fractional Township, and two sets of plats and descriptions laid down on paper of a uniform size with an inch space on the margin, so that all the plats when finished may be bound in a book.

7th. You are furnished with a copy of a form of contract, so that you may enter into contracts with the deputies, assuring always to have a duplicate signed, one of which is to be returned to this office when entered into.

8th. All the surveys contracted for in the Michigan and Illinois Territories have been at 250 cents per mile. It is thoroughly expected you will be able to get the military lands done in Missouri at the same rate, but if as you suggested, this should be impracticable, you are authorized to give 3 dollars per mile, but only in case of necessity — being satisfied you will guard the interests of the United States from imposition, in as much as by doing so, you are advancing your own interests.

9th. When any deputy surveyor has finished his contract, made his returns to your office and is certified and returned to this office, the accounts will be paid off in such manner as may be most convenient of the Treasury Department—

Signed E T

This instruction is given here to illustrate the method and procedures that were in use at the time.

The *Instructions for Deputy Surveyors* written by Tiffin are given in the Appendix to this book. He sent a copy of them to Meigs, which Meigs acknowledged on August 3, 1815. Tiffin's instructions were much more complete than those by Mansfield in 1804 and they were issued to all surveyors under his authority. It is believed they were sent to the surveyors in Mississippi and Louisiana by Meigs and that they may have been used to guide the surveys south of Tennessee for a short period of time.

Rector was temporarily ill with the fever, and contracts for the survey of the Fifth Principal Meridian were delayed. On October 27, 1815, Deputy Surveyor Joseph C. Brown began the survey of the baseline at the confluence of the Mississippi and St. Francis Rivers and ran it due west. On the same date, Prospect C. Robbins began the survey of the meridian at the confluence of the Arkansas and Mississippi Rivers and ran it due north. Robbins intersected the baseline in the 58th mile, approximately 26 miles west of the Mississippi River, on November 10, 1815. There he established the initial point of the Fifth Principal Meridian, which controls the rectangular surveys in all of Arkansas, Missouri, Iowa, North Dakota, and in most of Minnesota and half of South Dakota.

One other letter should be mentioned here. The lakes in Michigan became a problem for Alexander Holmes; he requested instructions from Tiffin who passed it on to Meigs. Meigs replied on June 26, 1815, as follows;

"Your letter of the 16th conveying a letter from Mr. Holmes dated the 8th Ins't. is before me; in my opinion the lakes incountered by Mr. Holmes, of five or six miles

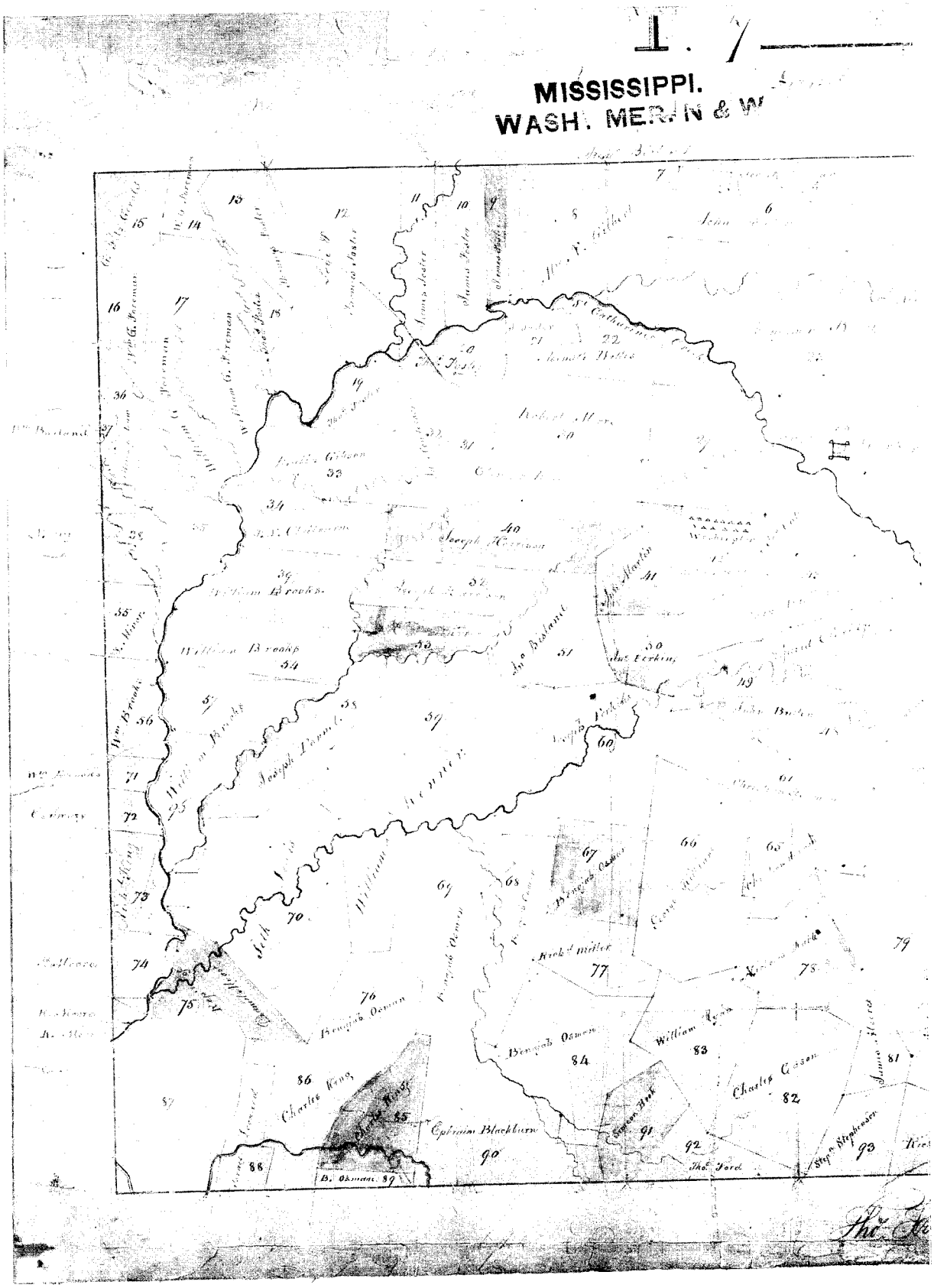
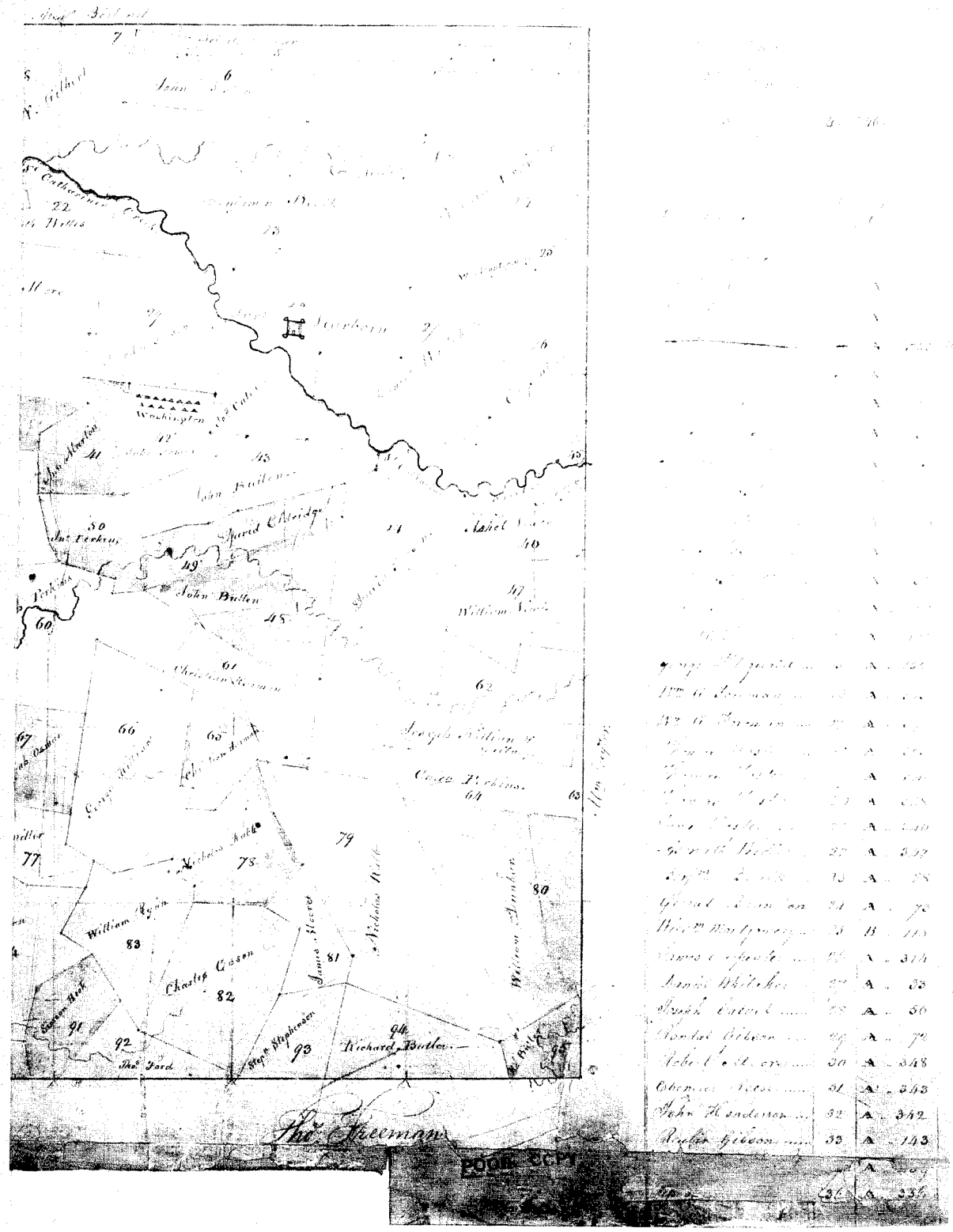


Figure 27. Mississippi Township with 95 Sections.

T. 7 — R. 2

SSISSIPPI.
H. MERIN & W



POOR COPY

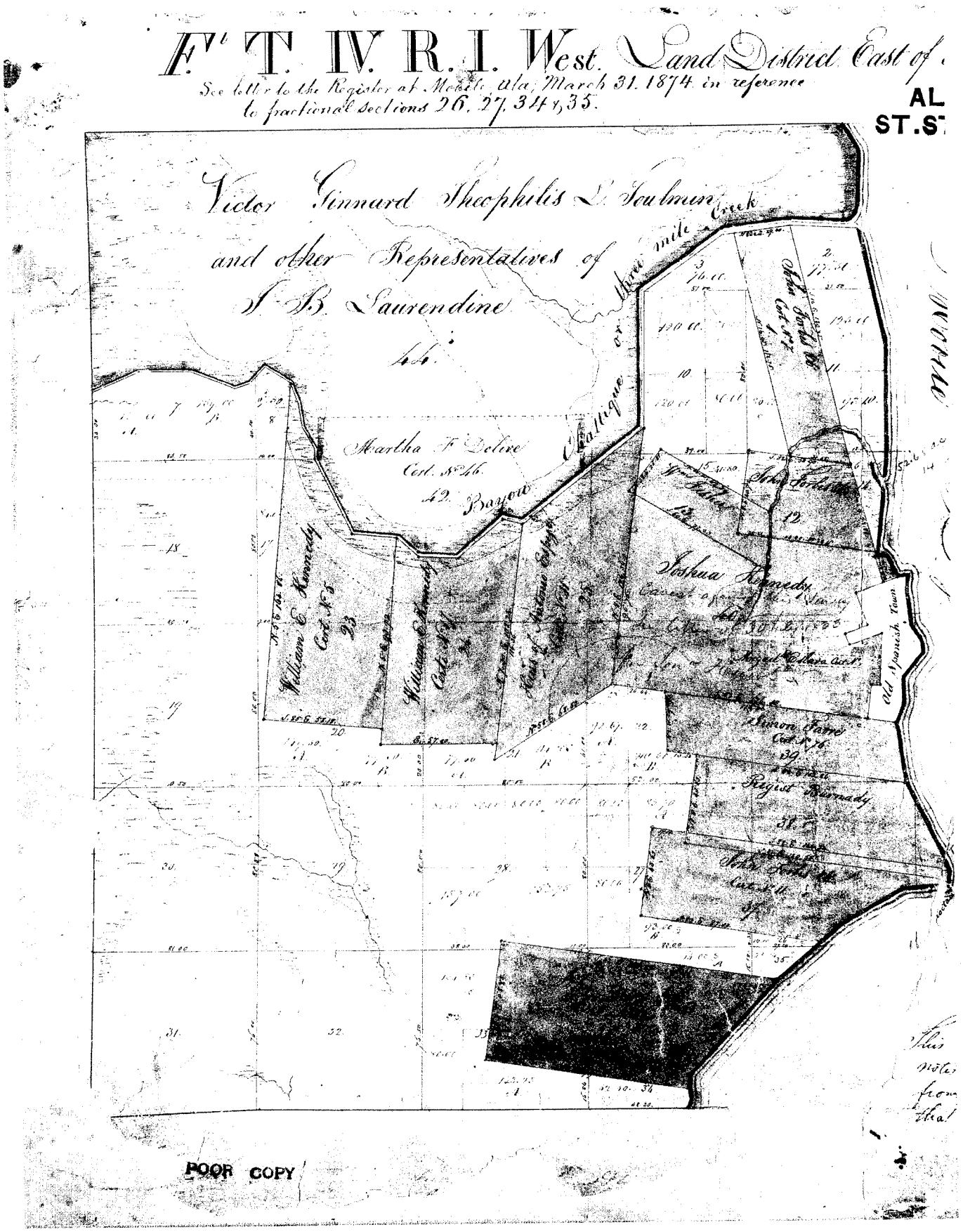
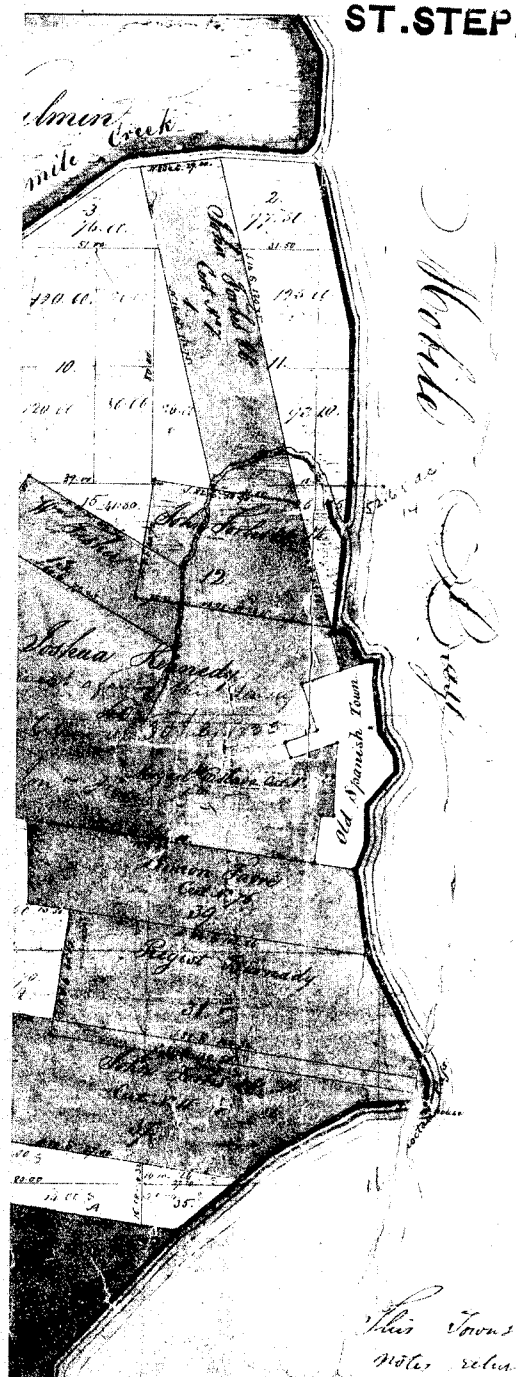


Figure 28. Alabama Township with Tract Numbers. Sections Retain Identity.

Land District East of the Island of New Orleans, & East of Pearl River.
1874 in reference

ALABAMA. S & W
ST. STEPHENS. MER.



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No. of Sec.	Contents	No. of Sec.	Contents
2	97. 50		3371. 32
3.	76. 00	26.	16. 10.
7.	315. 00	27.	338. 70.
8.	67. 50	28.	631. 75.
10	400. 00	29.	640. 00.
11. E.	218. 10	30	646. 00.
11. W.	86. 00	31.	628. 00.
14	52. 65	32.	610. 00.
15. E.	41. 80	33. N.	1. 10.
15. W.	5. 00	33. S.	358. 08.
17	84. 00	34. N.	64. 00.
18.	642. 00	34. S.	62. 40.
19.	642. 00	35.	28. 64.
20.	249. 00		
21.	191. 60		
22	203. 17		
	3371. 32	Total	7396. 09.

Claimants Name	No. of Section	No. of Certif.	Contents
John Forbes & Co.	1.	7.	342. 00
John Forbes & Co.	12.		243. 83.
William Fisher	13.		181. 31.
William E. Kennedy	23.	5	670. 70
William E. Kennedy	24.	17	583. 00.
Heirs of Antonio Espejo	25.	11.	644. 25.
John Forbes & Co.	36.	12	670. 00.
John Forbes & Co.	37.	11.	507. 75.
Regist Burnady	38.		507. 75.
Simon Favre	39.	76.	337. 50.
Joshua Kennedy	40.		923. 00.
Miguel Eslava	41.	15.	45. 06.
Martha F. Dolive	42.	46	642. 00.
William E. Kennedy	43.	7.	9. 10.
Victor Ginnard & Co.	44.		4789. 60.
		Total	11086. 85.

[illegible]

This Township has been protracted from the field notes returned to this Office, with the other papers from the principal Deputy Surveyors Office, after that office was abolished.

in circumference, should be meandered, and the adjacent lands returned as fractional."

Up to that time, lakes hadn't been meandered; they were included in the lands surveyed, except the Great Lakes, which were clearly navigable.

The Years 1816-1820

The *Appropriations Act of April 16, 1816,* 3 Stat. 277, provided funds for the survey of th Ohio-Michigan boundary, which had been authorized in 1812 but never executed. In the fall of 1816, Tiffin contracted with William Harris for the survey, which was done in the summer of 1817. The *Ohio Enabling Act* had described the line as due east from the southern extremity of Lake Michigan, but Ohio's constitution called for a line from the northern cape of Miami Bay to the southern end of Lake Michigan. Harris ran a random line due east from the south end of Lake Michigan to Lake Erie, intersecting that lake south of Miami Bay. He then ran back on a true line from the northern cape in Miami Bay on a bearing of S. 87° 42′ W., marking and monumenting the line in accordance with the Ohio constitution. Tiffin, the first governor of Ohio, naturally watched out of the State's interests. The governor of Michigan protested loudly to President Monroe who ordered a new survey. Tiffin then contracted with John A. Fulton at $5 per mile to survey a line due east from the south end of Lake Michigan (Harris' random line) until the line hit Lake Erie. Fulton surveyed and marked the line in 1818, but Congress did not approve either line. Tiffin later had the Michigan Meridian surveys closed against the Fulton or southerly line. The dispute wasn't resolved until 1836, long after the rectangular surveys were completed in the area. The northern or Harris line was finally adopted. In compensation for her loss, Michigan received the Upper Peninsula. The land between the Harris and Fulton lines became known as the "Toledo Strip."

On *April 19, 1816,* 3 Stat. 289, Congress passed the *Indiana Enabling Act.* That State formed a constitution and government and was admitted to the Union on December 11, 1816.

On *April 29, 1816,* 3 Stat. 325, Congress established the office of "surveyor of the lands of the United States in the territories of Illinois and Missouri," in other words, a Surveyor General for those two territories. The first Surveyor General was William Rector. It isn't known why Illinois was taken away from Tiffin, except that Rector was at St. Louis and therefore immediately adjacent to the surveys in Illinois and better able to supervise the surveys there. Rector had been well trained by Mansfield and Tiffin so was capable of handling the added work. It took Tiffin about two years to get all his contracts in Illinois settled and transfer the Illinois records to Rector.

The *Act of February 22, 1817,* 3 Stat. 346, provided that

> "from and after the first day of September next, the sections designated by number two, five, twenty, twenty-three, thirty and thirty-three, in each and every township of the public lands, . . . shall be offered for sale either in quarter sections, or half quarter sections, . . . and in the case of the division of a quarter section, the partition shall be by a line running due north and south, . . ."

Here again Congress used the term "by a line running due north and south." Since the half-quarter section line was not surveyed by the government it had slight effect on the Surveyors General. Tiffin followed the principle set down by Mansfield whenever he had to deal with a division line; i.e., set the one-sixteenth corners at midpoint and run a straight line to connect them, ignoring the due north-south statement in the law.

On *March 1, 1817,* 3 Stat. 348, Congress passed the *Mississippi Enabling Act,* with the boundaries of the new State described as they exist today. Mississippi was admitted to the Union on December 10, 1817.

On *March 3, 1817,* 3 Stat. 371, Congress created the Territory of Alabama, with boundaries as they are today, from what was left of the former Mississippi Territory.

On the same date, *March 3, 1817,* 3 Stat. 375, Congress enacted a law authorizing the appointment of a "Surveyor of the Lands of the United States in the *Mississippi Territory,* lying north of an east and west line, to be drawn from the river Mississippi, through Fort Williams, to the western boundary line of the state of Georgia—." This act is a perplexity because technically the Mississippi Territory now no longer existed except on paper. The previous two acts had split the territory north-south into a new State and the Territory of Alabama. It is believed that no Surveyor General was ever appointed under this act.

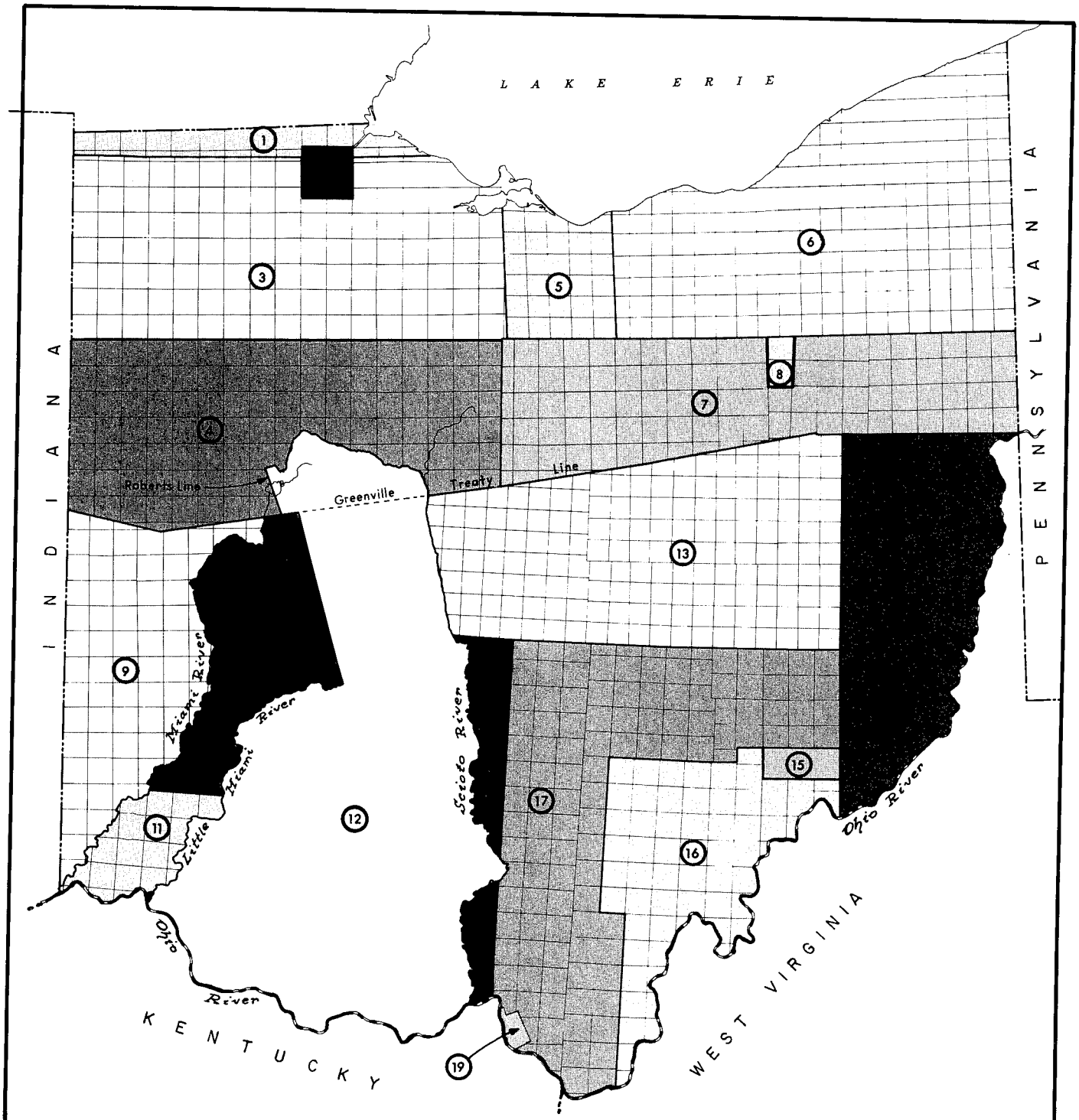
On March 17, 1817, Meigs forwarded a commission to John Coffee, appointing him Surveyor General "of the northern part of Mississippi Territory." Coffee established his office at Hunstville, Alabama; it was moved to Florence, Alabama, in 1823.

On *April 20, 1818,* 3 Stat. 466, Congress passed an act which states: "That the powers and duties of the surveyor of the lands in the northern part of the late Mississippi territory, shall extend to the whole of the Alabama territory, and that only." So the error made a year earlier was corrected. In Sec. 3 of this act, it states, "That all lands lying between the basis meridian, and the first standard meridian, in the Alabama district, be attached to the land district east of the Pearl River." That put some lands west of the St. Stephens Meridian, which were actually located in Alabama, in a land district in Mississippi instead of in Alabama. But the basis meridian referred to must have been the St. Stephens Meridian and the first standard meridian must have been what is now called a guide meridian. The term "standard meridian" had been used by Tiffin in the northwest territory to describe a principal meridian but guide meridians had not been used there as yet. The term "basis parallel" was being used in the south to describe a baseline.

On *March 2, 1819,* 3 Stat. 489, Congress passed the *Alabama Enabling Act,* which directed that the Surveyor of the Lands South of Tennessee (Freeman) and the Surveyor General of Alabama (Coffee) were to survey the boundary between Alabama and Mississippi. This state boundary was surveyed in 1820, the northern part by contract with Coffee and the southern part by contract with Freeman.

Also on *March 2, 1819,* 3 Stat. 493, Congress created the Territory of Arkansas, which included most of what is now Oklahoma, and began the process of dividing the vast Missouri Territory into separate states.

Through treaties with the Indians at Fort Meigs, September 29, 1817, and at St. Mary's, Ohio, in September and



1. Michigan Meridian Surveys
2. Twelve Mile Reserve
3. North and East of First Principal Meridian
4. South and East of First Principal Meridian
5. Firelands
6. Connecticut Western Reserve
7. Ohio River Base
8. Muskingum River Base
9. East of the First Meridian
10. Between the Miamis
11. Symmes Purchase
12. Virginia Military Reserve
13. U.S. Military Reserve
14. Original Seven Ranges
15. Donation Tract
16. Ohio Company Purchase
17. East of the Scioto
18. Scioto River Base
19. French Grants

Figure 29. Original Ohio Land Subdivisions

October 1818, the United States acquired title to nearly all the lands in northern Indiana and northwestern Ohio. These lands were ordered surveyed. On March 20, 1819, Tiffin submitted to Meigs his plans and proposals for these surveys. The plan for northwestern Ohio was simple enough: run a baseline due west from the southwest corner of the Connecticut Reserve to the west boundary of the state, surveyed by Harris in 1817, which was already known as the First Principal Meridian. Return east on this line setting the quarter section, section and township corners, numbering the ranges east from the meridian. Survey the range lines north and south from the baseline, numbering the townships north and south from that line, closing the lines against the old surveys, and against the Michigan state boundary to the north. Tiffin asked Meigs which state boundary, by Harris or by Fulton, he should use. By a letter dated April 3, 1819, Meigs ordered that the Fulton line be used and the surveys were closed against the southerly line. The plan was accepted and Tiffin contracted for the surveys, completing almost all the townships in northwestern Ohio during 1819 and 1820. They are all numbered east from the state boundary and north and south from the baseline, except for the four townships in the old Twelve-Mile Square, previously surveyed. Fig. 29 indicates the complete system of surveys as finally completed in Ohio.

Tiffin's plan for Indiana was slightly different in some important aspects. The Indiana plan follows:

> Plan for surveying the United States land in *State of Indiana* purchased from the Indians by the Treaty of St. Marys in 1818 —
>
> First lay off the Indian reservations in conformity with the Treaty. Then, in consequence of the approximation of the Range lines, which have been run north from the Base line connected with the second principal meridian, the width of most of the ranges has been considerably diminished at their northern extremity, by continuing these range lines through the purchase. This diminution in the width of the ranges will be much increased so as to contravene that provision of the land laws of the United States, which requires that townships be made *"Six Miles Square"*. To alleviate this difficulty, and to comply as nearly as practicable with the provision of the law, it is proposed, after continuing the *"Second Meridian"* to the northern limit of the purchase to run a *line of correction* from the meridian due East and West, between Townships *Sixteen* and *Seventeen* to be continued west to the state line between Indiana and Illinois and east to the SE corner of Township No. 17 N Range 11 E. — the Township corners on this line of correction will be placed at the distance of six miles from each other; and from these corners the range lines will be continued through that part of the purchase lying north of them. The Range lines of the old surveys will be continued through that part of the purchase lying south of the correction line and closed on said line wherever they may intersect it.
>
> In consequence of the old surveys in the eastern side of the state, extending north of the proposed line of correction, it will be necessary to run that part of this line which lies east of the 11th Range E. between Townships No. 22 and 23 to the Eastern line of the State of Indiana founded upon the *Baseline* and the *second principal meridian,* will be, of course ultimately extended into all of the unsurveyed lands in that State; as the simplest and most convenient system that can be devised. But before the surveys can be closed to the western boundary of the state, it will be necessary that, that line be surveyed; as it constitutes the western limit of the surveying department assigned to the Surveyor General of the United States.
>
> Should there be any other additional surveys decided to be made in Michigan Territory, south of the district lately surveyed there — It is proposed to continue the system already adopted for that Territory, and close the surveys there upon the north boundary of Ohio.
>
> Plan annexed
> Edward Tiffin, S.Gl.

Tiffin's plan was fully adopted, except that of closing the Second Principal Meridian surveys against the west boundary of Indiana. That omission proved troublesome and costly, which will be seen later. But most importantly, this is the first known use of the term "correction line" and its use to correct for convergency of meridians. Mansfield had used a correction line of sorts south of the baseline but its primary purpose was to correct errors due to poorly executed surveys. The term "correction line" took hold, and it is still used by most of the population in the public land States to describe what we now call a standard parallel. The principle of using a correction line to correct for convergency caught on and was used thereafter in the rectangular system, but it would not be until 1851 that a prescribed distance between correction lines would come about. Each Surveyor General used distances of from 48 to 60 miles depending on his opinion of necessity.

Before leaving the year 1819, one other act of Congress should be mentioned. On *March 3, 1819,* 3 Stat. 523, Congress directed President Monroe to take possession of Florida and establish a government there, in accordance with the Treaty with Spain concluded February 22, 1819; which added a large and troublesome area to the public lands requiring survey. The territorial government was actually established *March 30, 1822,* 3 Stat. 654. But on March 20, 1819, Meigs wrote to Thomas Freeman, the Surveyor General at Washington, Mississippi, instructing him to begin the rectangular surveys in the former Spanish possession. On September 15, 1819, Freeman issued instructions to Silas Dinsmore, Principal Deputy Surveyor of the new land district east of the island of New Orleans, for the survey of what is now known as the St. Helena Meridian. Freeman instructed Dinsmore to use the initial point of the Washington Meridian, on the Line of Demarcation (31st parallel) and extend the Basis Meridian due south, and to survey "Standard Meridians" and "Standard Parallels" at 24 mile intervals to control the township boundaries within the system. The township and section lines were to be surveyed south, placing the errors in either section 31 or section 36, which was the reverse order from the normal procedure. This was the first full use of the term "Standard Parallel". The "Standard Meridian" is now known as a Guide Meridian. The 24

mile interval between them was not universally adopted until 1855. The instructions to Dinsmore are given in the Appendix. The St. Helena Meridian surveys were begun in 1819 and the survey of west Florida was underway. The United States had claimed but did not have undisputed title to the area until the Treaty with Spain. All valid land claims (private claims) under the former government were honored.

On *March 6, 1820,* 3 Stat. 545, Congress passed the *Missouri Enabling Act.* The boundaries of the new State were approximately as they are today. The remainder of the Missouri Territory continued to bear that name, even after the State of Missouri was admitted on August 10, 1821. The Surveyor General of Illinois, Missouri, and Arkansas would be in charge of all the lands north of the State of Louisiana in the old Louisiana Purchase.

On *April 24, 1820,* 3 Stat. 566, Congress took a giant step forward regarding the public lands—they abolished the credit system of purchase, reduced the price to $1.25 per acre (down from $2) and offered all the nonreserved public lands for sale in 80-acre, half-quarter sections. The first section of the act affected the Surveyors General the most. The entire section follows:

> CHAP. LI—An act making further provision for the sale of public lands.
>
> Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, That from and after the first day of July next, all the public lands of the United States, the sale of which is, or may be authorized by law, shall, when offered at public sale, to the highest bidder, be offered in half quarter sections; and when offered at private sale, may be purchased, at the option of the purchaser, either in entire sections, half sections, quarter sections, or half quarter sections; and in every case of the division of a quarter section, the line for the *division thereof shall run north and south,* and the corners and contents of half quarter sections which may thereafter be sold, shall be ascertained in the manner, and on the principles directed and prescribed by the second section of an act entitled, "An act concerning the mode of surveying the public lands of the United States," passed on the eleventh day of February, eighteen hundred and five; *and fractional sections, containing one hundred and sixty acres, or upwards, shall,* in a like manner, *as nearly as practicable, be sub-divided into half quarter sections,* under such rules and regulations as may be prescribed by the Secretary of Treasury; but fractional sections, containing less than one hundred and sixty aces, shall not be divided, but shall be sold entire: Provided, That this section shall not be construed to alter any special provision made by law for the sale of land in town lots.

Of particular note are the *emphasized* portions of the act. The due north and south provision of previous acts was dropped, which made into law the practice of the Surveyor General ignoring the due wording as being impossible. Also, fractional sections were to be subdivided into quarters and eighties if they contained more than 160 acres. The act left it up to the Secretary to prescribe the manner of subdividing quarter sections along the north and west boundaries and along meander lines.

The abolition of credit was necessary as an administrative matter. Purchasers were bidding high prices for land (in the cotton plantation country of the South, reportedly as high as $18 per acre in 1818), making the down payment and perhaps one or two other payments, and then failing to pay the balance. The GLO was in the mortgage banking business and didn't want to be. Lands not paid for reverted to the government and could be offered for sale again.

The whole system was a massive headache. Congress later enacted special legislation relieving the purchasers who couldn't pay, which affected the Surveyors General, and will be discussed shortly.

Tiffin's Last Years, 1820-1829

On June 10, 1820, the Secretary of the Treasury, through Meigs, issued a circular of instructions to the Surveyors General, directing them to protract on the plats the 80-acre subdivision in all the fractional sections according to the *Act of April 24.* Tiffin remarked that this was a lot of work but apparently proceeded to protract all the half-quarter sections lying north and south in the fractional sections, including the sections along the north and west boundaries of the townships. The work took a long time because of the volume. Tiffin did not have actual lines of protraction placed on the plats, instead the areas of the half-quarter sections and remaining fractions were listed on the margin of the plats.

Whatever it was that Tiffin did, it was not acceptable. On November 9, 1821, Meigs issued a *Circular to the Surveyors-General* which read:

> "Sir: By the first section of the act of April 24, 1820, all the public lands of the United States shall be offered at *Public Sale* in half-quarter sections; and *fractional* sections containing one hundred and sixty acres or upward shall, as nearly as practicable, be divided into half quarter sections, under such rules and regulations as may be prescribed by the Secretary of the Treasury; but fractional sections containing less than one hundred and sixty acres shall not be divided, etc. By the Act of May 10, 1800, Sec. 3, the excess or deficiency of regular sections or quarter sections in any township is to be thrown on the North and West sides of the township, making fractional sections more or less than one hundred and sixty acres. In subdividing such fractional sections to form a half quarter section, viz., 80 acres, the Secretary of the Treasury directs that the subdivisional line for such fractions as lie on the *North* side of a township shall be an *East* and *West* line, forming the half quarter section on the *South* side of the fraction; and for such fractions as lie on the *West* side, the subdividing line shall be a *meridian,* forming the half quarter section on the *East* side of the fraction. This mode of subdivision will preserve the compactness of the tracts, with the general divisions, and will not interfere with the rule adopted relative to fractions formed by a stream, river, etc."

The following postscript was added to the copy sent to Rector in St. Louis:

"P.S. to Gen'l Rector

This mode of subdividing is precisely the one adopted by yourself, but as it has not heretofore been generally adopted the object of this circular you will preceive is to approve of your plan and make it a general one."

It is unknown what "the rule adopted relative to fractions formed by a stream, a river, etc." was. An 1825 plat, approved by Tiffin, divided the sections along the north and west boundaries as described in the quoted circular. The township also contained lakes (discussed later). Fig. 30 is a sketch of a portion of the township. Lot numbers were not used. The areas of the fractional parts of a section were listed on the margin of the plat, such as; the N ½ NE ¼ Sec. 3, 74.52 acres; N ½ NW ¼ Sec. 4, 76.94 acres; SW ¼ Sec. 9, 106.25 acres; E ½ NE ¼ Sec. 9, 93.11 acres (even though the fraction was also a part of the SE ¼, Sec. 9); W ½, Sec. 27, 320 acres, and so on. The dashed lines and areas shown in the sketch were not shown on the plat. Fractional parts along the west side of the township were listed in the same manner as that used for Secs. 1 through 5.

In January 1821, Meigs directed the Surveyor General at Washington, Mississippi (Freeman), to begin the surveys in the recent Choctaw cession. They were to begin on the south boundary of that cession and extend northerly. The field notes indicate that the initial point of the Choctaw Meridian and Baseline in Mississippi was established in 1821. The exterior boundaries of T. 1 N., R. 1 W., were surveyed by Charles M. Lawson, Deputy Surveyor, and the subdivisional lines of that township were surveyed by Gideon Fitz, Deputy Surveyor. The notes were examined and approved, on September 30, 1822, by Levin Wailes, "Surveyor of the United States Lands South of Tennessee." Thomas Freeman was in charge when the surveys were begun in 1821. Levin Wailes was appointed to the position by letter dated January 10, 1822.

On *March 2, 1821,* 3 Stat. 612, Congress passed an act granting relief to credit purchasers who hadn't paid for all the land they had bought. The first section of the act follows:

CHAP XII.—An act for the relief of the purchasers of public lands prior to the first day of July, eighteen hundred and twenty (b)

Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, That in all cases where lands have been purchased from the United States, prior to the first day of July, eighteen hundred and twenty, it shall be lawful for any such purchaser, or other person or persons, being the legal holder of any certificate or certificates of land, on or before the thirtieth day of September, eighteen hundred and twenty-one, to file, with the register of the land office, where any tract of land has been purchased, a relinquishment, in writing, of any section, half section, quarter section, half quarter section, or legal subdivision of any fractional section, of land so purchased, upon which the whole purchase money has not been paid, and all sums paid on account of the part relinquished, shall be applied to the discharge of any installments which may be, or shall hereafter become, due and payable upon such lands, so purchased, as shall not have been relinquished, and shall be so applied and credited as to complete the payment on some one or more half-quarter sections where the payments by transfer are sufficient for that purpose: Provided, That all divisions and subdivisions, contemplated by this act, shall be made in conformity with the first section of an act making further provision for the sale of public lands, passed the twenty-fourth day of April, one thousand eight hundred and twenty: And, provided also, That the right of relinquishment hereby given shall, in no case, authorize the party relinquishing to claim any repayment from the United States: And, provided, also, That where any purchaser has purchased, at the same time, two or more quarter sections, he shall not be permitted to relinquish less than a quarter section.

The act seems clear enough—only units of either a full section, half section, quarter section, half-quarter section or legal subdivision of a fractional section (the fractional parts left after full half-quarter sections have been removed) could be relinquished. The problem was that the purchasers wanted to retain all the land they had paid for at $2 per acre and some Registers of the Land Offices went along with them. In December 1822, Tiffin received a request from the Register at Vincennes to prepare plats with lot numbers on fractional sections along the Wabash and Ohio Rivers, in T. 7 S., R. 14 W., Second Principal Meridian. The Register had accepted relinquishments on tracts, NOT by legal subdivision. Fig. 31 indicates the problem as shown in sketches prepared by Samuel Williams, Tiffin's chief clerk, on December 12, 1822.

Although Tiffin protested the action of the Register in making what he considered illegal relinquishments, and by law he was right, he had to prepare what are now called Supplemental Plats for all the sections where such relinquishments took place. Some plats had been prepared earlier on the preemption tracts in the Between the Miami Rivers townships north of the Symmes Purchase, in which lot or tract numbers had been used to designate areas not in conformity with regular section subdivisions. And, of course, private land claims had separate numbers to define them and their areas. But the relinquishment tracts were on sections already surveyed and protracted in a regular and legal manner. Tiffin had to change them to a different lotting, which is just what a supplemental plat does today. Fig. 32 is a sketch of three different sections which show lotting and lot numbers required because of relinquishments. Apparently only those sections containing improper relinquishments were lotted in this manner. In those sections containing proper relinquishments, the lots were not numbered.

It was about this time that the Surveyors General were ordered to prepare all the plats instead of the deputy surveyors doing it. Platting had become too complex to be left up to the field surveyors.

The *Act of May 8, 1822,* 3 Stat. 709, authorized the appointment of a Surveyor General for Florida but failed to provide funding. On July 9, 1824, Robert Butler was appointed to the position and established the office at Tallahassee. The *Appropriation Act of February 25, 1825,* 4 Stat. 85, provided regular funds for the office, which were continued thereafter.

On September 11, 1822, John McLean became the Com-

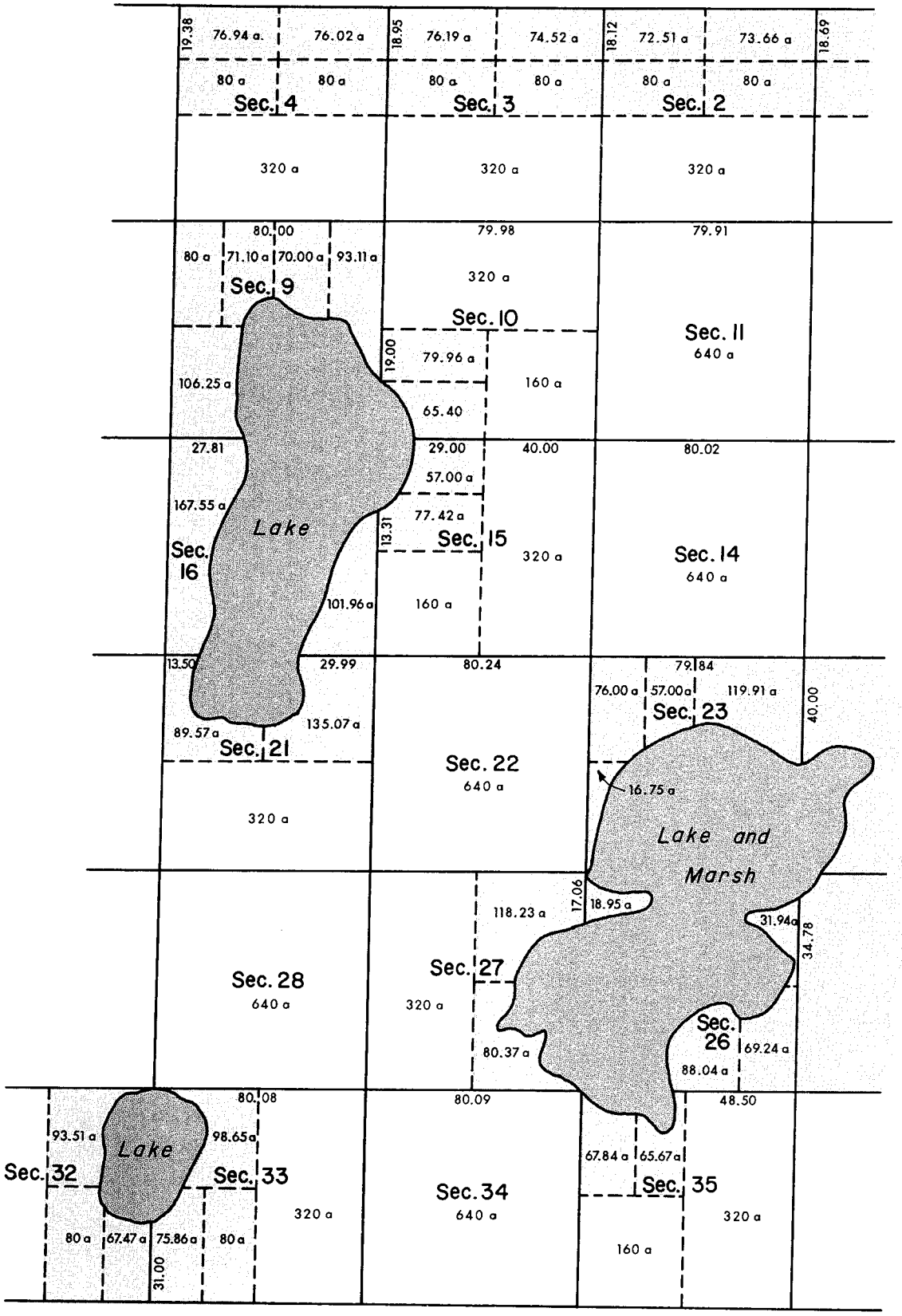
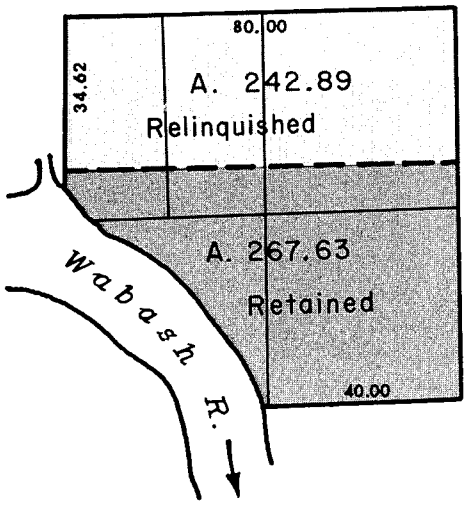


Figure 30. "Lottings" in a Michigan Township, Circa 1825.

FRAC'L SEC. No. 17, TOWNSHIP No. 7 S., RANGE No. 14 W.



FRAC'L SEC. No. 36, TOWNSHIP No. 7 S., RANGE No. 14 W.

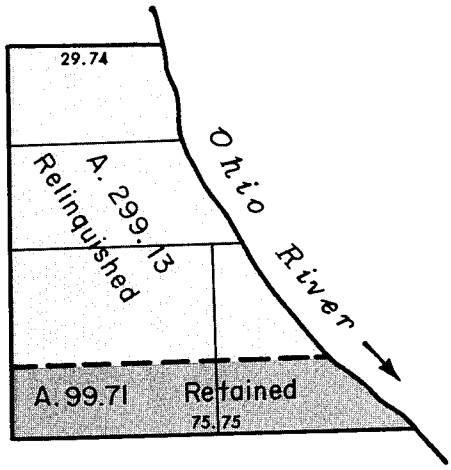


Figure 31. Improper Relinquishments in Indiana.

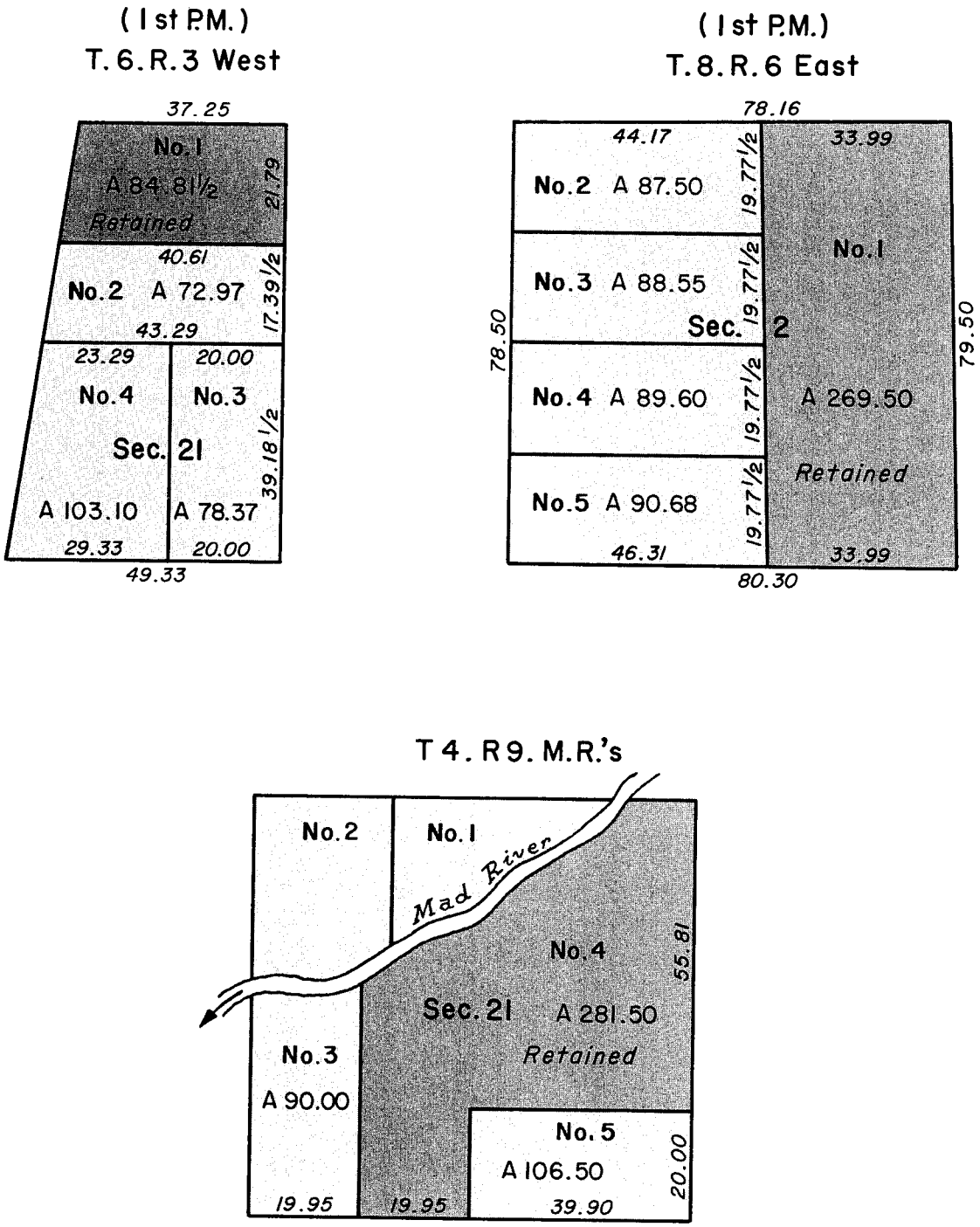


Figure 32. "Supplemental" Plats of Sections Containing Relinquished Lands — 1824.

missioner of the GLO, replacing Meigs, but retained the office for only a few months. Continuity in the business of the GLO was maintained by the chief clerk, John Moore. Two men, who were not surveyors, maintained the regular order of business in the Surveyor General's office and in the GLO for many years. Tiffin had hired Samuel Williams as his chief clerk who remained in that position until 1845. Josiah Meigs hired John Moore, who was chief clerk until about 1850 and who wrote the first *Manuals of Surveying Instructions*. George Graham replaced McLean as Commissioner of the GLO on June 26, 1823.

In *Circulars to the Surveyors General* dated August 4, and August 14, 1823, Graham ordered that a listing be made at the bottom of each plat showing the township, range, date of survey, number of miles surveyed, number of fractional sections caused by private land claims and navigable rivers, and the name of the Deputy Surveyor who did the work. This information was to be within ruled lines of columns and boxes. The response was gradual and it was not until the 1830's that these circulars were complied with; the practice continued until about 1946.

On August 15, 1823, Graham wrote the following letter to Wailes at Washington, Mississippi:

Levin Wailes, Esq. August 15, 1823
Washington, Miss.

Sir: Your letter of the 19th ult. transmitting Cert's of the Commissioners for the Dist. West of the Pearl R. on claims confirmed, markd B.N. and 170 together with a copy of the plat of Township No. 14, R. 5 East in the Choctaw D. West of the Pearl R. districts, have been received.

In relation to the falsity of the survey of fract. Township 14 of Range 5 E. I have not the means of comparison by reference to the original survey as I find it was among those returned to you for further examination on 26th May last.

I find that under the original survey the fractional township alluded to the two fractional sections No. 1 and 2. have been sold and one of them completely paid for—.

Fraction No. 1. cont'g 370 acres was sold to Jas. McKee on the 28 Aug't 1816 and had been placed on further Credit under the Act of 2d March 1821 for the relief of the purchasers of Public Lands.

Fraction No. 2. cont'g 440 acres was sold to Isham Arthur, on the 16 Oct. 1816 and had been completely paid for under the provisions of the above cited act. No patent has however yet been issued on the latter tract. As there has evidently been a fraud committed on the Gov't by the Deputy Surveyor who surveyed the Township originally, and the purchasers of the two fractions created by the *Supposed* course of the Big Black River may set up a pretended claim to the Land contained in what will now be the fractions agreeably to the resurvey extended by the river. I am desirous, if possible, of ascertaining what are the views of the purchasers as to the boundaries of the fractions on the South side at the time of purchase—. Were they aware that the Big Black River was considerably North of the position as laid down in the original false Survey and did they suppose from the circumstances that the purchase of what were represented to be the quantities contained in those fractions would give them any title to all of the Land as represented by the actual Survey? If you can conveniently have access to the purchasers I will thank you to make some inquiry into the particulars and to explain to Mr. Grayson, the Register, who will probably be unable to aid you—. There is evidently something strangely wrong in this business and the truth should be thoroughly inquired into.

In all cases where you are satisfied that it is of importance to the public interest to have resurveys made, you are hereby authorized to do so—. You will please to inform me in your next, of the name of the Deputy Surveyor who made the original (false) Survey of fractional Township 14. R. 5 East and if living, the place of his present residence.—

I am —
G. Graham

P.S.
What affect will this resurvey have upon the fract. Sect. North of the Big Black River.

The township concerned is T. 14 N., R. 5 E., Washington Meridian, through which the Big Black River meanders south of Vicksburg, Mississippi. The results are unknown and whether or not Wailes had the township resurveyed before or after the above letter was written.

It is the first instance found where a fraudulent meander was found following a survey and entry of the lands. Obviously, the Big Black River was much further north in fact than was shown on the original plat and it might prove interesting to know how the problem was finally dealt with. However, it should be noted that Graham gave Wailes blanket permission to execute resurveys whenever he was "satisfied that it is of importance to the public interest to have resurveys made."

Graham had been in office only two months and probably didn't realize the ramifications of such authority being given a Surveyor General, especially if lands had been already entered or patented. This type of resurvey would cause many problems and litigation in the years ahead, the most famous of which is probably the case of *Cragin vs. Powell,* 128 U.S. 691, a Louisiana case decided by the U.S. Supreme Court in 1888.

The Big Black River situation came up again in 1826; on September 28, 1826, Graham approved instructions written by George Davis, then Surveyor General, for the resurvey of T. 14 N., R. 4 E. The original survey there showed the Big Black River in a grossly different position than where it was actually located in relationship to the section lines.

On September 9, 1823, Graham wrote to Tiffin, questioning the form of contracts used and the method of monumenting corners in open country. The following paragraph is extracted from Tiffin's reply dated September 22, 1823.

"The omission in the form of contracts with deputy surveyors which you advert, is supplied in the *Instructions* given them. You will observe by the contract that it binds the deputy to execute his surveys "agreeably

with the laws of the United States, *and such instructions as he may receive from the said Edward Tiffin, Surveyor General*". To every surveyor is given in writing ample and detailed instructions regarding every part of his duty, and which instructions contain the following rule: "In case any corner should fall in a prairie or other place where there may be no trees for bearings within a convenient distance, you will, at the mark of such corner raise around the post a mound of earth or pile of stones, not less than two and a half feet high and two and a half feet diameter at the base."

This clause about corner monumentation in praires does not appear in the instructions issued by Tiffin in 1815. Conjecturably, Tiffin must have added that statement to his instructions between 1815 and 1823. This method of monumentation in prairies was proposed by Mansfield, for the Vincennes Tract surveys in 1804. But no copy of General Instructions to the deputy surveyors, by either Mansfield or Tiffin, have ever been found, which contain that particular method of monumentation.

By letter dated October 7, 1823, Graham ordered Coffee at Florence, Alabama, and Wailes at Washington, Mississippi to have accurate connections made of the township and section lines against the State line between Alabama and Mississippi, showing the fractions of sections made fractional by the State line, and they were to do so in all cases in the future. The St. Stephens Meridian survey system is located in both states. The township and section lines had been run before the State boundary was surveyed in 1820 under contract with Freeman and the State boundary survey hadn't tied in the section lines. Obviously, a problem ensued: What part of a section should be taxed by the State of Alabama and what part by Mississippi? It wasn't until after the Illinois-Indiana line caused similar and expensive problems that the rectangular surveys were held in abeyance until after a State boundary was surveyed.

Island surveys first came up in 1824. On January 29, 1824, Graham wrote the following letter to Tiffin:

Sir:

Application has been made to this office for having the islands situated in the Miami River within the reservation of twelve miles square at Fort Meigs surveyed. One in particular situate in township No. 1. which is estimated to contain fifty acres, is said to be particularly valuable. I will thank you to attend to the subject of these islands and cause such of them to be surveyed as may in your opinion be valuable.

There is also represented to be islands situated in the large ponds or lakes interspersed throughout certain parts of the Detroit District, which have not been surveyed, it is presumed because they were not thought to be worth the expense of surveying. Particular enquiry has been made by a resident at Detroit in relation to one of these islands, called Apple Island, situate in Lake No. 2. of Township No. 2 N., Range No. 9 E. and is estimated to contain about forty acres.

There is also discovered on the Map other Islands similarly situated. I merely wish to call your attention to this subject of the islands, in the Detroit District that when a favorable opportunity occurs you may take measures to cause such of them be be surveyed as from the best information you can collect, may be worth the expense. Your letter of the 20th inst. has been received.

I am
Geo. Graham

This treatment of islands always remained. Unless an island was quite large, it was seldom surveyed during the regular, original rectangular surveys. Most islands were small and the cost of surveying, platting, and sale was greater than the monetary return to the government at $1.25 per acre. But the GLO always did and still does consider islands public land until surveyed, platted, and sold. As will be seen later, they were surveyed upon application by a prospective buyer at the applicant's expense.

The numbering of sections and private land claims as sections within a township was the subject of a letter to Wailes on January 30, 1824, and to Silas Dinsmore on May 7, 1824. The letter to Dinsmore follows:

Silas Dinsmore
Prin'l Dep. S. Land
New Orleans

Surveying Department
General Land Office
7 May 1824

Sir,

I have this day returned to the Register and Receiver of the Land Office at Jackson & your plat of the survey made for Charles Hale for Claim No. 40 in Report No. 3 of the Commissioners with a request that they would send it to you in order that it might be corrected. You describe the land as being Section 39, in Township 2 of Range 3 E. and being the north half of sec. 22 in Township 2 of Range 3 East by which it appears that although you give the private claim a Sectional Number, you also describe it as being part of what would have been its proper sectional numbers of these said lands now private claims in the Township— If this is the manner in which you mean to designate the private and public lands in your Surveying District—I hasten to inform you that in all cases when there are private claims in a Township, you must give each Tract a number as a section without any reference to what would be its number if the Township was divided into 36 regular sections— so that if there results part of the Township being *regular*, Sections No. 1 to 6 should also include 3 private claims; that tier of sections would be numbered from 1 to 9 and what would be regularly numbered, if there were no private claims, as Section No. 7 will be numbered as No. 10, and this difference in the numbers of Sections must be continued through the Township by which, if there were no other private claims in the Township, the Section in the S.E. corner of the Township will be designated as No. 39. You will please correct the plat accordingly and also describe it in the description contained in the body of this survey, by the courses and distances of each line, and size, etc. of the bearing trees. You will forward the Plat to the Register and Receiver in order that it may accompany their Certificate

I am, very respectfully
your Obed't Servent
Geo. Graham

P.S. I also enclose an extract of a letter from Mr. Gallatin to Sur. Gen'l Briggs, dated 26 July 1803 of a copy which was sent to the Reg. & Rec. at St. Helena in Aug't last with a request that they would furnish you with a copy of it in relation to the numbering of the private claims.

The matter being discussed was the numbering system illustrated by Fig. 24. What Dinsmore did was basically what was being done in Michigan and Missouri, but more nearly what is the practice today. Dinsmore left all the normal section numbers intact within the township and then gave any private land claims that cropped up a tract number, beginning with Tract 37. There certainly was no provision in the land laws allowing a deviation of the section numbering system called for in the *Act of May 18, 1796*.

On June 1, 1824, Graham notified Levin Wailes of his dismissal from office and the appointment of George Davis to replace him as "Surveyor of the Lands South of Tennessee." Also on June 1, 1824, Graham notified William Rector at St. Louis of his dismissal from office, which was then held down by William Milburn, chief clerk. William McRee was appointed to replace Rector but couldn't go to St. Louis immediately. General William Clark was appointed Acting Surveyor General in October and conducted the business until McRee finally arrived and assumed the duties of Surveyor General of Illinois and Missouri around May 17, 1825.

The *Act of May 24, 1824*, 4 Stat. 34, provided for an optional change in the mode of surveying lands fronting on water courses. The complete act follows:

CHAP. CXLI.—An Act changing the mode of surveying the public lands, on any river, lake, bayou, or water-course.

Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, That, whenever, in the opinion of the President of the United States, a departure from the ordinary mode of surveying land on any river, lake, bayou, or water-course, would promote the public interest, he may direct the surveyor general, in whose district such land is situated, and where the change is intended to be made, under such rules and regulations as the President may prescribe, to cause the lands thus situated, to be surveyed in tracts of two acres in width, fronting on any river, lake, bayou, or water-course, and running back the depth of forty acres; which tracts of land, so surveyed, shall be offered for sale entire, instead of in half-quarter sections, and in the usual manner and on the same terms, in all respects, as the other public lands of the United States.

APPROVED, May 24, 1824

This act is a modification of the *Act of March 3, 1811*, which applied only in the Orleans Territory. The 1811 act was for tracts of 14.50 chains front (about 5 arpents) and 116.25 chains depth (about 40 arpents). The *Act of 1824* applied to all the public lands. The "two acres in width" was nearly 6.33 chains. A waterfront tract, surveyed according to this act, would contain 80 acres, and was used extensively in Louisiana but only sparingly in the north. A few years later, a man in Michigan made application to purchase a tract to be surveyed according to this method; his application was rejected.

In Louisiana, many of the lands, even those within the rectangular surveys, fronting on bayous were surveyed by this method. The act was repealed *December 16, 1930*, 46 Stat. 1029.

On July 9, 1824, Commissioner Graham wrote to Robert A. Butler at Nashville, Tennessee, forwarding his appointment to the position of Surveyor General of Florida. Graham instructed Butler to begin the surveys "adjacent to the seat of government, which is located in Gadsden County, and within which tract of country it is understood that there are a few if any private claims." Graham went on to instruct Butler to establish the initial point of the Tallahassee Meridian at the southeast corner of the section selected by the Governor of Florida as the seat of government under provisions of the *Act of May 4, 1824*. Butler established the point later in 1824. T. 1 N., R. 1 E., was later patented to General Marquis de Lafayette for his services to the United States during the Revolutionary War. The Tallahassee Meridian controls all the rectangular surveys in Florida and a narrow strip in Alabama.

In 1825, another problem came up: the thousands of small lakes in Michigan. Meigs had instructed Tiffin to meander lakes which were "5 or 6 miles in circumference," but the smaller lakes were not meandered; they were included in the land area of a section and sold as land if a settler chose to buy on those terms. Most settlers would not buy land containing a lake, thereby paying $1.25 per acre for areas they couldn't farm.

The Register at Detroit wrote to Tiffin on March 24, 1825. His letter stated the problem and contains the following excerpt: "These lakes can be of no manner of use to anyone, and the manner in which the survey has been made is a virtual exclusion from market. . ." The Register requested that small lakes be meandered and excluded from the land area calculations.

Tiffin recommended to Graham that action be taken. Graham was absent so John Moore passed the request on to the Secretary of the Treasury, recommending that the ponds and lakes be meandered and the sections lotted. Moore said the lakes and ponds were 40 acres and upward in area but recommended that the decision on what to meander should be left to the discretion of Tiffin. Apparently approval was given, because Tiffin had his deputy surveyors meander all small lakes which were of "sufficient magnitude" and "would not admit to be drained." In many surveyed townships, he sent the surveyors back to meander lakes and then corrected the plats to exclude them from area calculations. The fractional parts were listed with their areas on the plats, but were not given lot numbers. After 1825, small lakes of 40 acres or larger were meandered and very often the larger marshes and swamps were excluded by meandering; the motive being to promote land sales. Settlers didn't want to pay for land they couldn't farm. Once again a decision was made without benefit of a precise law and the whole matter would later cause much litigation.

In 1826, the problem of erroneous surveys in Michigan first appeared. Complaints were received of improper corner markings and distorted section lines in the townships north of the baseline in ranges 10 and 11 west. Those townships had been surveyed in 1817 by Joseph Wampler. Tiffin reported to

Graham that Wampler had become ill during the surveys, which were then taken over by Wampler's assistant surveyor. Tiffin thought it possible some errors might exist but that most of the complaints were unjustified and were only an effort to discredit Wampler. Tiffin explained that he no longer allowed the deputies to use assistant surveyors for any reason. Tiffin's explanation was accepted. But what wasn't known was the existence of iron ore deposits in the Michigan Peninsula. This fact and the inability of Tiffin to ever examine any of the field work led to many bad surveys in Michigan. The surveyors were either careless, dishonest, or both. In the 1840's and early 1850's, 341 townships were resurveyed. Most of them were in the Lower Peninsula north of Saginaw Bay and about 25 townships were in the Upper Peninsula. Tiffin was made aware of the erroneous and fraudulent surveys in 1826 but had no power to correct the situation. He had no funds for corrective work and had to depend upon the honesty of his deputies. Most of the bad surveys, needing resurvey, were made after Tiffin left office. The accusations against Wampler may not have had any real merit other than the fact that his surveys were somewhat wild. Ohio was a rich State and Michigan a Territory. The Toledo Strip boundary issue, the Fulton-Harris lines, was a hot matter. The Surveyors were foreigners from Ohio. There was much political agitation to have the surveys made by Michigan men and to have a Surveyor General in Michigan. So whether Wampler was anything less than an honest surveyor is very questionable.

On January 20, 1826, Graham wrote to George Davis at Washington, Mississippi, concerning fractional sections and subdivisions of them. The following is extracted from that letter:

Sir,

"In relation to the subdivision of fract. sections which formed the subject of your two letters of the 9th and 19th, ult. I reply, that prior to the act of Congress passed on the 24th of April 1820... fractional sections were not liable to be subdivided. It is here proper to premise that the technical meaning of a *"fractional section"* is a tract of land *not bounded by sectional lines on all sides,* in consequence of the intervention of a navigable stream or some other boundary recognized by law, and *containing a less quantity than six hundred & forty acres.*

Tracts of land bounded on all sides by sectional lines & containing a less quantity than six hundred & forty acres are *not fractional* sections known to the law, & therefore are not to be treated as such.

The act of Congress passed on the 24th Apr. 1820 provides for the subdivision of *quarter* sections into *half quarter* sections, by lines running North & South, and also provides that the corners & contents of half quarter sections which are to be sold after the 30th June 1820, shall be ascertained in the manner & on the principles directed and prescribed by the 2nd Section of an act... passed on the 11th day of Feb. 1805...

It was never contemplated by the Act of 24th Apr. 1820, that the lines dividing quarter sections, into half quarter sections, should be *actually surveyed,* at the expense of the United States...."

The letter then goes on to repeat the requirements of the circular of June 10, 1820, and also directs Davis to make an 80-acre subdivision by either a north-south or east-west line in fractional sections against water boundaries wherever a full 80 can be had and to leave the remainder as a fractional lot. The result was that there were many more small fractions left after the full half-quarter section was designated, such as the "E ½ SW ¼ Sec. 19" (80 acres) and "Fract. W ½ SW ¼ Sec. 19" containing perhaps 38 acres or perhaps only five acres. Graham's definition of fractional section was used by the commissioners thereafter, as was the lotting procedure, until 1832.

In 1827, the subject of island surveys began to become a matter of greater importance. In May 1827, Tiffin contracted for the survey of Bois Blanc Island in Lake Huron, "in the strait of Michilimackinac." The rectangular system was not yet extended that far north, and Tiffin thought it impractical to attempt surveying the island into townships and sections. He thought the island was about 20 miles long and 2 to 3 miles wide. He instructed Lucius Lyon to survey the island into lots according to the *Act of May 24, 1824,* i.e., lots of 2 acres frontage and 40 acres depth. Tiffin's special instructions for the survey were extensive and detailed. Actually, the island was surveyed with a baseline down the middle and rectangular sections laid off perpendicular to the baseline; the tracts were given section numbers.

On *March 2, 1827,* 4 Stat. 236, Congress had authorized Tiffin to have the north boundary of Indiana surveyed, to be paid for from public land survey funds. Tiffin contracted with E. P. Kendrick, a former clerk in his office, for that boundary survey, which Kendrick did in the fall of 1827. The rectangular surveys were then closed against that State boundary.

In December 1827, the Surveyor General's office at Florence, Alabama, burned with the loss of the plats and field notes of the surveys that were made under that office, a catastrophe which could have been foreseen. The Symmes Purchase records had burned in 1810, and the British had burned the GLO building in 1814, so fire was always a possibility. The Surveyor General of Alabama had sent copies of some of the field notes to Washington, and, of course, copies of all plats including the descriptive notes of the surveyed townships. The commissioner was able to make copies of those records, but the field notes of most of the townships were lost; they had to be resurveyed to obtain the field notes.

In 1833, Commissioner Elijah Hayward reported these facts to the Congress and recommended that copies of all field notes be sent to Washington. In 1834 and ensuing years, Congress appropriated funds to pay for clerks to copy all field note books in each Surveyor General's office. These copies were sent to Washington, and copies of both the plats and field notes have been sent to Washington ever since. The descriptive notes of the townships continued to be sent to the land offices, along with their plats, at least until 1910. The only remnant remaining of the old descriptive notes is the *General Description* at the end of the present-day field notes and the summaries at the end of the miles of original surveys.

The townships in Alabama which had been completely sold before 1827 were not resurveyed. As a result, no field notes exist to this day for many townships in that state. Although the term "resurvey" was used, not very many of the Alabama townships were actually resurveyed as that term was under-

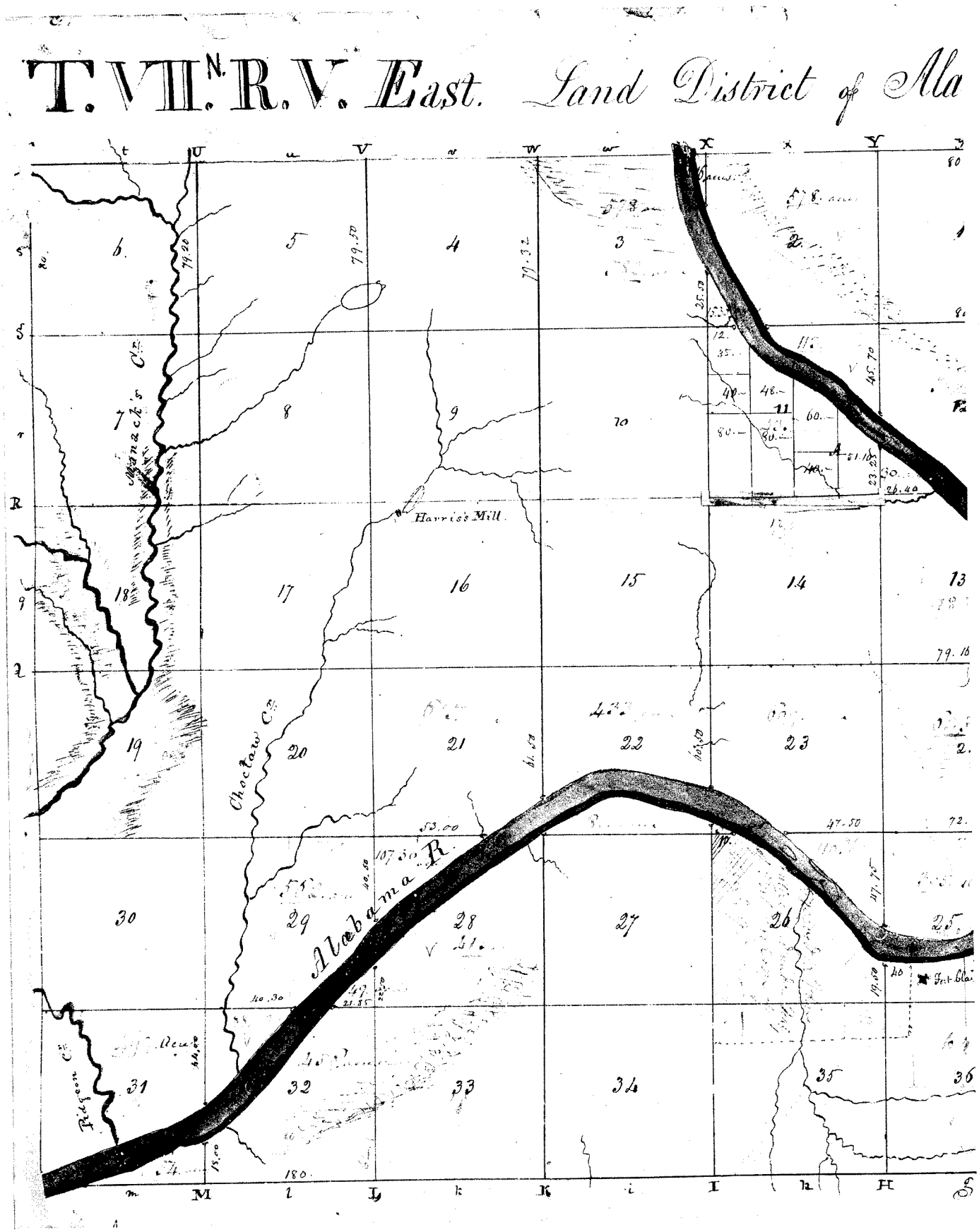


Figure 33. Alabama Township — Original Plat

d District of Alabama.

ALABAMA.N & E
ST.STEPHENS. MER.

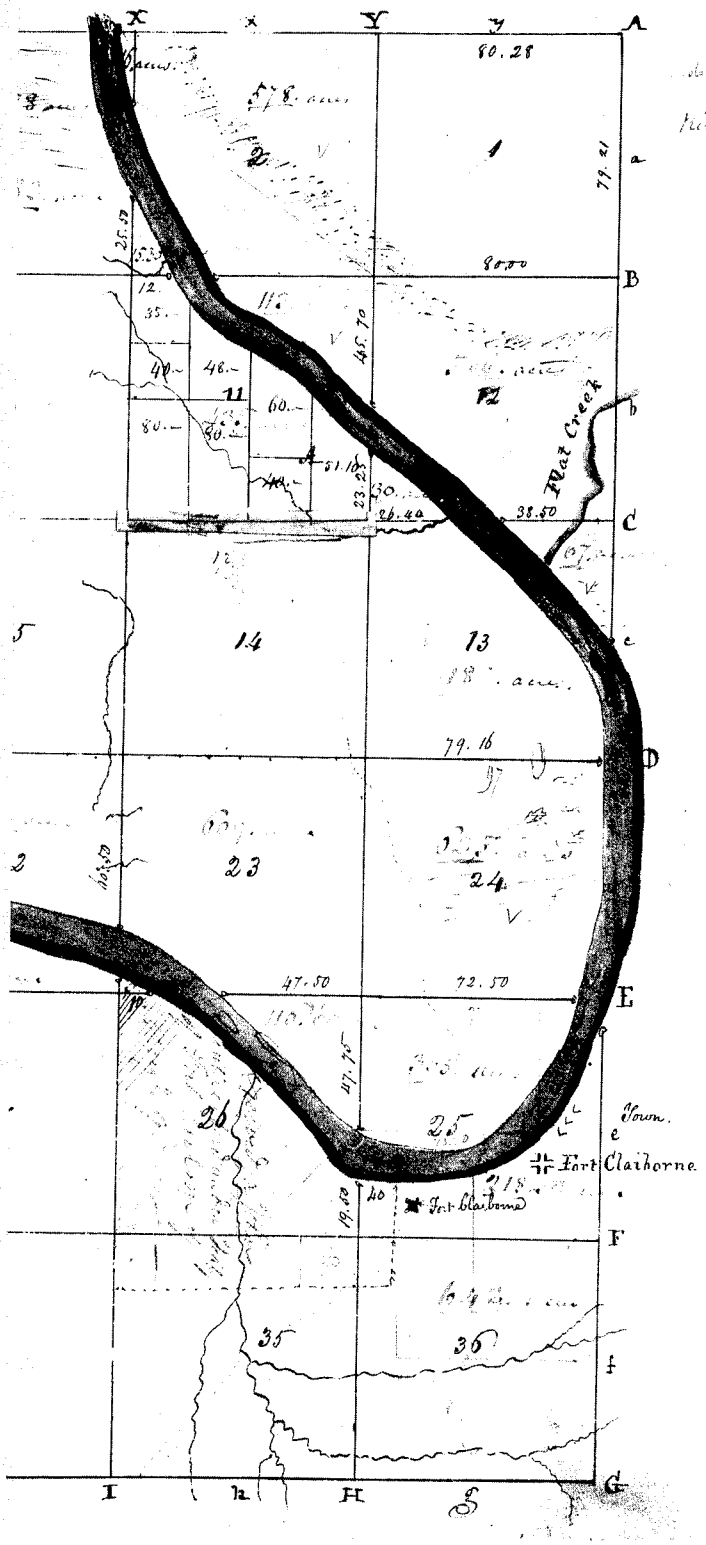


Table of Contents.

Sec.	Acres.	Sec.	Acres.
1.	635.00	19	11.182.70 638.80
2	593.30	20	640.00
3	615.	21	615.00
4	635.30	22	518.00
5	634.00	23	612.00
6	634.80	24	625.00
7	636.40	25	523.50
8	639.20	26	630 –
9	640.50	27	640 –
10	638.80	28	522.30
11	[illegible].00	29	611 –
12	596.00	30	640.00
13	556.00	31	557 –
14	640.80	32	644.50
15	639.20	33	640.40
16	640.40	34	642.50
17	640.00	35	642.00
18	637.00	36	642.00
	11.182.70		22.060.70 Total.

Thos Rhodes
Dep. Surveyor.

Reuben Rice
Frederick Matthews } Chain Carriers.

(Signed) Thos Freeman
Surveyor U. S. Lands
South of Tennessee.

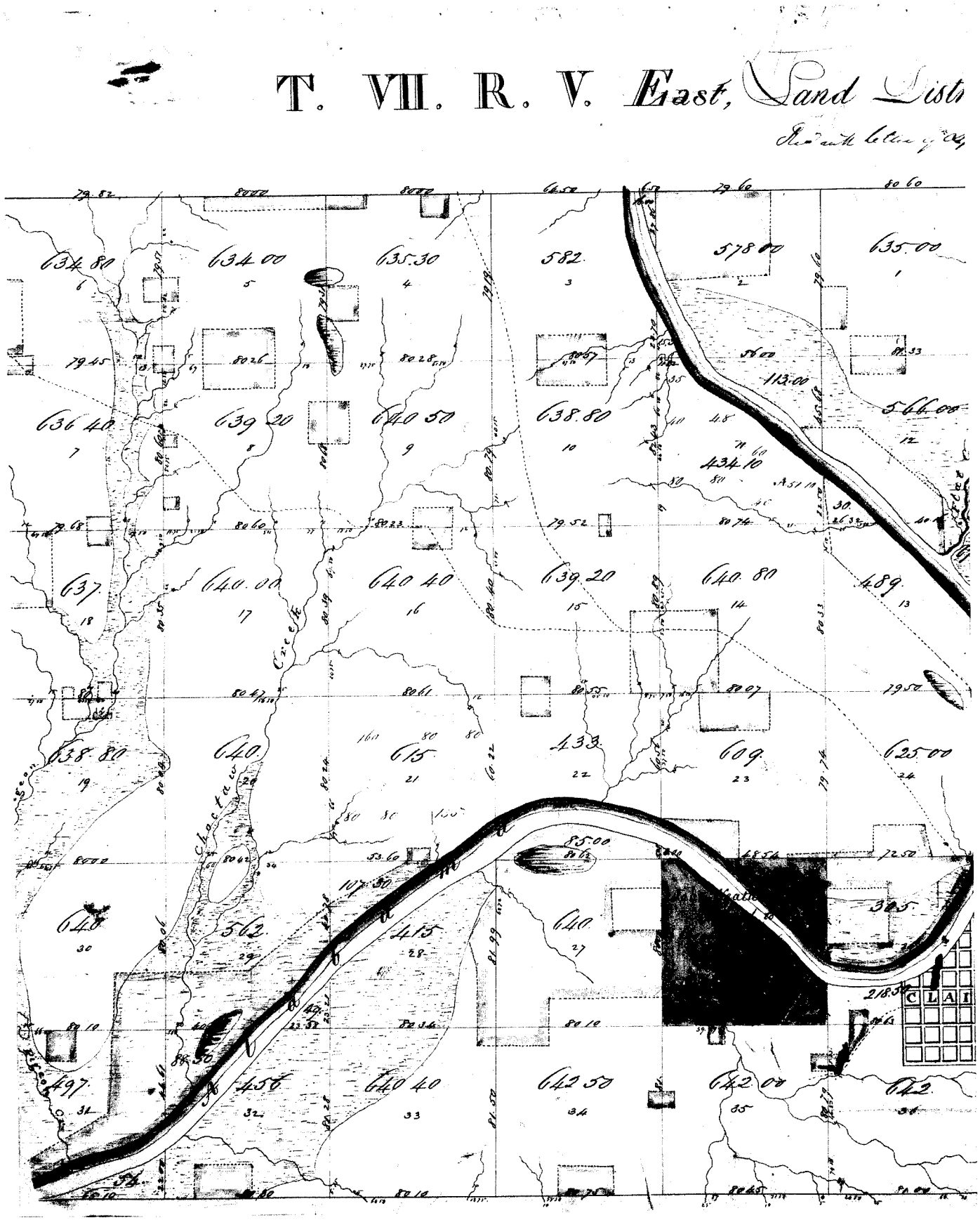
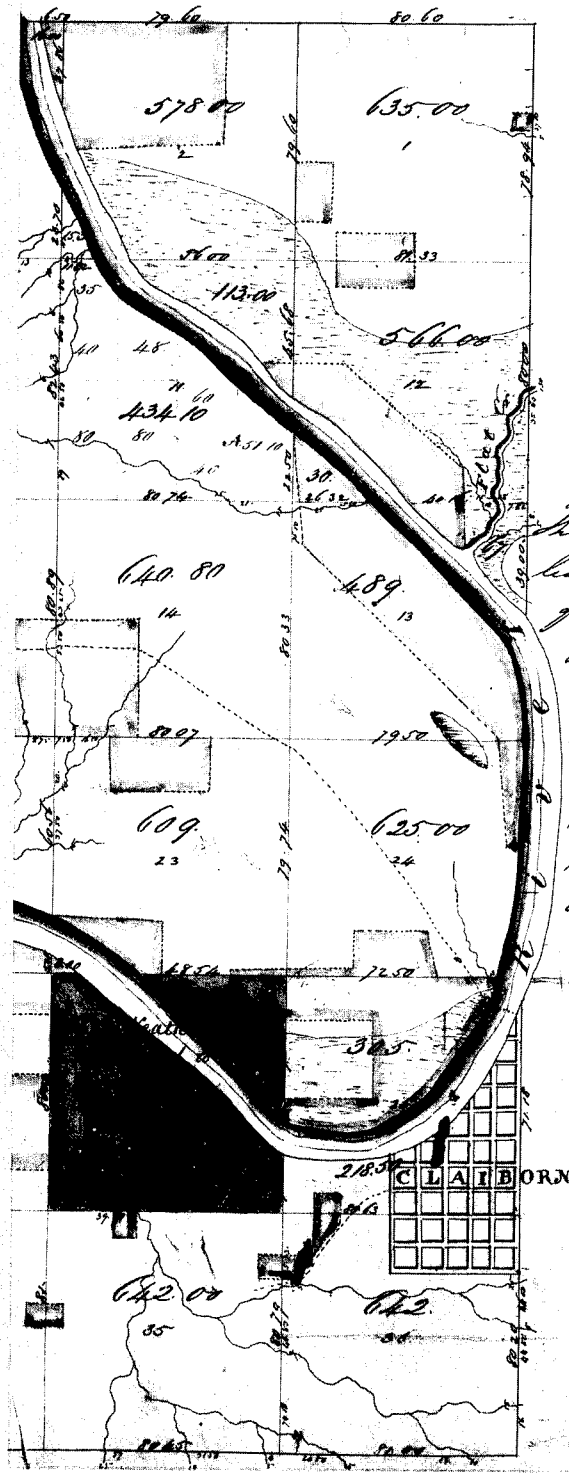


Figure 34. Alabama Township — Lines Retraced After Fire.

East, Land District Southern Part of Alabama.

Rec'd with letter of Apl. 13/48.

89 ~~101~~ ~~B~~



The South and East boundary line 10.22 miles, Sectional lines 57.56 miles retraced by John James in the 1st quarter of the year 1848 under Contract dated December the 14th 1847.

The above Map of Township No 7 Range No 5 East is strictly conformable to the field notes obtained by retracing the original lines and establishing the land marks thereof, on file in this office which have been examined and approved,

Surveyor's Office, Florence, (Ala)
8 April 1848. Examined & Approved

J. A. H. Weakley, Surveyor

of the public lands in Alabama

Surveys paid for per G. L. O. [illegible]
No 609 dated 27th April [illegible]

POOR COPY

stood at that time. In fact, the commissioner later directed that the term resurvey should not be used, rather that the work to be done was a retracing of the original survey solely for the purpose of replacing the field notes lost in the fire. This retracing continued at least into the late 1840's. The surveyor reran the old lines, returned the distances to topography and distances as he found them to be between the corners, and described the corners and bearing trees. So although actually a retracement, the work was more on the order of a dependent resurvey as we use that expression today. Figs. 33 and 34 are copies of the plats of T. 7 N., R. 5 E., St. Stephens Meridian. The original survey was made during Thomas Freeman's tenure and the retracement survey was made in 1848. The differences are apparent. Almost all the townships retraced were in the St. Stephens Meridian network.

The Illinois-Indiana boundary began causing problems in 1827. In 1818, Tiffin proposed closing the Second Principal Meridian surveys against the State boundary. In 1819, that boundary north from the Wabash was surveyed by John McDonald. On October 12, 1824, Tiffin reported that he was leaving the tenth range west undone until he had more information. He believed that Rector had extended the Indiana surveys over into Illinois, which proved to be true. Apparently the problem was one of jurisdiction and land sales.

The Illinois-Indiana boundary passes through R. 10 W. of the Second Principal Meridian; the range was surveyed as being full with no regard for the State boundary. The Surveyor General of Illinois, Missouri, and Arkansas, William McRee, in 1827, was responsible for Illinois, and Tiffin was responsible for Indiana.

Land sales had to be identified by State as well as by township, range, and section. The State boundary was surveyed. But where was it in relationship to the rectangular surveys? And who was to find out, Tiffin or McRee? Where was the funding? The surveys had already been executed and paid for once.

Congress finally appropriated funds in 1833 for the division of the tenth range as divided by the State boundary. Each Surveyor General contracted for the work on his side of the line. The whole problem caused the Surveyors General to be very cautious in later years. They held the rectangular surveys in abeyance until the State boundaries were surveyed and then closed against the established boundary.

This is not to say that problems never occurred again; similar boundary problems occurred later in Florida and more recently in California-Nevada, but they were due to boundary changes or disputes. The Illinois-Indiana boundary established the policy of the State boundary survey preceding the rectangular surveys.

Letters dated April 24, 1828, notified George Davis of his termination and the appointment of James P. Turner to replace him as Surveyor of the Land South of Tennessee, at Washington, Mississippi. Turner had been Principal Deputy at St. Helena, Louisiana, prior to his appointment to be Surveyor General; but on September 24, 1829, William S. Hamilton was appointed to replace Turner. Hamilton declined the job, and Joseph Dunbar was notified of his appointment to the position on December 23, 1829.

By the *Act of May 23, 1828,* 4 Stat. 289, Congress appropriated $25,000 for removal of the Great Raft in the Red River, a navigable stream, in Louisiana and Arkansas. This great log jam had been in progress for centuries; as flood waters deposited logs against the upper end, the main channel was blocked. It flooded the surrounding country, creating large shallow lakes and swamps. Most of the lakes were meandered during the original surveys. The log jams impeded and/or made navigation of the river impossible. With removal of the Great Raft over a period of many years these lakes were drained, causing many complex problems in the adjoining surveys because of State sovereignty over beds of navigable waters, riparian rights, omitted lands, fraudulent or erroneous meanders, and dried up lake surveys.

On May 26, 1829, Edward Tiffin was notified to surrender his office to William Lytle. Tiffin was in ill health; William Lytle was officially commissioned Survey General of Ohio, Indiana, and the Territory of Michigan on July 3, 1829. Tiffin died at his home in Chillicothe, Ohio, on August 9, 1829; thus ended the career of a doctor-turned-politician who was never a surveyor, but who had so ably guided the rectangular system of land surveying during a developing period that his name is still well known by all surveyors who work with that system. Jared Mansfield died on February 3, 1830; thus passed the two men who had such a profound influence on bringing the system into full bloom.

The Years After Tiffin, 1829-1836

The first action Lytle took was to move the Surveyor General's office to Cincinnati where it remained until moved to Detroit. During his short tenure in office, Lytle made no significant improvements in the rectangular system.

On *May 29, 1830,* 4 Stat. 417, Congress provided for the protection of any persons engaged in surveying the public lands or private land claims. If any forcible opposition was offered to any deputy surveyor, the President could order the marshal of the district to provide protection. This act is now codified in *43 U.S.C. 774.*

Also on *May 29, 1830,* 4 Stat. 420, Congress granted a limited preemption to existing settlers or squatters on the public lands. The squatters were the persons "offering forcible opposition" to the public land surveys. By granting preemption, Congress temporarily removed the reason to oppose the surveys.

In July 1830, Graham was removed from office and John Moore became Acting Commissioner. On September 30, 1830, Elijah Hayward replaced Graham as Commissioner of the GLO. Andrew Jackson had become President of the United States, and his administration is attributed with the slogan "To the victor goes the spoils." Jackson introduced the spoils system in government in which most government officials were appointed on the basis of political affiliation rather than ability. Hayward was the first commissioner to serve under the system and soon let his power be known.

By letter dated October 26, 1830, Hayward ordered Butler in Florida to have the island of Key West surveyed. He was to meander the island, both at high tide and at low tide, show the area between both lines as well as the area of the island, and survey a private land claim on the island. Hayward thought that not knowing the location of Key West by township and range wouldn't make any difference.

By another letter of some date, Hayward ordered Butler to survey only the exterior boundaries of townships that didn't

contain good land. If a township did contain good land, the whole township, not just part of it, would be subdivided. Connections were to be accurately made to all private claims, and swamps and ponds were to be distinctly shown on the plat, both by letters and colors. Nearly identical instructions were sent to Lytle in Cincinnati.

Surveying Key West without tying to the rectangular net was not a new idea. Tiffin proposed the same procedure for Bois Blanc Island. But the idea of showing swamps by both lettering and coloring the swamp area was something new.

On February 25, 1831, Gideon Fitz was notified of his appointment to be Surveyor General at Washington, Mississippi, replacing Dunbar.

On *March 3, 1831,* 4 Stat. 492, Congress authorized the establishment of the office of Surveyor General in Donaldsonville, Louisiana. H. Browse Triste was commissioned to that position on June 15, 1831, and soon opened the office.

The lands south of Tennessee were now divided into the surveying districts of Alabama, Mississippi, Florida, and Louisiana, but Fitz still carried the title of Surveyor of the Lands South of Tennessee. He soon became just the Surveyor General of Mississippi in the correspondence.

On March 18, 1831, William Lytle died at Cincinnati. Samuel Williams filled in until April 13, 1831, when Micajah T. Williams took office as Surveyor General of Ohio, Indiana, and Michigan Territory.

On April 10, 1831, Fitz reported that Turner had let a contract for a township resurvey north of the Red River in Louisiana. Also the original surveyor had set off the magnetic declination as 9° W. instead of 9° E.; therefore, all lines had been originally run 17° or 18° off cardinal, causing a need for resurvey. When the deputy submitted his field notes of the resurvey, Fitz wanted to know if he had authority to pay for the resurvey and authority to order resurveys generally. Hayward answered the inquiry on July 26, 1831, telling Fitz to send diagrams showing the differences between the two surveys and to have the second survey "critically examined" to see that all original corners had been destroyed and to send the evidences to Hayward for a decision. The letter then went on to say, in part:

> "In the absence of any specific provisions of law on the subject of resurveys, it is exceedingly difficult to say to what extent the Executive can exercise a discretionary power. That authority *does exist* in the Department to correct errors in Surveying public lands, I am fully satisfied of, and would not hesitate to exercise said authority within reasonable limits where the necessity for so doing in order to subserve the public interests was so apparent as to being the object within the undoubted jurisdiction and legitimate authority of the Department. But on the other hand, where the errors are of a character & magnitude exceeding that which should exist in the ordinary course of business. . . where they have grown out of gross ignorance, or willful neglect of those in whom confidence has been reposed for the due execution of the public service, then, according to my views of duty, the subject is beyond the limits of the Executives discretion & requires the express interference of the national legislature, and probably an increased appropriation of public money to meet the exigency.
>
> Therefore, before the Department can determine the extent of its authority to order resurveys, it will require from you the most satisfactory and detailed information both as to the extent of the required resurveys and the Specific causes which render the same necessary. Under any circumstances such report would be required, whether the Department should act on the subject, or application be made to the Congress to authorize a remedy.
>
> In your Report on this subject you will carefully discriminate between the correction of erroneous surveys, and the necessity for retracing old lines where the marks & figures have been obliterated by age, or destroyed by accident, or design.
>
> In conclusion I have to state that no person is hereafter to be employed as a Deputy Surveyor without giving bond and Security for the faithful discharge of his duty in double the amount of the value of the contract. . . and no person is to be employed as a Deputy Surveyor who has not given practical evidence of his *Skill in Surveying,* and who cannot produce the most satisfactory evidence of his *moral integrity.* Without a rigid attention to the requisites the public interest will be compromised.
>
> I am
> E. Hayward

It would appear that what Hayward was saying is that in retracing old lines or on minor resurveys, the Surveyor General had authority to do them. But on anything major, such as a whole township or in case of gross errors, the facts should be reported to the Commissioner who would decide whether to approve a resurvey on his own authority or submit the matter to Congress for approval and funding. Quite clearly Hayward was trying to deal with a complex problem and establish some sort of policy on resurveys. Nothing in the statutes even considered resurveys as a blanket item. Surely the Commissioner could order a corrective resurvey of public lands, if funding was available, up until such time as entries were made or patents issued based on the original survey. But very seldom did gross errors or fraud show up until after settlers were in the area and couldn't find the survey corners or otherwise discovered wild survey lines. As a general policy the lands weren't open till surveyed and opened to entry and sale; by the time errors were discovered entries had already been made.

On July 27, 1831, Hayward directed Fitz to begin the surveys in the Chickasaw Cession in northern Mississippi. The Choctaw surveys were to be extended via a guide meridian between ranges 10 and 11 east, of the Choctaw base. When it reached the north boundary of T. 14 N., a guide baseline (standard parallel) was to be run east and west between townships 14 and 15 north. The townships and ranges would all refer to the Choctaw system. Had these orders been followed, there would not have been a Chickasaw Meridian System in Mississippi.

On July 28, 1831, Hayward sent very long instructions to Fitz, directing Fitz in the manner in which the public land

surveys would be made and ordered Fitz to prepare instructions for the deputies. Nearly the same letter was sent as a circular on September 23, 1831, to the other Surveyors General: William McRee, St. Louis; John Coffee, Florence, Alabama; Micajah T. Williams, Cincinnati; Robert Butler, Florida, and H. Browse Triste, Louisiana. The circular was also sent to James S. Conway on July 6, 1832, after he was appointed Surveyor General at Little Rock, Arkansas.

Gideon Fitz was the first to respond to Hayward's order. In December 1831, Fitz issued his *Instructions for Surveying in the State of Mississippi.* Fitz directed that the townships be subdivided in a manner which resulted in the half-mile posts, supposedly quarter-section corners. By the method of running the lines, many of the half-mile posts were not quarter-section corners because they were not established according to the law. Fitz also introduced bark scribing of bearing trees and numerous other changes in methods. His instructions are reproduced in the Appendix.

The Surveyor General of Arkansas Territory, James S. Conway, prepared his *Instructions to Deputy Surveyors,* in 1833. Those instructions followed the pattern of the instructions issued by Tiffin in 1815. Over the next 20 years, surveying instructions were issued by nearly all the Surveyors General in one form or another; some used the same instructions issued by a fellow Surveyor General. Instructions were issued for Ohio, Indiana, and Michigan, 1833; Illinois and Missouri, 1834; Arkansas, 1837, Florida, 1842; Arkansas, 1843; Wisconsin and Iowa, 1846; Ohio, Indiana, and Michigan, 1850; Florida, 1850; Wisconsin and Iowa, 1851; and Illinois and Missouri, 1856. Hayward's order to issue written instructions to the deputy surveyors started the whole series of instructions which evolved into a standard *Manual of Surveying Instructions,* applicable to all, in 1855. But during the period, each Surveyor General had his individual concept of how the surveys should be performed in his area of authority; most stayed within the letter of the law, as they interpreted that law.

In monumentation, platting, distance between correction lines, field notes, tree markings, and similar items there were differences. Each set of these instructions should be examined for the differences (see Appendix).

By letter dated August 18, 1831, Hayward instructed Micajah T. Williams at Cincinatti and McRee at St. Louis to extend the Fourth Principal Meridian north to the north boundary of Illinois and on the same direction into what is now Wisconsin. The north boundary of Illinois was surveyed by Lucius Lyon in 1831-32. The meridian was extended to the Illinois boundary in 1831, and an initial point was established. The baseline for the new surveys in Wisconsin was the north boundary of Illinois. In 1832, Lucius Lyon, Deputy Surveyor, ran the extended Fourth Principal Meridian into Wisconsin and surveyed T. 1 N., R. 1 W., in what is now that State. All of the townships in Wisconsin are numbered north from its south boundary and east or west of the Fourth Principal Meridian, which was not, however, extended as a separate line. Rather, it was surveyed as township boundaries as the surveys progressed. An unusual fact about the Wisconsin surveys is the spacing of the correction lines. On August 12, 1880, Commissioner James A. Williamson wrote the following letter in part to Rose C. Smart, at Oshkosh, Wisconsin:

Madam,

"Your communication of the 4th instant, making inquiry about the 5th Correction line in Wisconsin has been received.

In the early period of surveying operations, and while the same were still in the hands, and under the control of the Surveyor General, correction lines were made at every ten townships in certain surveying districts, of which Wisconsin was one, as approximating an even number of townships, to the length of a degree of latitude. They were run in such a manner that a true length of eighty chains was to be found midway between any two correction lines, — which necessitated the marking of a reduced length for a township on the south side and an increased length on the north side of the correction line, to accomodate the convergence.

The fifth correction in Wisconsin was placed at (6) six townships, because if laid at ten (10) townships, it would have shortened the possible actual measurement to much—by reason of its running into Lake Superior and thus have defeated the very object for which it was intended. . ."

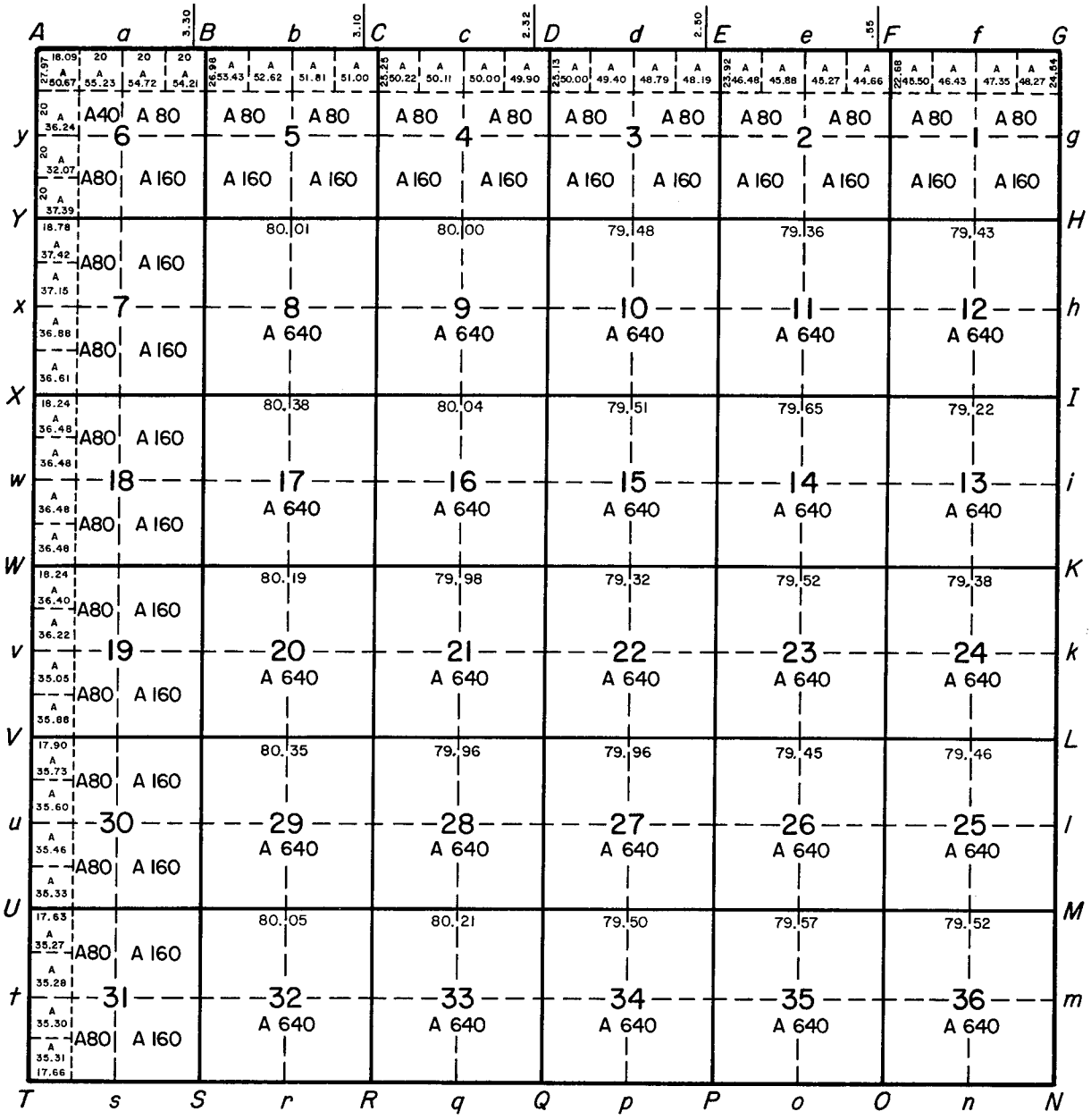
From the letter it appears that the township boundaries in Wisconsin may have been surveyed increasing or decreasing the six-mile length, depending upon where the boundary was in relation to the correction line or standard parallel. Only an examination of the field notes would reveal the true situation; if so, this was another early method of trying to deal with convergency.

On *April 5, 1832,* 4 Stat. 503, Congress passed the last major act affecting the system of rectangular surveys which provides for the sale of public lands in units down to quarter-quarter sections, the one-sixteen section of 40 acres or a lot. The entire act follows:

CHAP. LXV.—An Act supplementary to the several laws for the sale of public lands. (a)

Be it enacted by the Senate and House of Representatives of the United States of America, in Congress assembled, That from and after the first day May next, all the public lands of the United States, when offered at private sale, may be purchased at the option of the purchaser, either in entire sections, half sections, quarter sections, half-quarter sections, or quarter-quarter sections; and in every case of a division of a half-quarter section, the line for division thereof shall run east and west, and the corners and contents of quarter-quarter sections, which may thereafter be sold, shall be ascertained as nearly as may be, in the manner, and on the principles, directed and prescribed by the second section of an act, entitled "An act concerning the mode of surveying the public lands of the United States," Passed on the eleventh day of February, eighteen hundred and five; and fractional sections, containing fewer or more than one hundred and sixty acres, shall in a like manner, as nearly as may be practicable, be subdivided into quarter-quarter sections, under such rules and regulations as may be prescribed by the Secretary of the Treasury: Provided, That this act shall not be construed to

MICHIGAN MERIDIAN TOWNSHIP 9 NORTH RANGE 12 EAST



SUBDIVIDED BY HIRAM BURNHAM IN 1834 UNDER CONTRACT DATED 25 NOV. 1833.

1833 INSTRUCTIONS OF THE SURVEYOR GENERAL FOR THE STATES OF OHIO AND INDIANA AND THE TERRITORY OF MICHIGAN.

Figure 35. Township Surveyed Following the Act of April 5, 1832.

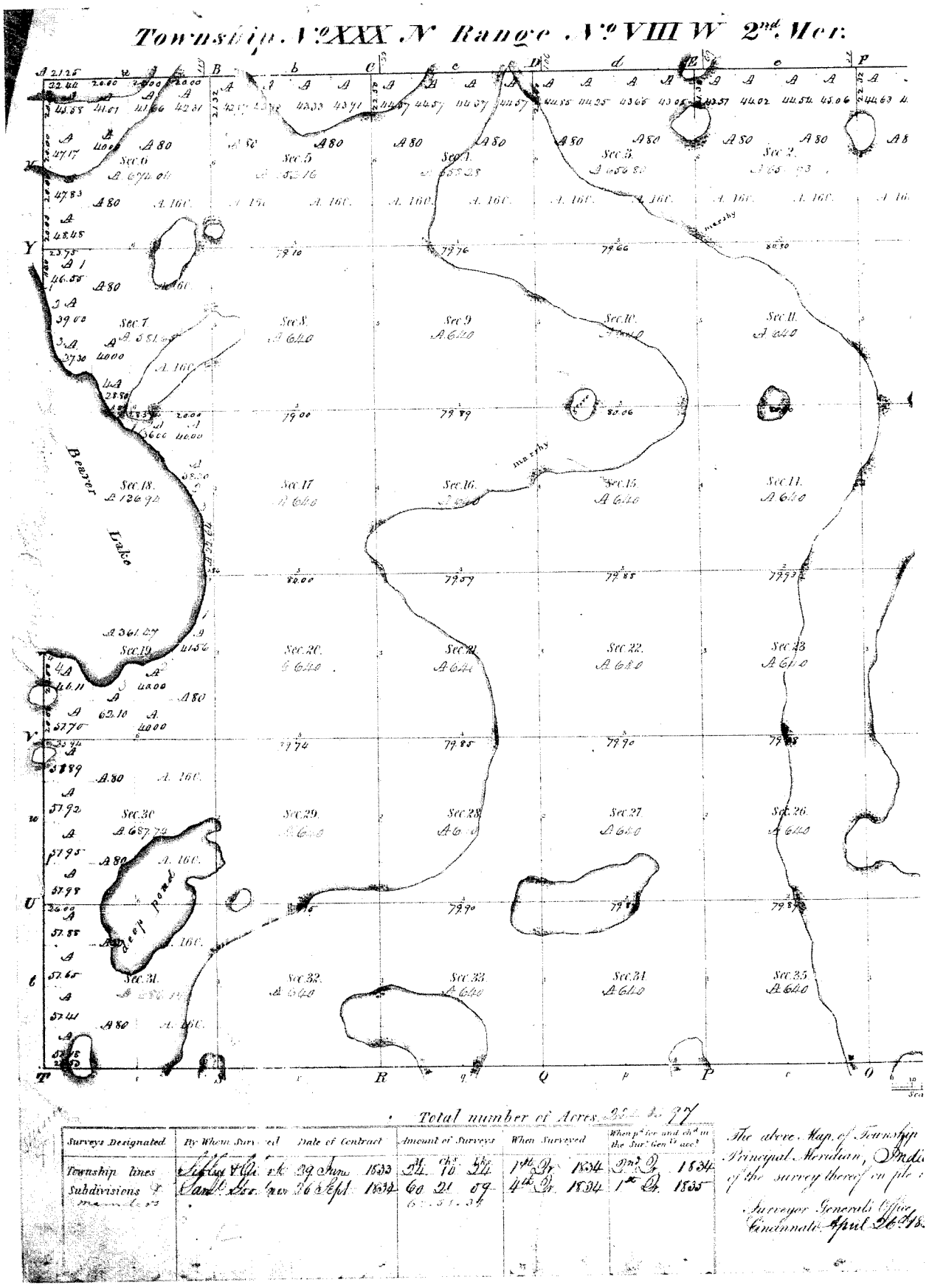
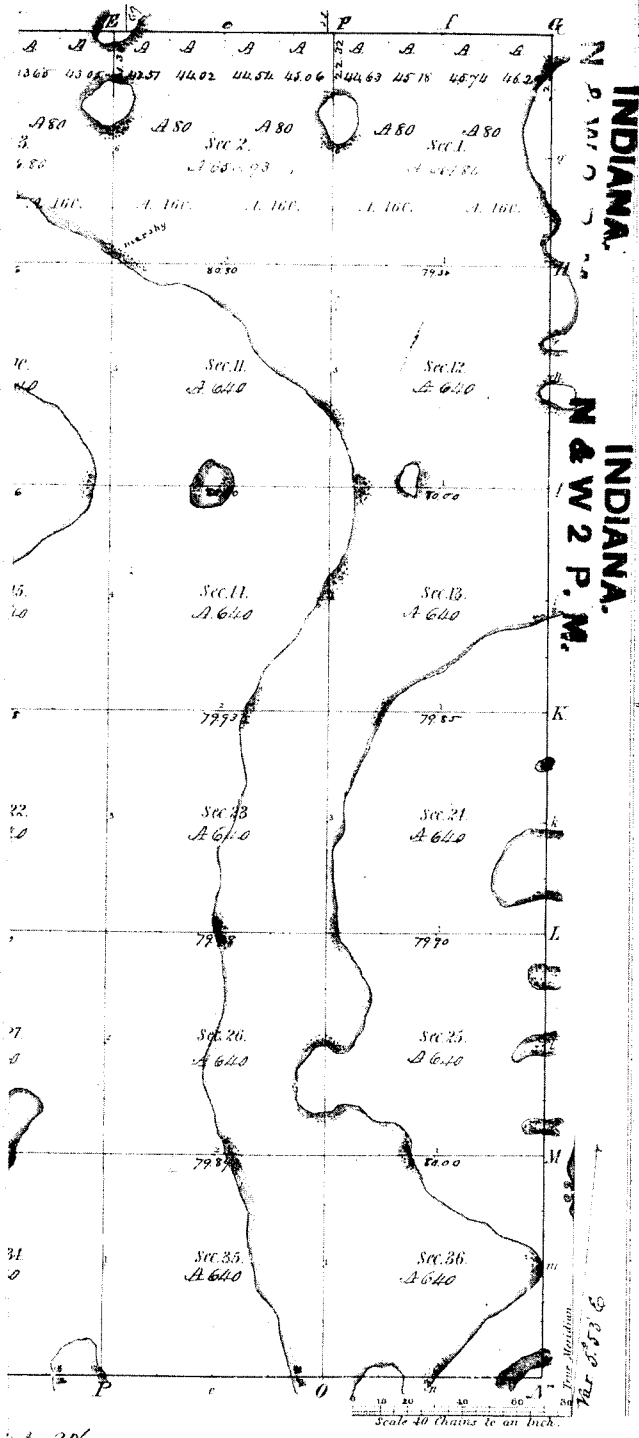


Figure 36. T.30N., R.8W., Second Principal Meridian, Indiana. Example of Proper Platting — 1836.

VIII W 2nd Mer: IND



Meanders of Illinois Lake								
Posts	Courses	Ch & Lks	Posts	Courses	Ch & Lks	Posts	Courses	Ch & Lks
1	S 12 p E	15 53						
	S 13 E	7 25						
	S 4 E	11 69						
	S 24 p E	6 10						
	S 42 E	7 60						
	S 54 E	3 63						
	S 76 p E	4 11						
	S 29 p E	19 98						
	S 37 E	6 80						
2	S 33 E	8 24						
	S 69 E	6 25						
	S 52 p E	9 14						
	S 42 p E	10 18						
	S 34 E	10 32						
	S 57 E	7 45						
	S 29 E	10 31						
	S 30 E	6 34						
	S 5 E	11 34						
	S 1 p W	15 15						
3	S 7 p W	9 94						
	S 17 W	9 27						
	S 30 p W	9 20						
	S 35 W	12 95						
	S 68 p W	11 93						
	S 84 W	9 22						
	S 79 p W	6 57						
	S 57 W	6 30						
	S 49 p W	8 60						
	N 57 p W	9 25						
	N 79 p W	13 28						
4	N 78 p W	19 37						

Lot 27

	for and ch in at Gen O acc	
D	1534	
D	1535	

The above Map of Township 19 30 North of Range No 8 West 2nd Principal Meridian, Indiana, is strictly conformable to the field notes of the survey thereof on file in this Office which have been examined and approved.

Surveyor Generals Office
Cincinnati April 26th 1836.

Robt T Lytle
Surv Genl
by Saml Williams

Robt T Lytle

alter any special provision made by law for the sale of land in town lots: And provided also, That no person shall be permitted to enter more than one half-quarter section of land under this act, in quarter-quarter sections, in his own name or in the name of any other person, and in no case, unless he intends it for cultivation, or for the use of his improvement. And the person making application to make an entry under this act shall file his and her affidavit, under such regulations as the Secretary of the Treasury may prescribe, that he or she makes the entry in his or her own name, for his or her own benefit, and not in trust for another: Provided, further, That all actual settlers, being housekeepers upon the public lands, shall have the right of preemption to enter, within six months after the passage of this act, not exceeding the quantity of one half-quarter section, under the provisions of this act, to include his or their improvements, under such regulations as have been, or may be prescribed by the Secretary of the Treasury; and in cases where two persons shall live upon the same quarter section, subject to be entered under the provisions of this act, each shall have the right to enter that quarter-quarter section which includes his improvements.

APPROVED, April 5, 1832.

Since passage of this act, the 40-acre aliquot part or fractional lot has been the smallest legal subdivision and it is the basis of the present-day platting system. The requirement that, "in every case of a division of a half-quarter section, the line of the division thereof shall run east and west," was directly opposite the *Act of April 24, 1820*. Apparently that provision applied only to land sales, not to the survey plats. It should be remembered that these section subdivisional lines were not ordinarily surveyed by the government. That job was left to the District Surveyors and later to the county surveyors. The subdivision of the quarter section had to be done according to the *Act of February 11, 805,* i.e., midpoint and intersection of centerlines.

On May 8, 1832, Hayward issued a circular (see Appendix) to the Surveyors General, prescribing the methods and procedures to be used in platting the townships in accordance with this act. Fig. 35 is a sketch of a township in Michigan, surveyed and platted after passage of the 1832 act.

On December 30, 1836, Commissioner Ethan A. Brown chastised Surveyor General Henry S. Foote at Jackson, Mississippi, about his platting procedures, sent him a copy of the circular of May 8, 1832, and a copy of the plat of T. 30 N., R. 8 W., Second Principal Meridian, Indiana, and said that the Indiana plat (Fig. 36) was an excellent example of proper platting. The plat not only shows the proper lotting but also the swamps, marshes, and ponds, and the listing at the bottom per the circular of August 4, 1823, and the letter sent to Butler and Lytle on October 26, 1830, which directed the showing of swamps.

On June 15, 1832, Hayward wrote to McRee in St. Louis notifying him that Elias T. Langham had been appointed to replace McRee as Surveyor General of Missouri and Illinois. McRee had been nominated to survey the boundary between the United States and Mexico.

The *Act of June 15, 1832,* 4 Stat. 531, created the Office of Surveyor General for the Territory of Arkansas. James S. Conway was was officially commissioned on June 30, 1832, and established his office at Little Rock.

By letters of May 2 and June 25, 1832, Hayward instructed John Coffee at Florence, Alabama, to survey the lands in the recent Creek Cession in Alabama. The area to be surveyed was near the middle of the State with the St. Stephens Meridian surveys to the south and Huntsville Meridian system to the north. Coffee was to run a guide meridian north between ranges 21 and 22 east, St. Stephens Meridian to the north boundary of T. 24 N., then run a guide baseline east to near the State line but not too close against that line until the Alabama-Georgia boundary was finally decided. The guide baseline was to be run west eventually to the Mississippi boundary. All St. Stephens surveys to the south would close upon this guide baseline. The Huntsville system was to have a guide meridian run south between ranges 7 and 8 east to the above guide baseline and be closed there. Coffee didn't want to do it that way but Hayward prevailed. Thus, a straight east-west line was surveyed to close the two rectangular systems within the single State. Similar methods were to be later used in California and Colorado.

The *Act of July 9, 1832,* 4 Stat. 564, created the Office of Commissioner of Indian Affairs under the Secretary of War, where it remained until 1849. The office was necessary in order to have someone in charge of the complexities involved with the many Indian treaties and the moving of the Choctaw, Chickasaw, Creek, Cherokee, Seminole, and other Indian tribes to the Indian Territory, which is now part of Oklahoma.

The *Act of March 2, 1833,* 4 Stat. 663, ordered the Office of Surveyor of the Lands South of Tennessee moved to Jackson, Mississippi, effective April 1, 1833. Thereafter the holder of that office was called the Surveyor of Mississippi. Fitz moved the office to Jackson in July 1833.

A letter dated April 10, 1833, was addressed to "John Bell, Esq., Sur. Gen., etc. for the Chickasaw Cession (care of John Coffee, S. Gen. at Florence, Ala)." The letter directed Bell, a Deputy Surveyor working for Coffee, to begin the surveys in the recent Chickasaw Cession in northern Mississippi. He set up a separate office for those surveys at Pontotoc, Mississippi, located within the Chickasaw cession. In later letters, he was sometimes addressed as "John Bell, Sur. Gen., Pontotoc, Miss." although he was more a Principal Deputy, working more or less independently from the office at Jackson.

The Mississippi field notes indicate that the initial point of the Chickasaw Meridian was established August 28, 1833, on the east bank of the Wolf River and on the south boundary of Tennessee, by John Thomson, Deputy Surveyor. The notes indicate that the State boundary used was run by "General Winchester." From that point, the basis meridian for the Chickasaw surveys was extended due south. The plat of T. 1 S., R. 1 W., indicates that the east boundary was surveyed by Thomson, the south and west boundaries by John Ralston, and the subdivisional lines by John Hudspeth. The plat was approved in 1834 by John Bell, "Surveyor of Lands in Mississippi ceded by the Chickasaws." Thus, Mississippi contains all or part of six different meridian systems, second only to Ohio for the distinction of having the most complexities in the public lands surveys.

On June 8, 1833, Hayward wrote the following letter to Micajah T. Williams, Surveyor General at Cincinnati:

> Sir,
>
> In relation to the revision by Mr. Hervey Parke of the Survey of Town. 1 S., of Range 7 E. in the Territory of Michigan, I have to remark, that insasmuch as nearly the whole of the land in said township has been sold, and a portion thereof patented, it is not perceived how this office can now apply any remedy for the erroneous survey.
>
> If, however, the purchasers in that township will all enter into a formal agreement that the vacant lines shall be run out, and that quarter Sectional corners shall be established, where there are now none, adopting the Section corners and marked lines where they are found, and to abide by the result of a resurvey, and will moreover agree to pay for the excesses of land that may be found in any quarter Section (the Government being bound to refund in cases where deficiencies shall be discovered if a resurvey be ordered) and all be willing to surrender the patents which have, or will be issued on the existing survey, then, and under no other circumstances, can the subject be considered by the Department.
>
> I am
>
> E. Hayward

If ever a resurvey caused argument, T. 1 S., R. 7 E., Michigan was that township. The actual resurvey was not made until 1844 and will be discussed in its proper order in history. It is extremely questionable whether Hayward had any authority whatever to commit the government to a refund if quarter sections were less than 160 acres. That statement was a direct contravention of the *Act of February 11, 1805,* which made the contents returned by the Surveyor General the true contents regardless of what a later survey might find.

James W. Weakley was officially commissioned by letter dated July 20, 1833, to be Surveyor General of Alabama, replacing "the late General Coffee." Coffee died July 7, 1833.

On February 24, 1834, Henry T. Williams was notified of his official commission to be Surveyor General of Louisiana, replacing H. Browse Triste.

On June 3, 1834, Hayward wrote to Fitz in Mississippi concerning platting procedures. The following remarks are extracted from that letter:

> "When a tract of Country is surveyed, I am decidedly in favor of giving the private claims therein *Sectional* numbers, as has been done in the Southern States generally; but when, as in the cases in question, the claims are laid down after the land has been surveyed into regular Sections as public lands, then I think it will be proper to adopt the course now pursued in Carver's Surveys, of designating the portions thereof in the different regular Sections, as Lots, having particular numbers. . ."

Carver was the deputy who had executed the survey of some private claims in a surveyed township. The renumbering of all the sections seemed unreasonable to Fitz so he designated the private claims as lots and Hayward gave his conditional approval. Presumably the fractions of the sections lying outside the claims would have been given lot numbers. Why they didn't give the claim a tract number as a whole unit instead of perhaps four lot numbers is unexplained.

The *Act of June 28, 1834,* 4 Stat. 701, attached all the lands west of the Mississippi, east of the Missouri River, and north of the State of Missouri to the Territory of Michigan. At that point, the Michigan Territory included all of what is now the States of Michigan, Wisconsin, Iowa, Minnesota, and about half of North and South Dakota.

On July 8, 1834, Hayward notified R. M. Williamson of his appointment to replace Gideon Fitz as Surveyor General at Jackson, Mississippi. Williamson took charge of the Mississippi office on August 16, 1834. On March 23, 1835, Hayward notified Williamson that his appointment had been rejected by the Senate. Surveyors General were appointed by the President but the appointment had to be confirmed by the Senate. Hayward ordered Williamson to close the office, that he should box up all the records and documents, turn them over to the Register of the Jackson Land Office, and discharge his clerks. That office remained closed until 1836.

On April 23, 1835, Robert T. Lytle, William Lytle's son, replaced Micajah T. Williams as Surveyor General at Cincinnati.

On July 24, 1835, Ethan Allen Brown was appointed Commissioner of the GLO, replacing Elijah Hayward. Brown was an extremely capable and intelligent man who had the respect of all who knew him.

On September 21, 1835, Lytle wrote to Brown about the problems encountered with surveying some of the old two-mile blocks in Ohio. Brown replied on October 29, 1835. The following is extracted from that letter:

> "I concur in your representation of the expediency of subdividing "the two mile blocks", as they are called, in certain townships in the northern part of the Cincinnati land district, and which are designated in your predecessor's letter of 29th November last: —but entertain apprehension of much embarrassment resulting to the purchasers and Settlers on those lands from a Survey of the lines intermediate between the two mile distances already Surveyed, unless, indeed, they have made their improvements under the advice of County Surveyors, so as to be their appropriate limits when an official Survey shall be made.
>
> It is readily to be conceived that any Survey on the principles established by law, which would *materially* interfere with the improvements, (whether *fields* in cultivation, *fences, dwellings* or *out houses* of the present owners) would be regarded by all parties interested as a great evil. The want of precise information as to the effect that a Survey would have on the improvements existing, is the reason why an order has not heretofore been issued from this Department.
>
> Under these circumstances I would desire a Report from the Surveyor of the County as the manner in which the Settlers have made their improvements—and which I request you will furnish as soon as convenient.
>
> Inasmuch as most of the lands referred to have been

sold many years ago, and no doubt are now in the hands of agriculturalists, it may be ascertained to be impracticable to apply the ordinary principles of Surveying the public lands to these tracts without producing great confusion and embarrassment to the Settlers in dividing their improvements among tracts different from those designated by the original entry.

Rather than Subject this meritorious class of our citizens to anticipated embarrassment of such a character, I would prefer an application to Congress for such (dispensation) of, or departure from, the ordinary mode of Surveying as would Secure to each individual the boundaries of the particular tract or quantity of land which he had under cultivation, and believed to be his own, although the quantity might either rather exceed, or be a little less than than for which payment was made to the United States, and leaving any excess or deficiencies to be Settled and arranged according to the circumstances of the case. —In this way each individual would Secure his farm, *and* no injury whatever result to the public survey.

I therefore have to refer the whole subject back for your further consideration and report.

Very respectfully
Ethan A. Brown

This letter is significant because Brown was attempting to come to grips with the "bona fide rights of claimants." The exteriors of the two-mile blocks had been surveyed by the government but not subdivided by actual survey into four sections. Entries were made and the lands occupied, but some public land still remained. If the settlers had these sections surveyed and subdivided according to law, shouldn't the county surveyors' work stand, even if the lines might be located in a slightly different place by a government survey at this time? Even if the blocks hadn't been subdivided by a surveyor, the people had improvements established probably in good faith. Should conditions acceptable to the settlers be now disturbed by a government survey made strictly according to the law? Brown realized that he probably did not have authority to give away any rights of the government; therefore, such authority would have to be given by an act of Congress. Just as Hayward, Brown's predecessor, tried to deal with the touchy matter of resurveys on April 10, 1831, Brown was trying to come to a decision on the matter of occupancy in good faith based on a valid entry and patent. Unfortunately, no evidence was found on how the problem was resolved.

The year 1835 would prove to be a landmark year in the execution of the rectangular public land surveys. William A. Burt invented his "True Meridian Finding" instrument, since known as Burt's Solar Compass. Burt had contracted for public land surveys in Michigan beginning in 1833 and found that iron ore deposits made needle compass surveying nearly impossible. He invented his solar attachment and in 1835, had it built by William J. Young of Philadelphia. It was patented on February 25, 1836. He used it on surveys in Michigan in 1835 and thereafter. The Burt Solar Compass made possible the accurate extension of the rectangular system of surveying in the iron ore regions and throughout the western United States.

The *Act of April 20, 1836,* 5 Stat. 10, created the Territory of Wisconsin, most of the old Michigan Territory lying west of the present boundaries of the State of Michigan. The Surveyor General at Cincinnati remained responsible for the public land surveys in the new territory.

On May 6, 1836, Edward Cross was notified of his appointment to be Surveyor General at Little Rock, replacing Conway.

On May 14, 1836, Daniel Dunklin was notified of his appointment to be Surveyor General of Illinois and Missouri at St. Louis, replacing Langham.

On June 3, 1836, Henry S. Foote was notified of his appointment to be Surveyor General of the Lands South of Tennessee. The letter ordered him to retrieve the records and reopen the office at Jackson, Mississippi.

The *Act of June 15, 1836,* 5 Stat. 49, provided for the admission of Michigan to the Union. The south boundary was fixed as the Harris or northerly line, surveyed in 1817. Michigan was admitted January 26, 1837.

Also on *June 15, 1836,* 5 Stat. 50, the State of Arkansas was admitted to the Union, reduced to the area within her present boundaries.

The *Act of July 4, 1836,* 5 Stat. 107, drafted by Brown, reorganized the GLO. It says, in part:

> "That from and after the passage of this act, the executive duties . . . appertaining to the *Surveying* and sale of the public lands . . . shall be subject to the *Supervision* and *Control* of the Commissioner of the General Land Office . . ."

Sec. 2 of the act authorizes appointment of a "Principal Clerk of the Public Lands" and a 'Principal Clerk of Private Land Claims." The third section provides for a:

> "Principal Clerk of the Surveys, whose duty it shall be to direct and superintend the making of surveys, the returns thereof, and all matters relating thereto, which are done through the offices of the Surveyor General; . . ."

Secs. 4 and 5 of the act provide for a Recorder of the GLO and a Solicitor to provide the Commissioner with legal advice. It makes clear that the Commissioner was the boss, although the Principal Clerk of Surveys handled most of the surveying problems.

John Moore was appointed to the position. Most of the instructions and letters to the Surveyors General and the public relating to surveys were written by the Principal Clerk and signed by the commissioner.

This act brought the public land surveys under a tighter control by the officials in Washington who did not institute any drastic reforms immediately. But the act did let everyone know who as in authority, and made into law those reforms which Elijah Hayward had made unilaterally. The Surveyors General continued in a semi-autonomous role, even though the Commissioner had more control.

THE PERIOD 1836 — 1849

The public land sales were at a peak in 1836. In 1883, Donaldson reported that the revenue from public land sales in 1836 exceeded 25 million dollars. Many of the States were

deeply in debt, caused primarily by canal-building projects. Attempts were being made in Congress to have the public lands ceded to the individual states or to sell them to the State at very nominal prices. None of those proposals succeeded. These same efforts are being made today with the so-called "Sagebrush Rebellion." It was also a period of rapid expansion in settlement of the West.

On October 21, 1836, James Whitcomb was appointed Commissioner of the GLO. Brown retired on October 31. John Moore was Acting Commissioner until Whitcomb took charge about December 12, 1836.

The subject of accretions came up in a letter dated March 6, 1837, to Daniel Dunklin at St. Louis. The previous Surveyor General, Langham, had let a contract to a "Mr. Talcott" for the survey of accretions formed in a lake located in sections 10 and 15, T. 39 N., R. 14 E., Third Principal Meridian, Illinois. The accretions may have been lands formed by reliction. Talcott had surveyed the accretions as additional lots in front of the meander line of lots already platted in the original survey. The following statement is extracted from Whitcomb's letter:

> "How your predecessor could issue instructions for the survey under these circumstances, and what appears still more inexplicable, how he could permit such separate fractions to be annexed to the sections, contrary to the surveying laws and general instructions from this office, which do not recognize of subdivisions like those presented by this plat remains yet to be explained. You will at once see the propriety of continuing to withhold your approval of this survey and of course the payment of Mr. Talcott's account should he apply for it, until such time as this business can be thoroughly examined."

From the very beinning of the rectangular surveys the survey of accretions in front of patented lands was not allowed. The so-called "Batture Case," *New Orleans vs. United States,* 35 U.S. 661, had been decided in the U.S. Supreme Court in 1836. That case dealt with the ownership of levees and accretions fronting the City of New Orleans; the Federal government claimed those lands and so did the City, however, the Federal government lost the case. In the decision, the following often-quoted statement was made:

> "The question is well settled at common law that the person whose land is bounded by a stream of water which changes its course gradually by alluvial formations, shall still hold by the same boundary, including the accumulated soil. No other rule can be applied on just principles. Every proprietor whose land is thus bounded is subject to loss by the same means which may add to his territory; and as he is without remedy for his loss, in this way, he cannot be held accountable for his gain.
>
> This rule is no less just when applied to public, than to private rights. The case under consideration will illustrate the principle."

The Batture Case was almost a test case because as a policy based on common law, the government didn't try to claim accretions to patented land.

Reliction and avulsions were another matter, as will be seen later. The GLO did claim relicted lakes and on occasion, the dried-up beds of rivers left vacant by avulsion.

Whitcomb wrote instructions to Lytle in Cincinnati on May 8, 1837, for the extension of the rectangular surveys in northern Michigan. Lytle was to contract for the completion of all townships south of Thunder Bay and south of a line drawn west from the source of the Thunder Bay River. He was to extend the Michigan Meridian north across the Strait of Michilimackinac onto the northern peninsula. A Standard Parallel was to be run due east and west from a township corner about midway between Thunder Bay River and the strait. Another Standard Parallel was to be surveyed due east and west from a township corner on the Meridian, in such place that it would remain north of Lake Michigan and south of Lake Superior. All of the exterior boundaries of the townships were to then be surveyed, but to stay back from the Wisconsin-Michigan boundary until it could be surveyed. Only those townships containing "valuable land" that people would "readily purchase" were to be subdivided. The Surveyors were to report the townships containing valuable land when they did the exteriors.

What is significant about this letter is the first clear use of the term "Standard Parallel." Before this time, the use of the terms "Correction Line, Basis Guide Line," and others had been used. During Ethan Allen Brown's short tenure, the policy of subdividing only the valuable townships had been established and Whitcomb continued it. This was purely an economy measure to make best use of the money available to survey those lands that people would quickly purchase.

The surveys in Michigan weren't extended immediately. In October 1837, Robert Lytle became ill. Samuel Williams acted as Surveyor General at Cincinnati until Ezekial S. Haines was appointed and assumed his duties on June 15, 1838.

On May 22, 1838, Volney E. Howard was notified of his appointment to be Surveyor General at Jackson, Mississippi, as Henry S. Foote had resigned.

On *June 12, 1838,* 5 Stat. 235, the Iowa Territory was divided from the Territory of Wisconsin. The new territory included all the lands in the former territory lying west of the Mississippi River. On the same date, *June 12, 1838,* 5 Stat. 243, Congress authorized the appointment of a Surveyor General for the Wisconsin Territory with no mention of Iowa. Albert G. Ellis was appointed Surveyor General on July 3, 1838, and established his office at Dubuque, Iowa, in February 1839; he was actually in charge of surveys in both Iowa and Wisconsin.

In November 1839, Haines at Cincinnati turned over the Wisconsin records to Ellis. Some private land claim surveys had been made in Iowa, beginning in 1832. The Fourth Principal Meridian had been extended into Wisconsin in 1831. William Burt had extended the Fifth Principal Meridian via offsets into Iowa in 1836 and 1837. All Ellis had to do was extend and expand the existing surveys in Wisconsin and Iowa whenever the expansion was authorized. No new principal meridians and baselines were established until 1851.

Another act passed on *June 12, 1838,* 5 Stat. 244, directed the Surveyor General of Ohio, Indiana, and Michigan to have the State boundary between Michigan and Wisconsin on the Upper Peninsula surveyed. But the boundary couldn't be surveyed as described in the *Act of June 15, 1836,* 5 Stat. 49.

Nothing was done about the boundary until 1847.

On July 20, 1838, Whitcomb sent a circular letter to all Surveyors General inquiring whether they were using "Tract Books" to record the entries and sales being sent to them by the Registers and Receivers, and whether it was necessary to continue the practice. This is the first mention of tract books in the correspondence. There can be no doubt that the Registers and Receivers used tract books at an early date to record entries, sales, and patents when they first came into use. That the Surveyors General kept them is very doubtful, but the use of tract books was continued in the land offices until the change to Master Title Plats in the 1960's.

By letter dated August 16, 1838, signed by John Moore, Richard D. C. Collins was appointed Surveyor General at Little Rock, Arkansas, "until the end of the next session of the Senate." On November 7, 1838, David Fulton was notified of his appointment as Surveyor General of Arkansas.

The *Appropriations Act of March 3, 1839,* 5 Stat. 449, broke the then traditional limit of $3 or $4 per mile for the execution of the public land surveys. It provided that up to $8 per mile could be paid in Louisiana, and was caused by the inability of the Surveyor General in Louisiana to get deputies to do the work for $4 per mile. From 1839 until the beginning of the direct system in 1910, the maximum allowance per mile varied, reaching as high as $20 per mile in Utah, and up to $25 per mile in the West Coast forests.

On February 5, 1839, Haines wrote to Whitcomb, replying to an inquiry made on January 15, 1839, about islands in the Grand River, in T. 8 N., R. 16 W., Michigan Meridian. The situation was that the part of the township south of the river had been surveyed in 1832 by William Mullet and the south bank of the river meandered. Lands were sold in the fractional sections bounded on the north by the river. In 1837, the township was completed; the section lines were extended across the river to complete the sections, the north bank was meandered, and islands in the river were surveyed, lotted, and areas returned on the 1837 plat. The islands were advertised for sale; the purchaser of adjacent lands south of the river claimed the islands belonged to him out to the center of the river. Haines rejected that allegation, sent up an enlarged plat of the islands to Whitcomb, and in his letter made the following statement:

> "It has been the invariable practice of this office, where islands have not actually been embraced *within* the survey of fractional sections fronting them to consider and hold such islands as reserved from survey,—the property of The United States, and subject at any future time to be surveyed and sold by the Government. Instances of the survey and sale of islands in our navigable rivers, are of very frequent occurrence. And where they are clearly shown to be *excluded* from the fractional sections by the original surveys, the property of The United States, in those islands, and the right of the Government to survey and dispose of them, has never been, so far as I am informed, disputed."

On February 15, Whitcomb replied, accepting Haines' report and agreed with him in every respect. The policy of the government concerning such unsurveyed islands as stated by Haines in 1839 is still the same today—they remain the property of the United States until surveyed and sold.

On March 14, 1839, William Milburn was notified of his appointment to be Surveyor General of Missouri and Illinois at St. Louis to replace Dunklin who had resigned.

A letter to David Fulton in Little Rock dated April 25, 1839, dealt with the size of the plats. Fulton's draftsmen were making the plats on paper 19 x 27 inches and leaving off the letters around the outside margin. Whitcomb instructed him that the standard plat size was 16 x 21 inches and that they had to put the alphabetical letters, Aa, Bb, Cc, etc., around the exterior of the townships because those letters were used to index the descriptive notes.

A circular letter of October 1, 1839, requested all Surveyors General to report their place of birth to the Commissioner. What prompted the request for such information is unknown, but the Surveyors General had to report their birthplace from then on, and in later years, the birthplaces of the clerks and draftsmen.

By letter dated February 5, 1840, George W. Jones was notified of his appointment to replace Ellis as Surveyor General of Wisconsin and Iowa.

In March 1840, the land owners in T. 33 N., R. 11 E., Second Principal Meridian, Noble County, Indiana, petitioned Commissioner Whitcomb for a resurvey of their lands and alleged that the original survey was grossly in error and fraudulent.

Whitcomb addressed the following letter to Haines on March 28, 1840:

> Sir,
>
> I herewith enclose a copy, marked A, of a petition which reached this Office through the Hon. Wm. Rariden, from the citizens of Noble County, Indiana, relative to certain alleged irregularities and errors in the original Survey of the Section lines in township 33 North Range 11 East of the 2nd prin. mer. and praying for a resurvey of the same.
>
> It being designed as soon as practicable to take up the whole subject relating to the subject of lost corners, errors in the original Surveys, etc. with a view of obtaining the opinion of the Attorney General on the several points involved and of determining on Such general rules as shall be found applicable to the different cases before any definite action is had. I will thank you at your earliest convenience to report such facts to this Office as may be in your possession relative to the original survey of the township in question accompanied by your views as to the proper course to be pursued and to explain what has been the practice of your office under the surveying laws in such cases and likewise in those referred to me in the following communications from your office, to wit:
> of the 23rd May, 1834 & 20 & 22nd December 1837, 12th June & 13th July 1838 and 20th August 1839, all relating (with their enclosures) to alleged defective surveys in Ohio, Michigan and Indiana.
>
> I deem it proper to state that according to the present impressions of this Office as to the power of the Department for making resurveys, and the manner in which the same shall be made, the following General positions are I think tenable subject however to such modifications as further enquiry into the subject may render proper and necessary.

1st. That errors in the Surveys of lands *patented* cannot be corrected without the Authority of Congress and a special appropriation.

2nd. That errors in the calculations of the contents, measurements, or boundaries returned on the plats of Survey admit of examination and correction if discovered in time, that is before the patents for the lands are issued, and in making the corrections when examinations in the field notes become necessary, the original marks must govern the Survey more especially in retracing the boundaries of any adjoining tracts which may have been patented.

3rd. That when the original marks have been obliterated or cannot be found in the field, it will be competent for the Department on the fact being made known, to have them restored so far only as the lands have not been patented and in such cases, the nearest original marks must be taken and worked from in conformity with the plat and field notes of the old Survey.

4th. That in the case where double corners may have been inadvertently marked in the field by suffering an incorrect mark to remain, the true corner to be identified by measuring according to the field notes of survey from the nearest original marks.

5th. That in case of a disagreement between the measurements returned on the plat and the actual distance found by measuring in the field between two adjacent original marks as for instance from a mile to a half mile corner the excess or deficiency to be equally divided.

6th. That in the case of an accretion or diminuation occasioned by the change of the bed of a navigable river or other Water a resurvey may be ordered at any time before the land is patented.

I am Sir Very respectfully
Your Obt. Servant
Jas. Whitcomb

In Haines' reply, he agreed that although the original field notes and plat returned a complete survey and monumentation, the survey was no doubt fraudulent. Haines pointed out that the lands were all sold and that a resurvey ought not be made without the consent of the proprietors of those lands. He cited the *Act of February 11, 1805,* which fixed the corners, lines, and areas as returned by the Surveyor General. Haines believed that such a correction survey could not be made unless government lands were involved but left the decision up to Whitcomb.

This exchange and Whitcomb's list of general positions are significant because they were a first attempt to lay down some rules to govern resurveys and restoration of lost or obliterated corners. They clearly state the Department's position on doing resurveys of public lands before the lands were patented.

The *Act of June 12, 1840,* 5 Stat. 384, provided for the discontinuance of the Surveyor General's Office and transfer of records to the State whenever the public land surveys were completed within a State.

On February 19, 1841, Haines sent Whitcomb a plan for the extension of the rectangular surveys into the Upper Peninsula of Michigan. The line between ranges 3 and 4 west was to be extended across the Straits of Mackinaw to the line between townships 42 and 43 north. The fourth correction line would then be extended east and west to control the surveys on the peninsula. The plan was approved and on April 1, 1841, Haines contracted with William A. Burt for the survey of the township boundaries and then reported that Burt was chosen for the surveys because the lines would be run with the solar compass. Haines recommended that the instrument be used on all surveys in Upper Michigan including section lines.

On March 26, 1841, Whitcomb wrote to Haines saying that Surveyor General Fulton in Arkansas was having trouble with "local attraction" to such a degree on the Sabine River that he had to relinquish the contracts for approximately 1,000 miles of lines. Fulton had heard from Judge Burt about Burt's "Sun Compass" and wanted to know of its availability. Whitcomb asked Haines for a full report on the instrument. But on April 17, 1841, William Pelham was notified of his appointment to replace Fulton at Little Rock, Arkansas.

On April 20, 1841, Benjamin A. Ludlow was notified of his appointment to replace Volney E. Howard as Surveyor General at Jackson, Mississippi.

On April 27, 1841, Silas Reed was notified of his appointment to replace William Milburn at St. Louis, Missouri.

On May 4, 1841, notification went to James Wilson at Keene, New Hampshire, that he was appointed Surveyor General of Wisconsin and Iowa, replacing Geo. W. Jones at Dubuque, Iowa.

On June 8, 1841, Whitcomb wrote to Ludlow giving him the "what for" for having let contracts for resurveys in Mississippi and for "advancing" money to the deputies before the work was done. Whitcomb reiterated the policy of prior approval for resurveys, especially of townships already opened to market, and that deputies couldn't be paid until after the surveys had been completed, examined, and approved.

The Surveyors General at that time only had to send a copy of the contract to the commissioner; no prior approval of contracts per se was required. But there was a terrible lack of communication between the Commissioner and Surveyors General. Whitcom had quite clearly told Haines of the existing policy on resurveys but did not send that same policy decision to the other Surveyors General.

Circulars, official departmental policy decisions, and regulations were routinely used. Why an important policy, such as resurveys, was not distributed is not known.

On June 25, 1841, Francis D. Newcomb was notified of his appointment to be Surveyor General of Louisiana, replacing Henry T. Williams. Newcomb was discharged in 1845 and was tried in 1846 on charges of fraud in connection with fraudulent surveys and illegal payments to deputy surveyors.

On July 3, 1841, Elisha M. Huntington was appointed Commissioner of the GLO. On July 7, 1841, Huntington sent Haines' report on the Burt Solar Compass to all Surveyors General and recommended the instrument should be put to use in all the surveying districts. It wasn't, however.

On *September 4, 1841,* 5 Stat. 453, Congress passed the

General Preemption Act and provided for distribution of proceeds from the public land sales to the public land States.

The public land sales had brought large sums of money into the Treasury, producing a surplus. The government was out of debt and had money in the bank. The act provided that 10 percent of the net proceeds of public land sales would be distributed to the states involved and also granted each public land State 500,000 acres of land "for internal improvement." The lands granted were to be selected in not less than half-section units.

Settlers were granted the right of preemption on surveyed public lands, by legal subdivisions, not exceeding 160 acres or a quarter section. If two or more persons claimed preemption on the same quarter section, the one first occupying the land had first right. The settler had to pay for the land at a fixed price of $1.25 per acre.

The surveyed land provision of the act was changed to either surveyed or unsurveyed lands in 1842, but purchase and patent could not take place until after the lands were surveyed. Selection could only be by legal subdivisions.

On September 7, 1841, J. C. Brown was notified of his appointment to be Surveyor General at St. Louis, Missouri, replacing Silas Reed. Brown didn't last long because on March 18, 1842, a letter went to Silas Reed reappointing him to the position, so Reed was out of the job for only six months.

On October 28, 1841, John Moore, Acting Commissioner, wrote to Weakley at Florence, Alabama, about the retracement of lines in southern Alabama to replace the notes lost in the 1827 fire. Moore stressed that the work was a retracing of the old lines, not a survey as such, that all old corners had to be honored, and that the old marks on bearing trees were not to be altered, but that the letter "R" might be added to show that the tree had been recorded during the retracing.

Also on October 28, 1841, William Burt reported to Haines in Cincinnati that he had completed his contract. He had surveyed 1,100 miles of line and had made topographic, geological, and weather observations in the Upper Peninsula of Michigan. Apparently Burt was to make these observations as part of his contract; he would then have been the forerunner of what would one day become the United States Geological Survey (USGS).

On March 21, 1842, Valentine Y. Conway was notified of his appointment to be Surveyor General at Tallahassee, Florida, replacing Butler, who had held the job since its establishment in 1824.

On February 21, 1842, Huntington sent a "Joint Resolution of the Legislature of the State of Michigan" to Ezekial S. Haines, in which it was alleged that in approximately 80 townships, north of Saginaw Bay, in Michigan there were "great imperfections." The resolution requested that resurveys be made by the government. A deputy who had surveyed some of the townships admitted that they weren't done according to law and instructions. Haines was raked over the coals and told to make a full report of the situation and explain why he had let fraudulent surveys be made.

Haines replied on March 4, recommending that an experienced deputy be contracted with to investigate the surveys on the ground and report the conditions so that a decision could be made based on facts. Any township found defective should then be resurveyed at the expense of the original deputy or his sureties. In reality, Haines had no way to enforce the last suggestion.

On April 2, 1842, Huntington again wrote to Haines, approving of his suggestions and ordered the investigations made. He expressly cautioned Haines that no old corners could be disturbed, that those corners had to stand wherever lands were entered or patented. Huntington wanted the investigative report quickly so that he could "withdraw from market" those townships which were defective but in which no entries had been made.

These investigations of the Saginaw Bay townships continued at least into 1843. They were originally surveyed by J. A. Rousseau in 1837, 1838 and 1839; by W. R. Coon in 1839; G. W. Reilly in 1838 and 1839; and G. W. Gist in 1839. The main block was located in townships 15 through 26 north, range 2 east, and east thereof to Lake Huron and Saginaw Bay. The bulk of the investigations and reports were made by William A. Burt. The cost of the resurveys, which were largely retracements, was paid by special appropriations made by Congress. These resurveys were begun in 1844 and the solar compass was the required instrument to be used, which was spelled out in each contract.

On May 19, 1842, Thomas H. Blake was appointed to replace Huntington as Commissioner of the GLO.

On July 22, 1842, William Johnston replaced Haines as Surveyor General of Ohio, Indiana, and Michigan.

On April 4, 1843, Blake issued the *Annual Instructions* to Wilson at Dubuque, which were much more elaborate than those issued by previous Commissioners to the Surveyors General. Wilson was instructed to extend the surveys in Wisconsin and Iowa, contracting only for exterior boundaries, and then for the subdivisions of those townships that contained land which would readily sell when put on the market. Blake stressed that contracts should be no larger than what a deputy could complete in one field season, which was approximately 15 townships.

It was about this time in the history of surveys that the policy was firmly established of letting contracts to one deputy for the survey of exterior township lines and to another deputy for the subdivisions. The theory was that the subdividing deputy would be controlled by the previous survey and the subdivisions would be a check of the correctness of the boundary work, thus preventing frauds and gross errors from snowballing. But this idea didn't work; the deputies didn't blow the whistle on each other.

On June 5, 1843, Alexander Downing was notified of his appointment to be Surveyor General of the Lands South of Tennessee, at Jackson, Mississippi, replacing Ludlow.

Two letters went to Silas Reed, Surveyor General of Illinois and Missouri in 1843, dealing with false meanders which were a real problem, especially where lands were already patented along them. A letter to Reed dated July 12, 1843, follows:

> Sir,
>
> I have to acknowledge the receipt of your communication of the 21st Ult., accompanied by a diagram, explaining certain errors just discovered in the original survey made by Chas. W. Pelham, in 1832 of fract. township 22 N., of R. 20 W. of the 5th principal merid-

ian, Mo., south of white River by which it would seem that the river in said survey is represented a considerable distance South of its true position, leaving a body of unsurveyed land south of the river, & requesting instructions from this office, since a part of the lands situated on the river have been sold by the existing plat.

In reply I have to state, that it will not be expedient or proper to change the old Section lines and marks of the Survey South of the river, according to which the titles to the lands sold have become vested. You will therefore direct your Deputy to retrace the original Section lines as far as necessary, and return correct measurements thereof, from which you will calculate the true contents; he will likewise extend the section lines to the true river through the unsurveyed portion, after which you will transmit correct maps to this office & to the Register.

As regards the half, the quarter, & the quarter quarter sections which have been sold with the false river as one of the boundaries, you will return them on the new plats without regard to the false meanders only preserving the same subdivision lines, extended if necessary.

I am very respectfully
Your Ob. Serv.
Thos. H. Blake
Commissioner

The Batture Case was having its effect. Blake was ruling that once lands were patented fronting along a meander line, the patentee held riparian rights on the river regardless of the fact that it was in a false position. The surveyor General could only correct the survey of those lands which were still owned by the government. But the last paragraph is significant; it says that the section and section subdivision lines of the sold lands are to be extended to the true meander line. Blake was treating the false meander line as an error rather than as fraudulent in the philosophy described in Sections 7 through 94 of the *Manual of Surveying Instructions, 1973*. But the dividing lines were extended to the true meander line because the idea of partition lines hadn't yet been very well developed. In fact, many local and State court decisions then and later were based on the same idea—to extend the lines to the true water boundary.

On November 7, 1843, Reed made his annual report to the Commissioner, part of which dealt with false meanders. On December 5, 1843, Blake replied in the following segment:

"That part of your report particularly attracted my attention, in which you speak of the "Surveys of unfinished lines in Illinois and Missouri". You state, that "the Surveyors up to 1832, or thereabouts, on leaving the uplands and descending into the extensive bottoms which skirt those rivers, were frequently in the habit of meeting with marshy grounds, small lakes or sloughs connected with the stream, of stopping short of its true bank, and making their meanders as though they were upon the real bank of the river". "In many instances they have left unsurveyed a rich, dry, and well timbered strip of land, of from one half to three quarters of a mile, between the river bank and these low grounds." This strip you state, has been surveyed for a considerable distance on the right bank of the Illinois, and left bank of the Mississippi. On the 18th March last, you were advised, that unfinished surveys could be completed, where it was perfectly clear that title to the land was still in the United States, but that "great caution must be observed not to survey lands, the title to which is no longer in the U. States." I presume that the surveys to which you refer, have been made strictly in accordance with this suggestion, otherwise, much difficulty may grow out of them, as every owner of a tract of land represented upon the township plats as bounded by a river is entitled to the river front, whether the original survey of his tract extended to the river or not."

Very respectfully
Your Ob't Serv.
Thos. H. Blake
Commissioner

There were clearly two different problems to be confronted. The first was erroneous meanders, those in which the original surveyor had probably just guessed at where the meander lines were between actual section line crossings but had set meander corners on the true bank on the section lines. The second was a meander line run in fact, but along the edge of the river bottom, edge of the upland, or edge of the flood plain, leaving a large area between the meander line and true bank of the river. These lands were in fact what we call today "omitted lands," omitted from the original survey due to a fraudulent or grossly erroneous meander line. The two situations are similar but not exactly the same. However, the concept of omitted lands hadn't been developed yet and Blake treated them all in the same manner as accretion, again due to his interpretation of the Batture decision. Ironically, grossly erroneous and/or fraudulent meandering by the Deputy Surveyors did not cease in 1832!

On October 3, 1843, Blake notified Newcomb in Louisiana to move the Surveyor General's office from Donaldsonville to Baton Rouge, according to an order from the President. Newcomb moved the office, but the act creating that office stated that the Surveyor General was to be located in Donaldsonville; therefore, the move was technically illegal. Political flack ensued; the U.S. Attorney General rendered an opinion that the move couldn't be made. On March 14, 1844, Newcomb was ordered to return the office to Donaldsonville, Louisiana, and he complied; the office remained there until 1861.

In February 1844, Valentine Conway was ordered to and moved the Florida office to St. Augustine, Florida. He had been ordered to move the office in October 1843, but failed to comply.

The *Act of May 23, 1844*, 5 Stat. 657, was a general townsite law for lands occupied as a townsite. Townsite entry had to be made before the lands were put up for public sale and could not exceed 320 acres, taken by legal subdivision. The lands could be entered by appropriate authorities to be held in trust for the occupants.

The *Act of June 12, 1844*, 5 Stat. 662, abolished the Office of Solicitor of the GLO and directed that his duties be performed by the Recorder.

The *Appropriations Act of June 17, 1844*, 5 Stat. 681, contained the following clause, under Surveys of Public Lands:

"For surveying, with reference to mines and minerals, in that portion of Michigan south of Lake Superior, at a rate not exceeding five dollars per mile,... twenty thousand dollars."

On June 25, 1844, the Commissioner entered into a contract with Douglass Houghton, a Michigan State Geologist, for the rectangular survey of the township lines in Upper Michigan, from range 23 west and westward and north of the fourth correction line. The surveys were to be made "with reference to mines and minerals" and included 4,000 miles of township and section lines.

Surveyor General Johnston wrote the *Special Instructions* for these surveys. One provision was that the range lines along the correction line were to be 6 miles and 50 links apart, reflecting the policy already described that was used in Wisconsin to correct for convergency.

Houghton's arrangement with the Commissioner was actually to obtain knowledge of the mineral deposits, or in actuality a geological survey in conjunction with his work as a geologist for the State of Michigan. Houghton arranged a subcontract with William A. Burt and John Mullett for the survey of the township and section lines, while he did the geologic examinations. Apparently the rectangular surveys were being used as a means of paying for a geological survey at a slightly higher than normal rate per mile.

While Burt surveyed the township lines, Houghton and Mullet surveyed section lines and did their geology work as they progressed. The solar compass was used on all of this work. By the fall of 1845, over 40 townships had been surveyed in this manner. Unfortunately, Houghton and two of his boatmen drowned in a storm which wrecked his boat on October 13, 1845. The fatal accident occurred near Eagle River on Point Keweenaw, the most northerly protrusion of Upper Michigan into Lake Superior.

Lucius Lyon had replaced William Johnston.as Surveyor General at Cincinnati, June 30, 1845. Lyon reported the Houghton death to the Commissioner on October 30, 1845. In his following report dated November 10, 1845, Lyon made the following statement:

"The Solar Compass has been used with great satisfaction in all of the surveys of public lands in this State (Michigan) for some years past, and its introduction into general use would unquestionably promote the accuracy of the public surveys in all parts of the United States."

The surveys in Upper Michigan, "with reference to mines and minerals," were later carried on under contract with other deputy surveyors.

On September 20, 1844, a circular letter was sent to all Surveyors General directing them that thereafter all payments of contracts would be made directly to the deputies by the Treasury Department. After a contract was completed, the Surveyor General had to certify the correctness of the account and send it directly to the Treasury for payment.

The Commissioner didn't have enough manpower to handle all the account checking. If the billing was made directly to the Treasury, handling would be eliminated, which was purely an economy measure. The problem was that the Treasury people weren't surveyors and Treasury frequently paid the accounts without any knowledge of what they were paying for. It didn't take long for fraudulent accounts to be sent to the Treasury for payment. Newcomb in Louisiana jumped on the fraud possibilities almost immediately. The submitting of accounts direct to the Treasury was soon rescinded and were again submitted through the Commissioner.

A significant letter of that decade was sent to William Johnston on September 26, 1844, which contained clear instructions for the Dependent Resurvey of T. 1 S., R. 7 E., Michigan Meridian, laying down rules of double proportion for the restoration of lost corners. The entire letter follows:

General Land Office
September 26, 1844

William Johnston, Esq.
S. Gen'l, Cincinnati
Ohio

Sir:

I request your attention to the immediate resurvey of Township One South, of Range Seven East, in Michigan. The errors in the survey of this Township were made the subject of a letter from this to your Office, on the 8th June 1833, and again on the 9th May 1834 a petition signed by fifty one of the inhabitants of this Township was forwarded to the Surveyor General, with directions to have the matter adjusted in accordance with the principles laid down in the letter of 8th June 1833.

If the agreement by the settlers required by the Letter of 8th June 1833 has been obtained, it is well, but I do *not* consider it indispensable to the operations required of this and your Office. The land must be resurveyed, and for this service you will employ a Deputy in whose experience, skill and integrity you have the most implicit confidence, and if possible, one enjoying also the confidence of the Settlers in this Township. You will furnish the Deputy with the original field notes, of the survey of this Township, and direct him to make a thorough search for the old lines and corners, all of which, that can be clearly identified, will be reestablished. The lines and corners which cannot be found, must be established in Strict Conformity with the field notes, where practicable—working from the nearest original marks which can be found. But where it shall appear on running lines where neither the old lines nor corners can be found, that they will differ in length from those laid down in the field notes, the excess or deficiency must be apportioned among the Sections in just proportions; — for instance, — suppose that all of the lines of Sections 25 to 36, inclusive, of this Township are found in the field, and no other lines or corners, and the measurements in the original field notes show that each Section contained exactly 640 acres, or 80 chains square; — In running the trial or guide line from the North corner between Sections 25 to 26, due North to the North corner between Sections 1 and 2, it is found that this line, instead of being 320 chains long, is 340; — then the boundary of each Section on it, instead of being returned in the field notes as 80 chains, should be returned as 85. Where the boundaries of the Sections on

any such line are of different lengths, the length to be given to the boundary of either of those Sections, must be in proportion to the length of that boundary laid down in the field notes so, as the length of the entire last line now found by measurement, is to the entire length of the last line given by the field notes. The same course exactly will be pursued with the East and West lines, and the discrepancies will in like manner be apportioned, with this difference only, that where the true length of the Section boundaries on these lines, will, by a few links, either cross or fall short of the guide meridians laid down as before directed, those meridians should not be altered from a due North and South line on account of such a slight variation, — but where the variation will be important, the North and South lines must diverge from a straight line, till the extreme points, ascertained as above directed, of the East and West boundaries, of a Section, unite with those of the North & South boundaries and at the junction of their points the Section corners will be established in a permanent and durable manner, and the Section boundaries will be run and marked in straight lines between the corners thus established, taking care perfectly to eradicate all the trial or guidelines which may have been run, and in this way, whatever discrepancies exist will be equitably divided among the different Sections. In fixing the last half mile posts; the Deputy must in like manner, apportion the discrepancies among the quarter Sections, where the field notes show *that* the half mile stakes were placed exactly equidistant between the Section corners, they must be so placed between the Section corners found as above directed: — but where it would appear from the field notes, that the half mile stakes were not placed exactly equidistant between the Section corners, the discrepancies found must be apportioned as above directed. The original field notes will not be corrected, but any matter of correction must be entered in a new field book, which, when the work is finally completed, should be bound with the original field notes, and proper and distinct references made in *red* ink from the original to the corrected field notes, and vice versa. Ample and satisfactory security should be required of the Deputy for the faithful performance of his contract, and the Duplicate of his Bond, with a copy of his instructions, should be forwarded to this office. Corrected plats will also be forwarded to this office, and the District Office, when the work is completed. As the vested rights of a number of individuals may be affected by this resurvey, you *cannot* too earnestly urge upon the Deputy, the necessity for the utmost care and exactitude in executing it, — and in being governed by all the marks of the original survey, that can be clearly identified.

Very respectfully
Your Obt Serv
Tho. H. Blake
Commissioner

The principles laid down by this letter were those described in the "5th General Position" in the letter from Whitcomb to Haines on March 28, 1840, pertaining to the proposed resurvey of T. 33 N., R. 11 E., Second Principal Meridian, Noble County, Indiana. They also spelled out the principle mentioned in the letter of June 8, 1833, from Hayward to Micajah T. Williams when the petition was first made for the resurvey of T. 1 S., R. 7 E., Michigan. The wording of this letter for the method of double proportion is almost identical to that used in the 1930 and subsequent Manuals.

T. 1 S., R. 7 E., Michigan, was resurveyed by Hervey Parke in 1845. The plat of the original survey made by Wampler in 1819 is shown in Fig. 37. The 1845 resurvey plat is shown in Fig. 38. New areas were returned on the plat approved November 27, 1845 (see Fig. 39).

The *Act of March 3, 1845,* 5 Stat. 742, enabled Iowa and Florida to become States. After boundary adjustments, Iowa was admitted by the *Act of December 28, 1846,* 9 Stat. 117, with her present boundaries. That left a large part of Minnesota and the Dakotas unattached to any territory for almost three years. Florida, which had formed a government in 1838 and 1839 and petitioned for admission, was also officially admitted under this act.

The *Appropriations Act of March 3, 1845,* 5 Stat. 752, provided for the employment of assistant surveyors to supervise the survey of private land claims in Florida and resurveys in Louisiana. Funds were appropriated for extensive resurveys to correct erroneous and defective surveys in Louisiana, Illinois, Missouri, and Michigan.

Money was also provided for resurveys in Alabama to supply replacement for the field notes that were burned in 1827. This act also directed that the Surveyor General's office be moved from Cincinnati to Detroit and the records be turned over to the States of Ohio and Indiana.

On March 27, 1845, Charles A. Bradford, at Pontotoc, Mississippi, was notified of his appointment to be Surveyor General of Mississippi, replacing Downing.

On February 17, 1845, Conway in Florida reported an overlap of townships to the Commissioner along with a diagram of the situation. The Commissioner's reply, dated April 8, 1845, is complex and difficult to analyze without the original and corrective survey plats. Basically, it appears that a Deputy Wrightman surveyed Tps. 14 S., Rs. 17 through R. 20 E. The southern boundary of those townships was a basis parallel or standard parallel. Wrightman also surveyed Tps. 15 through T. 20 S., R. 19 E., and T. 20 S., R. 18 E. Deputy Clements had surveyed Tps. 15 through T. 19 S., R. 20 E., at a later date. Both the Wrightman and Clements surveys had been approved by Conway in 1843 and 1844, but no lands had been sold, for some unknown reason. Fortunately, Conway contracted with Deputy A. Worrall to retrace Clements' work. Worrall found that Clements' survey overlapped the Wrightman survey by approximately one and one-half miles in longitude and quarter mile in latitude. Commissioner Blake was very indignant about the whole thing and chastised Conway in strong language.

He instructed Conway to contract with a deputy to investigate the whole matter thoroughly and, if as reported, the Clements' surveys were to be terminated and closed against the Wrightman senior survey. All traces of Clements' work which overlapped into Wrightman's were to be destroyed after Clements' lines were retraced and closed against Wrightman, leaving fractional sections in Clements' work.

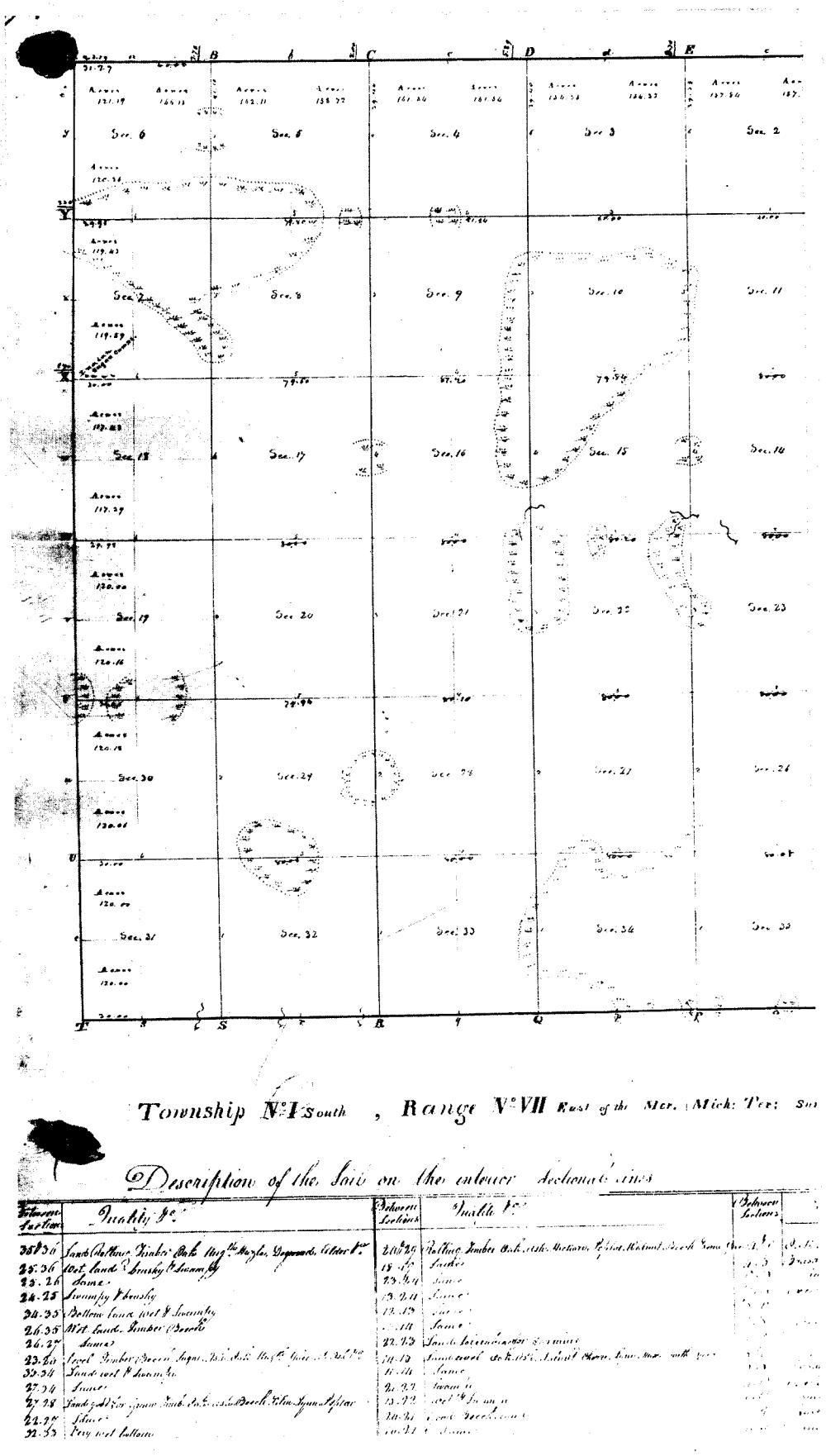
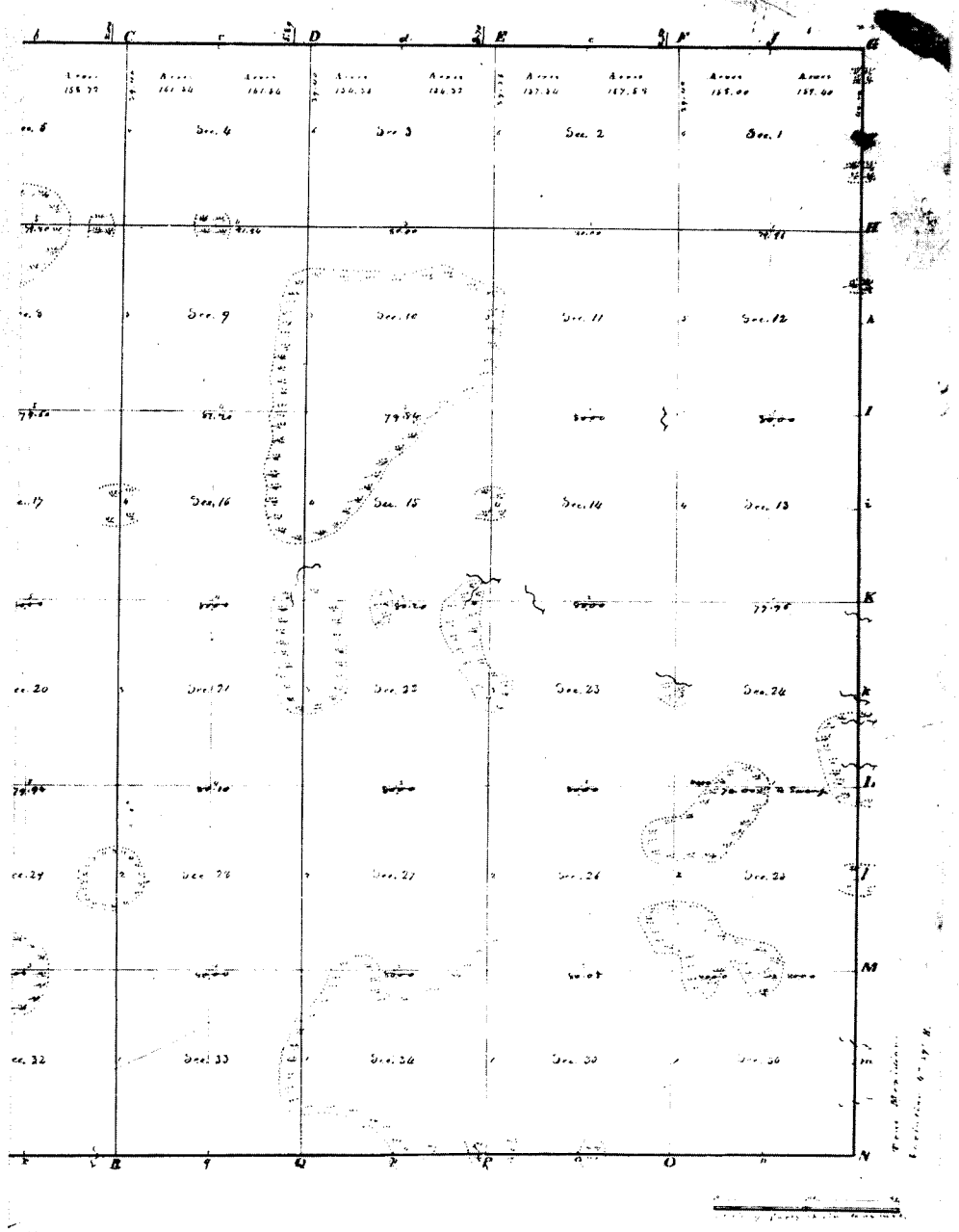


Figure 37. T.1S., R.7E., Michigan. Original Plat — 1819.



South , Range No. VII East of the Mer. Mich: Ter: Surveyed by Joseph Wampler. 1819.

the Soil on the exterior sectional lines

	Between Sections	Quality &c.	Between Sections	Quality &c.
[illegible] Alder &c.	20 & 29	Rolling Timber Oak, Ash, Hickory, Poplar, Walnut, Beech [illegible]	[illegible]	[illegible]
	18 & 19	Same	[illegible]	[illegible]
	23 & 24	Same	[illegible]	[illegible]
	13 & 14	Same	[illegible]	[illegible]
	12 & 13	Same	[illegible]	[illegible]
	[illegible] & 14	Same	[illegible]	[illegible]
	22 & 23	Land [illegible]	[illegible]	[illegible]
[illegible]	14 & 15	Land level Oak, Ash, Walnut, Cherry, Lime, Mix with [illegible]	[illegible]	[illegible]
	11 & 14	Same	[illegible]	[illegible]
	21 & 22	Same	[illegible]	[illegible]
[illegible] Aspen Poplar	13 & 22	[illegible]	[illegible]	[illegible]
	20 & 21	[illegible]	[illegible]	[illegible]
	10 & 21	Same	[illegible]	[illegible]

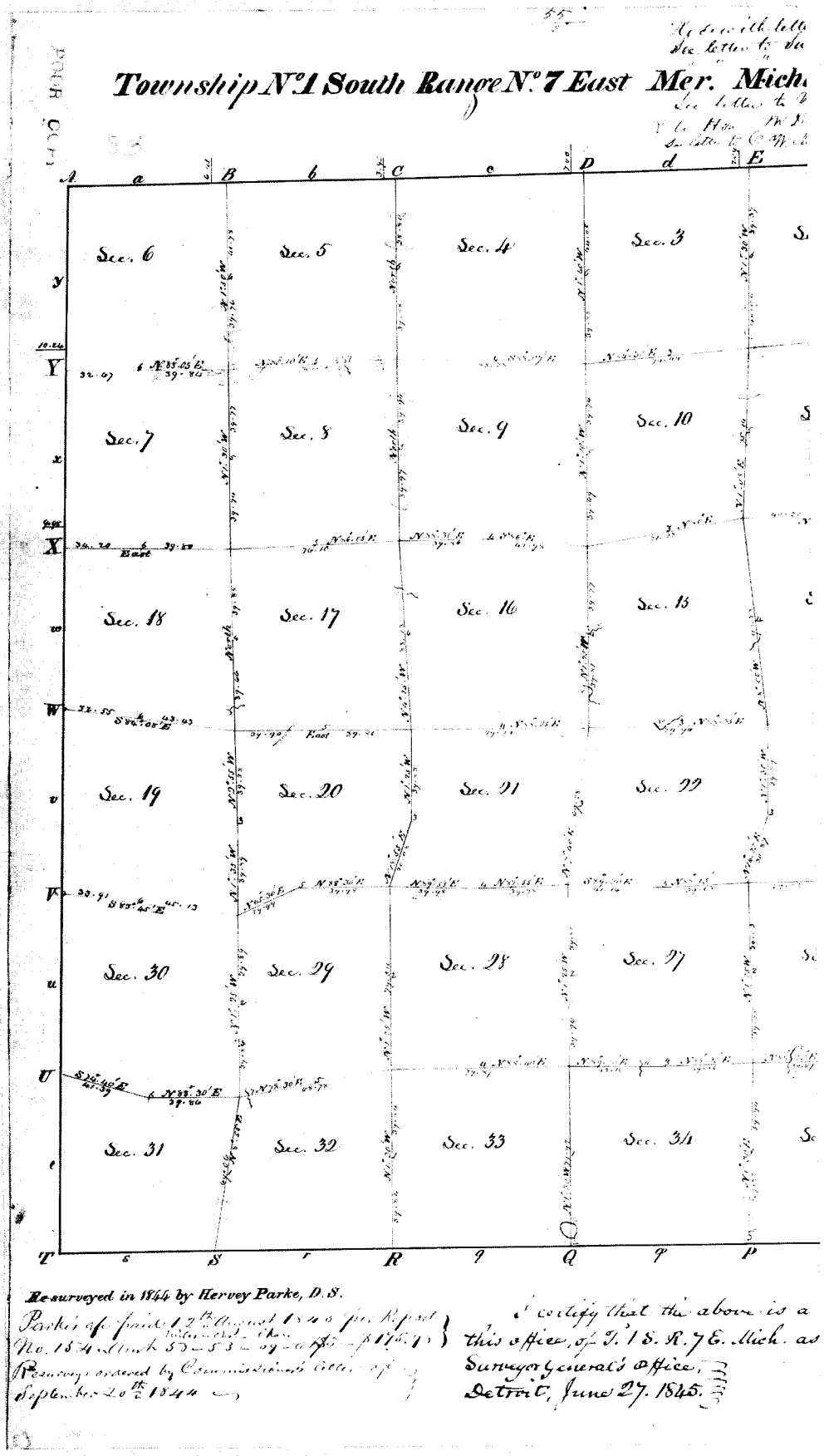


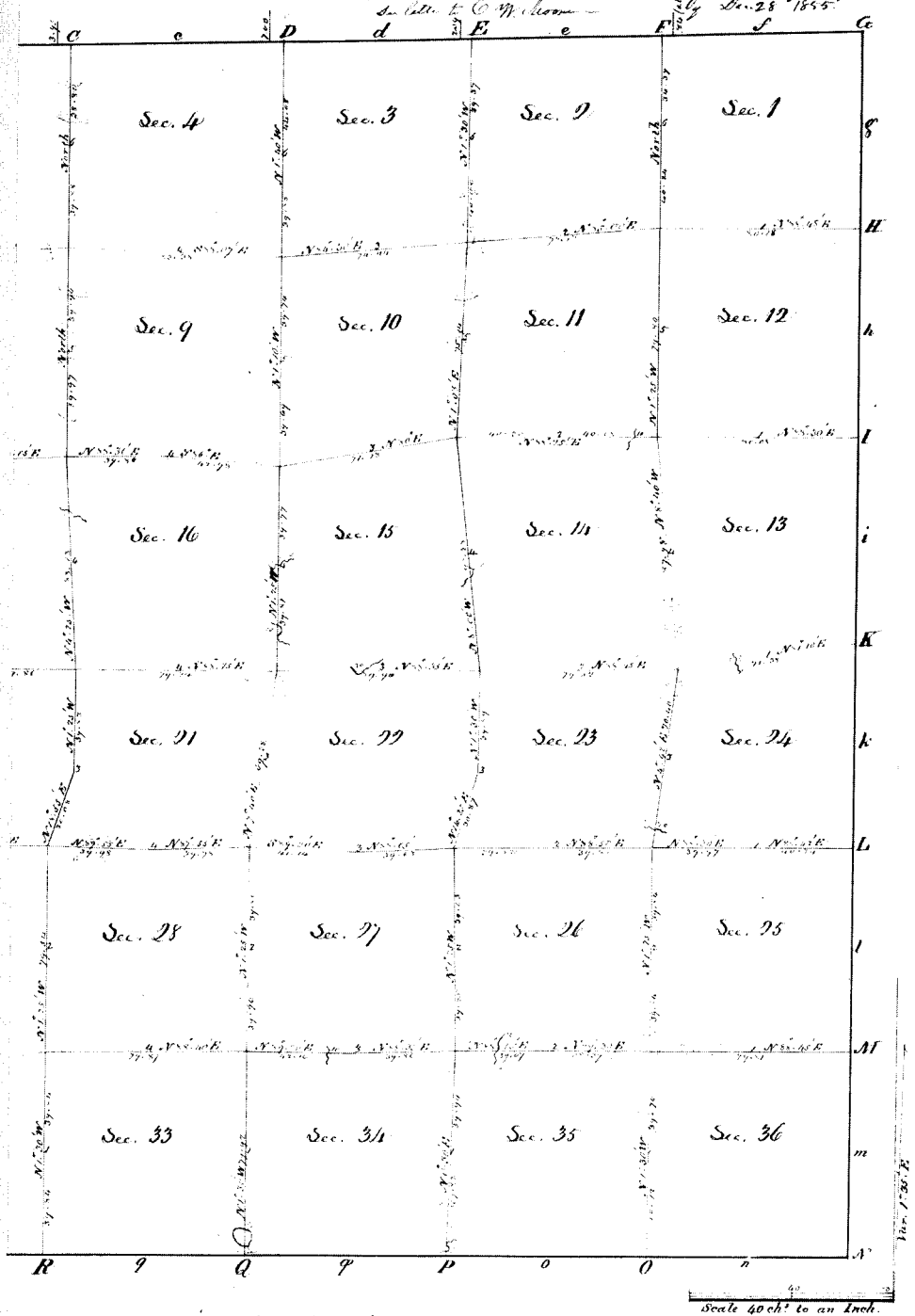
Figure 38. T.1S., R.7E., Michigan. Dependent Resurvey — 1845.

55

Rec'd with letter of Sur: Genl of 28 June 1845
See letter to Sur: Genl of — 30 July 1845
" " " " " 24 Dec 1845

outh Range No. 7 East Mer. Michigan.

See letter to Vice President of 1 Jany 1847
& to Hon. W. Duncan of 23 May 1848
See letter to C. W. Moore by Dec. 28 1855



Report 6 175.95

I certify that the above is a true copy of the map, filed in this office, of T. 1 S. R. 7 E. Mich. as re-surveyed in 1845, by H. Parke, D.S.

Surveyor General's Office,
Detroit, June 27. 1845.

William Whiston
Surveyor General.

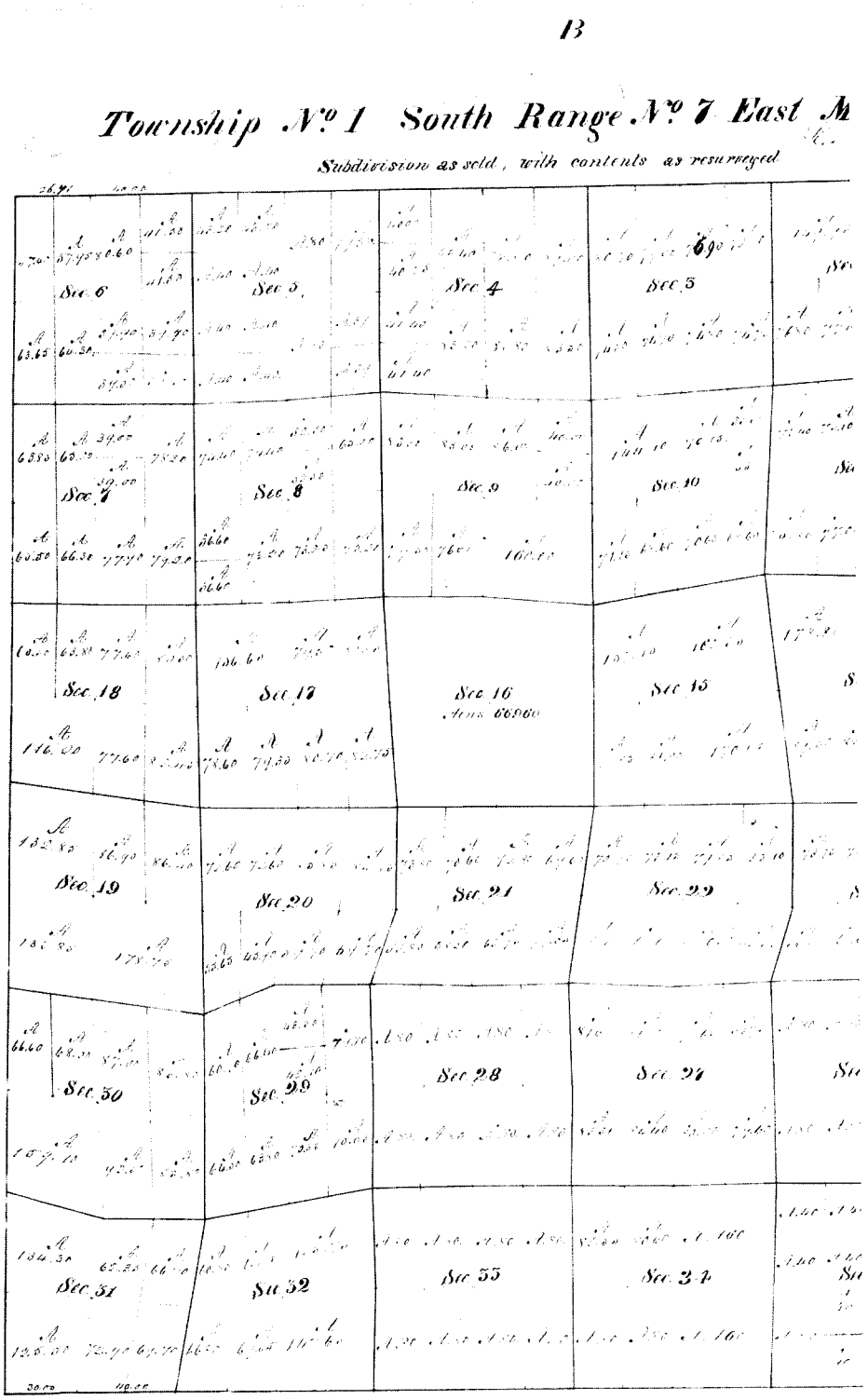
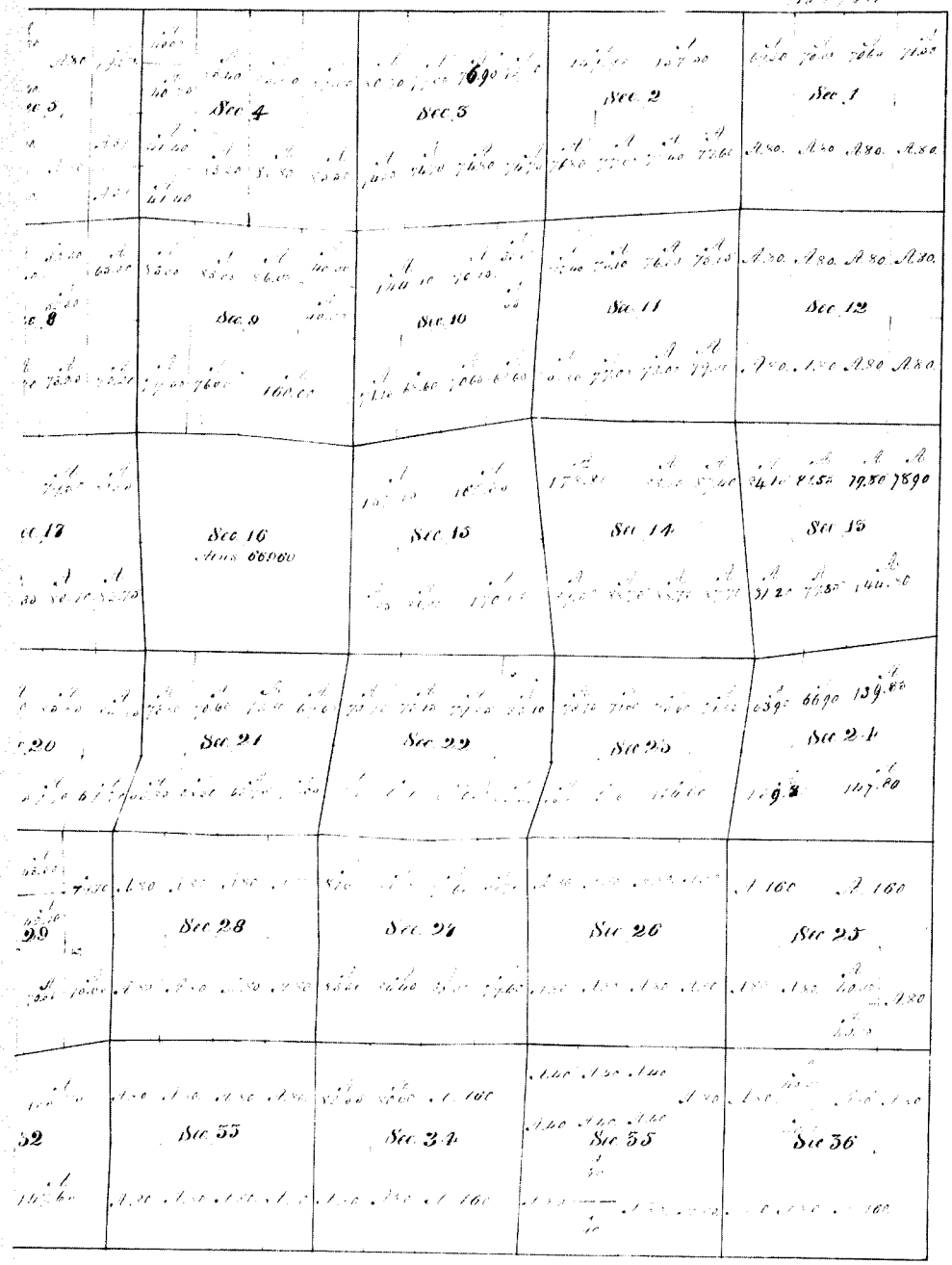


Figure 39. T.1S., R.7E., Michigan. New Areas for Resurvey.

B

No. 1 South Range No. 7 East Mer. Michigan

Subdivision as sold, with contents as resurveyed



I certify that the [illegible] of the [illegible] of the subdivision as sold of No. 1 South Range No. 7 East according to the resurvey by Harvey Parker, Deputy Surveyor, in 1844.

[illegible]
Detroit November 27th 1845

[illegible]

Sections 6, 7, 18, 19, 30, and 31 in R. 20 E. would cease to exist and sections 5, 8, 17, 20, 29, and 32 would be fractions.

Holding the senior survey and terminating the junior overlapping survey against it is still the general policy today wherever land ownership and patenting history permit that action.

On April 16, 1845, James Shields, a Democrat, became Commissioner of the GLO, the same Shields who had challenged an obscure lawyer and surveyor named Abraham Lincoln to a duel. Fortunately Lincoln talked him out of it.

By letter of April 21, 1845, Johnston was directed to close the office in Cincinnati and move it to Detroit, Michigan. He was to turn over the Ohio Survey records to the State of Ohio. The Detroit office was opened sometime during May or June 1845.

On May 12, 1845, George W. Jones was notified of his appointment to be Surveyor General of Wisconsin and Iowa at Dubuque.

On May 13, 1845, Frederick R. Conway was notified of his appointment to be Surveyor General of Illinois and Missouri at St. Louis, replacing Silas Reed. Also on May 13, 1845, Pierre T. Landry was notified of his appointment as Surveyor General of Louisiana.

On May 26, 1845, Lucius Lyon was notified of his appointment to be Surveyor General of Ohio and Michigan and thus ended the office known as "Surveyor General of the United States," which no longer existed in fact. Lyon did not take over the office in Detroit until June 30, 1845.

On July 24, 1845, Lyon was ordered to transfer the Ohio records if all the public lands in that State, especially islands, had been surveyed. The public land surveys hadn't really been thoroughly completed, but Samuel Williams, Chief Clerk, had been working on the records for some time, getting them indexed and boxed up; he turned the surveys over to the State of Ohio on August 11, 1845. Lyon reported that there were still many problems, uncompleted surveys, and field notes remaining. Sam Williams, who had been Chief Clerk for approximately 30 years, retired and did not move to Detroit.

On August 14, 1845, Robert Butler was notified of his appointment as Surveyor General of Florida, effective October 1 and until the end of the next session of Congress, replacing Valentine Y. Conway. Butler was appointed to a four-year term in January 1846.

On December 15, 1845, Lucius Lyon was instructed to contract for the resurvey of T. 33 N., R. 11 E., Second Principal Meridian, Noble County, Indiana. The resurvey was to be made according to the instructions for the resurvey of T. 1 S., R. 7 E., Michigan, which had been approved in June by Johnston. The citizens of Noble County finally got their survey after waiting only six years. The township was dependently resurveyed using double proportionate procedures.

During the latter half of the 1840's, more and more examinations in the field were made by Deputy Surveyors under instructions from the Surveyors General. Those examinations would prove to be largely fiction; just as a subdividing deputy seldom squealed on a fellow surveyor who did exterior boundaries, an examining deputy would seldom squeal on the deputy he was examining for the simple reason that next season, that same person might be hired to examine his work.

The *Act of July 11, 1846,* 9 Stat. 37, provided for sale of the leased mineral lead lands in Illinois, Arkansas, Wisconsin, and Iowa. These early efforts to lease the mineral lands had proved to be more costly than the revenue derived from the leases.

The *Wisconsin Enabling Act* was approved on *August 6, 1846,* 9 Stat. 56. The *Appropriations Act of August 10, 1846,* 9 Stat. 85, authorized the survey of the Wisconsin-Michigan boundary from the source of the Brule River to the source of the Montreal River by Surveyor General Lyon but allowed only $1,000 for the job. On September 15, 1846, Acting Commissioner James H. Piper instructed Lyon to have that boundary survey executed. Lyon had trouble getting anyone to do the work at the price. William A. Burt finally agreed to do it while surveying township boundaries in the region during the 1847 surveying season, using his solar compass. This is the first state boundary known to have seen surveyed entirely with a solar compass. Burt then closed his township lines against his State line.

After adjustment of the western boundary, Wisconsin was admitted to the Union on *May 29, 1848,* 9 Stat. 233.

The *Act of August 8, 1846,* 9 Stat. 79, equalized the salary of the Surveyors General and required that each deputy surveyor must "on the return of his surveys, take and subscribe an oath or affirmation that those surveys have been faithfully and correctly executed, according to law and the instructions of the Surveyor General. . . ." It provided for stiff penalties if a deputy surveyor was caught doing defective or fraudulent work. Congress was paying heavily for corrective resurveys and was trying to make sure honest work was performed.

The *Appropriations Act of August 10, 1846,* 9 Stat. 85, provided $30,000 for surveying the "copper region of Michigan, Wisconsin, and Iowa, with reference to mines and minerals." This act enabled the Wisconsin and Iowa territories to be added to the geological surveys. *Annual Instructions* went to Lucius Lyon on August 21 and to George W. Jones in Dubuque on August 31, 1846. Similar instructions went to the other Surveyors General.

Jones was instructed to extend the Fourth Principal Meridian north to Lake Superior, double chaining the meridian. All township boundaries and section lines were to be run with extra care, the meridional lines run due north and south. The east-west section lines were to all be run random and true, thus eliminating double corners around the township exteriors except on correction lines. The level of Lake Superior was to be used as the datum from which all levels or elevations were to be based. A profile of each section line was to be made, with a horizontal scale of 3 inches equal to one mile and a vertical scale of 660 feet equal to 1 inch. How the levels were to be determined isn't clear, perhaps by aneroid barometer which was invented in France in 1843. The elevation of all hills, valleys, prairies, etc., were to be determined; all topography, minerals, and geologic formations were to be shown on the maps. The field notes were to be thoroughly and carefully kept, with at least two pages devoted to each mile. These instructions are quite long and very detailed. The surveyors were allowed $6 per mile for all this detailed work. The most significant item was the elimination of double corners around the exterior boundaries of the townships. Jones prepared his 1846 *Instructions to the Deputy Surveyors*

following these annual instructions and incorporated the new requirement. Of course, this idea had already been in use to some extent prior to 1846, especially in Iowa. The elimination of double corners around the exterior boundaries as a policy was a big step toward improving the rectangular system as it was executed in the field.

On September 14, 1846, Lyon was instructed to make a personal inspection of T. 1 S., R. 7 E., Michigan, and determine the extent to which settlers had been cut off from their improvements by the recent resurvey. Lyon was to determine the value of any losses and make a report, which would be the basis for an act of relief by Congress to reimburse them. The resurvey of that township was controversial; many surveyors did not believe that double proportion was an acceptable or proper method of restoring lost corners. Though double proportion was a sound principle, most surveyors wanted to square up the erroneous lines which was really an impossibility and contrary to law.

On January 6, 1847, Richard M. Young became Commissioner of the GLO, replacing Shields, who became a Brigadier General in the Army and went off to fight in the Mexican War. James H. Piper had been Acting Commissioner since mid-1846. Young took over on March 1, 1847.

The *Act of March 1, 1847,* 9 Stat. 146, provided for further geological surveys in Michigan and for the sale of the mineral lands in quarter sections at the minimum price of $5 per acre. This was four times the price of agricultural lands, but still a very low price for the rich deposits of iron ore.

On July 28, 1847, Young wrote to Charles E. Morse, Deputy Surveyor in Little Rock. Morse had had an argument with Surveyor General Pelham about surveying in a township where the east boundary, done on a previous survey, was crooked. Pelham had told Morse to retrace the boundary but run the sections lines due north and then close the first tier of sections against the boundary; Morse didn't agree. Part of Young's letter follows:

> "In the case cited by you, where the East boundary of a Township is crooked or Serpentine, I consider the decision of the Sur. Gen'l correct, that the Meridional subdivisional lines should run due North and the areas of the subdivision of the Eastern tier of Sections should be calculated, whether excessive or deficient, and entered on the plat.
>
> This course is much better than running parallel lines, or by a mean variation, as it limits the evil to a single tier of sections when by either of the other methods it would be carried through the Township. Hence there would be no danger of the work being rejected if executed in accordance with the instructions of the Sur. Gen'l.
>
> From the remark at the close of your letter that such a line cannot be resurveyed or straightened, I deem it proper to suggest that where the lands in a Township are in the Market and in surveying the adjacent Township, it is found that your bearings and measurements do not accord with those returned of it, it may be *retraced,* and the Deputy would be paid for that Service, but the line should be exactly remarked and the corners precisely re-established."

Morse was being told to run what is now called a "Sectional Guide Meridian" that would limit the errors to one range of sections and not allow any other sections to be distorted by trying to run parallel to a defective east boundary.

The policy was a good one and should have been continued thereafter, but it wasn't. The authority for this deviation was the *Reorganization Act of 1836.*

For many years, attempts had been made to have the large swamp land and marsh areas turned over to the States. In September 1847, the Surveyors General were ordered to submit estimates of the amount of swamp lands that had been surveyed. It must be assumed that those estimates were based on the plats and field notes, because those records were the only source of such information available to the Surveyors General.

On April 22, 1848, Lucius Lyon issued *Special Instructions* to John Mullet, Deputy Surveyor, for the subdivision of 15 townships near Green Bay in northern Michigan. Mullet was instructed to run the section lines between the northern tier and western range of sections random and true, thus avoiding double corners around the exterior boundaries of the townships. This practice was put into increased use, and the *1851 Oregon Manual* made it official by spelling out that closing corners were to be used nowhere except on standard parallels.

The *Act of June 28, 1848,* 9 Stat. 242, authorized the Commissioner of the GLO to have surveyed the islands and keys in south Florida, which couldn't conveniently be surveyed in the normal rectangular manner, "in such mode and manner" as the Commissioner saw fit. Thus, Congress was again allowing a departure from the rectangular system in a special case. The Commissioner had no intention of changing the system—just the technical procedure of doing the surveys on the ground. After neogtiations, *Special Instructions* were issued to Professor A. D. Bache of the U.S. Coast Survey (USCS) on October 28, 1848, for the survey of the Florida Keys. Basically, the plan was to tie the USCS triangulation net to the township surveys in southeastern Florida, triangulate out onto the Keys, and tie them all into the net. The next steps were to calculate or protract the position of the township and section lines onto the islands. Where each section line crossed an island, it would be marked with meander corners. Section corners were to be established if they fell on an island and section lines run quite normally. The islands were to be meandered, plats made, and field notes written, all according to law. It should have worked, but it didn't. Over the next several years, the USCS mapped the Keys, but very few corners or meander corners were established; they were not meandered. Although a large amount of money was expended, the Commissioner received no plats, just some good maps. The USCS didn't understand the difference between a map and a plat for the conveyance of land by legal descriptions. The splitting of the responsibility for the surveys between two different government agencies with different missions didn't work then, and for all practical purposes, never did work.

The USCS completed their work in 1858. The last of the plats as surveyed by the USCS were delivered to the GLO in November 1870.

On *August 14, 1848,* 9 Stat. 323, Congress established the Territory of Oregon, which included all the lands west of the Continental Divide, between 42° and 49° north latitude. This

heralded the inevitable expansion of the public land surveys to the Pacific Coast, the Manifest Destiny. Oregon received sections 16 and 36 in support of public schools.

On August 28, 1848, letters went to Weakley at Florence, Alabama; Bradford at Jackson, Mississippi; and Pelham at Little Rock, Arkansas, instructing them to close those Surveyor General Offices and turn the survey records over to the respective States by June 30, 1849.

The Florence, Alabama, office was finally closed about October 29, 1849, and the records transmitted to the State sometime by early 1850. The Jackson, Mississippi, office was also closed in October 1849, and the survey records turned over to that State in the same month. The order to Pelham in Little Rock was later rescinded and that office remained operating for many more years.

On September 29, 1848, Lyon in Detroit was ordered to close out the Indiana surveys and turn over the records. The Indiana records were transmitted to that State sometime in 1850.

Also on September 29, 1848, Conway in St. Louis was ordered to close out the Illinois surveys and turn over the records, but the Illinois Legislature failed to pass the required act for their custody. The Commissioner wrote annual letters to the Illinois governor for years requesting the legislation. Finally, on March 27, 1869, the Illinois Legislature passed the required act and the records were turned over to that State in July 1869.

On January 16, 1849, Caleb H. Booth was notified of his appointment to be Surveyor General of Wisconsin and Iowa, replacing George W. Jones.

The *Act of March 2, 1849,* 9 Stat. 352, granted all the swamp lands that were subject to overflow and unfit for cultivation to the State of Louisiana. Under the terms of the act, any river front tracts surveyed in accordance with the *Acts of March 3, 1811, and May 20, 1824,* were exempt, as were lands already patented. Every legal subdivision (40-acre, one-sixteenth section or fractional lot), the greater part of which was swamp or overflowed, was granted to the State. The purpose was to aid the State in the diking, drainage, and reclamation of those lands. The wording of the act was defective because it didn't spell out criteria for determining what was "swamp and overflowed unfit for cultivation." Those decisions were the source of much contention and litigation in later years.

On May 30, 1849, Young instructed Boyd to confer with the governor of Louisiana because the State had to pay the expenses of determining the swamp lands and preparing the list. Boyd was to contract with deputies who would go in the field, examine every tract, meander the swamp or overflowed lands if necessary, and prepare plats. Young suggested that $6 per day in the field and $4 per day for office work would be a fair rate of pay; apparently the State didn't agree with that procedure and costs.

On April 11, 1850, Young again instructed Robert W. Boyd that where lands were "notoriously" known to be swamp and overflowed, those lands could be listed. If the field notes indicated entering or leaving a swamp, lines could be drawn connecting those topographic calls and thus determining the swamp area. In townships notoriously known to be swamp, the section lines could just be protracted without a field survey of them and the whole township could be listed. Only those lands that were overflowed at "normal stages" of a river could be listed. The whole cost had to be paid by the State, which could appoint an agent to work with the Surveyor General if it chose to.

The *Act of March 3, 1849,* 9 Stat. 403, created the Territory of Minnesota, which included the lands north of Iowa, west of Wisconsin and east of the Missiouri and White Earth Rivers. This large area had been technically unorganized since Iowa's admission to the Union. Minnesota was granted sections 16 and 36 for schools and all States thereafter received those two sections for school lands. The Surveyor General of Wisconsin and Iowa at Dubuque was in charge of the public land surveys and was instructed on July 9, 1849, to keep the Minnesota records separate from those of Iowa and Wisconsin.

Also on *March 3, 1849,* 9 Stat. 395, Congress established the Department of the Interior, which brought together under the Secretary of the Interior the Patent Office, the GLO, Indian Affairs, Public Buildings, and several other functions of government. The first Secretary of the Interior was Thomas Ewing from Ohio. No major changes were made in operating the GLO, whose new commissioner, Justin Butterfield, was appointed on July 1, 1849.

The public lands had ceased to be a major source of revenue. Expansion to the West and the gold discovered in California in 1848 was of more importance than revenue from the land sales, so it was only fitting that the GLO should be under the new department instead of under the Treasury.

CHAPTER III

THE GENERAL LAND OFFICE WITHIN THE DEPARTMENT OF THE INTERIOR

THE PERIOD 1849 — 1910

The first major act of Congress affecting the public land surveys under the new Department was passed on *September 9, 1850,* 9 Stat. 452, admitting California to the Union, which was never organized as a territory. The new State received sections 16 and 36 in each township as well as other grants.

Also on *September 9, 1850,* 9 Stat. 453, the Territory of Utah was established, which included the lands between California and the Continental Divide and between 37° and 42° north latitude.

On *September 20, 1850,* 9 Stat. 466, Congress passed the first major act granting land to subsidize the construction of railroads. Lands had previously been granted to aid in construction of roads and canals. The railroad was the NEW method of transportation. The act granted the even-numbered sections, 6 and/or 15 miles each side of the right-of-way in Illinois, Mississippi, and Alabama for constructing the Chicago and Mobile Railroad, which later became the Illinois Central. Most of the lands had already been surveyed so this large grant did not in itself immediately affect the surveyors.

The *Act of September 27, 1850,* 9 Stat. 496, created the Office of Surveyor General in Oregon and extended the rectangular system to that Territory. It also allowed the "geodetic method" for executing the surveys.

This geodetic method was meant to be surveying by use of an alidade and plane table, making a topographic map at the same time as the survey of township and section lines. The method was never used, except that a special set of geodetic notes were made along the Willamette Meridian. A transit was used to cut in peaks and other topography so that the surveys could first be made in the best agricultural areas.

The act also granted donations of 320 acres to a single man and 640 acres to a man and wife who were settlers in the Oregon Territory. The boundaries of these Donation Land Claims (DLC's) were supposed to follow section subdivision lines wherever possible. Similar donations had been made to settlers in Florida in 1848 and 1849. Most of the DLC's were taken up in what is now the State of Oregon; fewer were taken in Washington. After the State boundary between Oregon and California was officially surveyed, one claim was found to be partly in California, but was honored anyway.

On October 11, 1850, William Gooding was appointed Surveyor General of Oregon; he refused the job. On November 26, 1850, John B. Preston in Chicago, Illinois, was notified of his appointment to the position. Preston travelled to Washington, D.C., and was briefed in March 1851. He gathered equipment, four solar compasses which were diverted from Michigan, transit, sextant, and chains. Preston travelled over the Isthmus of Panama, where he wrote to Butterfield on April 30, and arrived in Oregon City in May, where he established his office. He made a reconnaissance of the Columbia and Willamette Rivers, established the initial point for the Willamette Meridian in the hills west of Portland at the end of May, and let contracts for the initial surveys. This meridian controls all the surveys in Oregon and Washington. The meridian line, running south, was surveyed by James E. Freeman from Wisconsin. The meridian running north and the baseline east to the Cascade Mountains and west to the Coast Range were surveyed by William Ives. Freeman was from Wisconsin and Ives from Michigan. All of the early surveys were made with a solar compass.

The *Appropriations Act of September 28, 1850,* 9 Stat. 515, states in part: "That hereafter the meridian of the observatory at Washington shall be adopted and used as the American meridian for all astronomical purposes, and the meridian of Greenwich, England shall be adopted for all nautical purposes." The Washington Meridian was used to describe State, territorial, and Indian boundaries until repealed *August 22, 1912,* 37 Stat. 342. The Washington Meridian is 77° 03′ 02.3″ in longitude west of Greenwich.

Another major act was passed on *September 28, 1850,* 9 Stat. 519; the so-called *Swamp Lands Act.* The *Act of March 2, 1849,* 9 Stat. 352, had granted the swamp lands in Louisiana to that State only. The 1850 act extended the grant to Arkansas and all other States then in the Union and granted all "legal subdivisions" (sixteenth, section or fractional lot), the greater part of which was "wet and unfit for cultivation." If less than half the legal subdivision was swamp land, no part of it was granted. The *Swamp Lands Act* was extended to Minnesota and Oregon on *March 12, 1860,* 12 Stat. 3. It placed a large burden on the Deputy Surveyors and Surveyors General. They were not always able or inclined to carry it out faithfully within the intent of the law. As already briefly described, the act was difficult to administer; the States involved were supposed to pay the costs inherent with the determinations, and making up of the lists. Various methods were to eventually develop; for example, Florida set up a "Board of Internal Improvement" by an act of its legislature on January 24, 1851. This board was to handle the swamp lands, make examinations, determinations, and lists. Arkansas set up a "Board of Swamp Land Commissioners" with basically the same function. Illinois and Missouri appointed commissioners for the purpose. In some cases, the plats were used to determine the swamp and overflowed lands, in others the field notes.

The Secretary of the Interior and Commissioner insisted that this was a land grant of public lands and that title could not be passed to the States until the lands were surveyed and properly identified. Yet, on July 12, 1858, Commissioner Thomas A. Hendricks admonished Warner Lewis, the Surveyor General at Dubuque, for having surveyed an island which was mostly swamp even though Wisconsin paid for the survey of it. Hendricks told Lewis he had no authority to survey such lands because they would pass to the State anyway. It is a strong probability that many swamp lands were granted to some States, especially, Louisiana and the Everglades in Florida, without being actually surveyed. The lists made up by the State Surveyor General of California were in certain cases proven fraudulent.

Although the swamp and overflowed lands were a massive headache, they did not have any effect on the system of rectangular surveys, only the information to be obtained while doing those surveys in the field. The present rules for swamp and overflowed lands are well described in the *1973 Manual of Surveying Instructions,* Sections 7-95 through 7-99; only incidental mention will be made of them hereafter in this book.

On December 13, 1850, the Territory of New Mexico was

created by Presidential Proclamation, which included what is now Arizona, New Mexico, and part of Nevada.

The *Appropriations Act of March 3, 1851,* 9 Stat. 598, provided for a Surveyor General of California; on March 24, 1851, Samuel D. King was appointed to the position. King also travelled to Washington, D.C., for briefing and received three solar compasses, transit, and other equipment. King followed Preston across the Isthmus and arrived in San Francisco on June 19, 1851, where he established his office. He contracted with Leander Ransom on July 8, 1851, for the establishment of the Mount Diablo Meridian. Ransom reached the summit of Mount Diablo on Thursday, July 17, 1851, and excavated or drilled a hole in the "haycock shaped" solid rock of the highest pinnacle on the mountain to mark the initial point of the Mount Diablo Meridian, but he couldn't measure and run line off the mountain peak. He got on line south of the initial point approximately 12 miles from it, and through a series of offset lines running east and north, established the corner of townships 1 north and 1 south, ranges 2 and 3 east. He then ran the baseline west toward the initial point and the surveys in California were underway.

The *Act of March 3, 1851,* 9 Stat. 631, provided for appointment of commissioners to handle the multitude of private land claims in California. After the commissioners verified the claims, the surveys were to be made under the supervision of the Surveyor General.

The most signficant action taken in 1851 affecting the rectangular system of surveys also occurred on March 3; the first *Manual of Surveying Instructions* was officially issued. It was written to the Surveyor General of Public Lands in Oregon and was prepared by John M. Moore, Principal Clerk of Surveys. It isn't certain just what Moore's true position was at that time. A private act of Congress dated *February 1, 1849,* 9 Stat. 759, titled "An Act to Compensate John M. Moore," refers to Moore as "late Chief Clerk in the General Land Office." Moore became Chief Clerk about 1815; he may have retired but was hired to write the 1851 and 1855 Manuals because of his vast knowledge of the public surveys. There can be very little doubt that Moore actually wrote most of the opinions on and instructions for the surveys to the Surveyors General and others, even though they were signed by the current Commissioner or himself as Acting Commissioner during his employment as Chief Clerk.

John Preston and Samuel King were issued a supply of the 1851 Oregon Manuals for their use in Oregon and California, so it was immediately entirely applicable in those States. On March 13, 1851, a supply was sent to Boyd at Donaldsonville, Louisiana, with instructions to construct mounds at corners in accordance with the Manual. On July 16, 1851, a supply was sent to Lorenzo Gibson at Little Rock with similar instructions. On April 23, 1851, Manuals were sent to George B. Sargent at Dubuque, Iowa, with instructions to run his range lines north to intersections with the correction lines and establish closing corners according to the Manual.

On October 8, 1851, Sargent was instructed to resurvey T. 90 N., R. 3 W., Fifth Principal Meridian, Iowa. The original surveys had been made in 1836 and 1837, many of the corners were missing, and in places, mounds called for at corners where "timber abounds." Most of the township was sold, but the residents petitioned for a resurvey. The township was to be resurveyed, all found corners honored and held, and all missing corners restored by double proportion. Sargent was to tie in all improvements and lines of occupancy as a basis for "an exchange of deeds" by the settlers if they desired, where the resurvey put improvements onto someone else's land.

In the *1851 Annual Reports,* Charles Noble in Detroit recommended hiring an "Inspector of Surveys" to help prevent frauds and grossly erroneous surveys. Sargent in Dubuque reported that he was withholding a small percentage (10 percent) of each contract to pay for examiners of surveys; thus, the deputy was indirectly paying for the examination of his work.

On March 8, 1852, Noble was instructed to hire an examiner of surveys on a per-diem basis. That letter also started to classify the different types of resurveys being made in Michigan. Part of that letter follows:

> "The surveys about to be undertaken will be designed to remedy two classes of defects and frauds.
>
> *FIRST CLASS. Incomplete Surveys.* — Where a *portion* only of the lines in a township is found to have been actually surveyed—and wherein some lines have been run and some corners established, which lines and corners can now be found. That portion of such original surveys which shall have been determined to be thus available, by retracing the same, is to remain undisturbed, and be respected whether there have been sales made therein, or not — and the residue of such townships must be surveyed, as if originally, but made to connect in all particulars with the former.
>
> *SECOND CLASS. Fraudulent Surveys* — Where there is no evidence found in the field of any good intent on the part of the Deputy Surveyor to comply with the terms of his contract — No system being manifest in the field work, and an entire absence of marks and monuments whereby to designate the *corners,* and where no lines are *traceable*—.
>
> In this class of cases the lines will have to be run and corners established, as if originally, and all the old irregular lines and corners must be most carefully and thoroughly *obliterated,* but their connections with the true survey must be taken and exhibited in the notes so that they may be represented on the township plats and thus be never likely to mislead — but in cases where, amongst such irregular surveys, there has been any tract of land *sold* which is *settled* upon and *occupied* according to the irregular lines of the original survey, if the same are found, they are to be particularly respected, *provided* the occupant *insists* on having the same *preserved;* but, in case he shall not so insist, then, with his expressed *written consent,* duly *attested,* the Deputy Surveyor may disregard such old irregular lines, and establish new regular lines as the boundaries of such section — But when an old irregular section corner is insisted on being *maintained* by the occupant of the tract, such, as a necessary consequence, will have also to be respected as governing the boundary of the adjacent sections, the lines of which will close on such corner. The marks on all such "bearing trees" as are not adopted, must be most effectually and indelibly, obliterated — and the new "bearing trees" will of course be marked with the usual initials, N. B. T."

The letter goes on to say that the examinations of the resurveys should begin toward the end of the fieldwork so that the two operations would be completed about the same time for comparison and not cause delays. In future years, the gap between the fieldwork completion and then the examination would sometimes be several years.

Most importantly, though, Butterfield was trying to classify resurveys. In his first class, he is describing a combination of what we call a dependent resurvey and a completion survey. Where actually originally surveyed, such as a half township, the corners were held fixed, and the other half was treated as never having been returned as surveyed at all. The difference is that he was connecting the new work to the old, and not closing against it, as surveying is done today.

In the second class, he is describing what now is called an independent resurvey, with the exception that today, the occupants' land is surveyed as a tract and is given a tract number, then the new work is closed against the tract. Butterfield is connecting the new work to the old tract, which would in all probability cause some heavy distortion in the connecting lines. The true independent resurvey as it is now known was not instituted until 1897.

In March 1852 the Minnesota-Iowa boundary was surveyed; it was to be along the parallel of 43° 30′ north latitude, from the Mississippi River to the Big Sioux River. The initial point on the Mississippi, monumented with an iron post, was established by Thomas J. Lee of the Topographical Bureau of the U.S. Army by astronomic observations in the fall of 1849. Sargent at Dubuque had been instructed to survey the line but never got a contract going. In March, Sargent finally contracted with Captain Andrew Talcott, an astronomic surveyor, for the work. Talcott sent a crew under Deputy Surveyor, James Marsh, ahead of him to run a random line with a Burt solar compass. Talcott's crews then came along running the line with a transit on a tangent line. They extended the range line between T. 100 N., R. 3 and R. 4 W. in Iowa to an intersection with the boundary. From this point on, corners were to be established at every half mile to stand and be marked as quarter section, section and township corners on the south boundary of T. 101 N., in Minnesota. At every 48 miles, an astronomic station was set up, the true parallel of 43° 30′ north latitude determined, and a falling measured to it from the tangent line. Corner moves were then computed for moving the temporary points on the tangent over to a true parallel of latitude and permanent quarter and section corners monumented. Thus the south boundary of Minnesota was established as a standard parallel for the rectangular net as well as a State boundary. It was later used as an auxiliary baseline of the Fifth Principal Meridian controlling the surveys west of the Mississippi River in Minnesota. The random line run by Marsh was used as a check on the astronomic positions and corner moves. As it turned out, the line run by Marsh, an experienced surveyor, agreed all the way and all the astronomic observations and calculations would not have been necessary. The Minnesota-Iowa boundary was surveyed between April 1 and September 6, 1852.

On July 10, 1852, Sargent was instructed to adopt the Oregon Manual to govern the surveys in Minnesota. He was to get the Minnesota surveys under way by running guide meridians and standard parallels in accordance with the Manual. The letter also instructs him to use standard parallels and "check" meridians in Iowa and Wisconsin and thus avoid double corners wherever possible. On May 16, 1853, nearly identical instructions went to Warner Lewis, the new Surveyor General.

The *Deficiencies Appropriations Act of July 21, 1852,* 10 Stat. 15, provided that no further geological surveys would be made by the government unless authorized by law, which halted the geological surveys in the Michigan-Wisconsin country.

On August 19, 1852, Merriwether L. Clark at St. Louis was instructed to contract for the resurvey of T. 8 N., R. 5 E. and T. 14 N., R. 2 E., Fourth Principal Meridian; and T. 15 N., R. 4 E., Third Principal Meridian, in Illinois. He was to hold all original corners in place and execute the surveys in accordance with the letter of October 8, 1851 (double proportion — T. 90 N., R. 3 W., Iowa). All improvements were to be shown as the basis of the "exchange of deeds."

Up until this time, double proportion was the method used to resurvey a "sold" township in Michigan, Indiana, Iowa, and Illinois.

The *Appropriations Act of August 31, 1852,* 10 Stat. 76, made provision for the survey of several large islands off the coast of California, including Santa Cruz, San Miguel, Santa Rosa, San Bernardino (San Clemente), Santa Catalina, San Nicolas, and Santa Barbara. The surveys were to be executed by the USCS under instructions from the GLO, with plats and field notes to be returned to the GLO. On April 1, 1853, Commissioner John Wilson instructed A. D. Bache of the USCS to tie in a corner of the rectangular system on the mainland, triangulate to the islands, run section lines, and meander the islands, similar to what was supposed to be done in the Florida Keys. But again, no rectangular surveys were made, or none have ever been found if there were any. Funds for these surveys were again appropriated in 1853 and in later years, but no plats were ever sent to the GLO. The islands were never surveyed as part of the rectangular system.

On September 16, 1852, John Wilson, who had been Acting Commissioner during much of Butterfield's tenure in office, replace him as Commissioner of the GLO.

On October 4, 1852, King in California contracted with Henry Washington to establish the initial point and survey of the baseline of the San Bernardino Meridian. Washington climbed to the "top of San Bernardino Mountain" on November 8 and erected a monument and flagged it, but he couldn't run line or measure from that initial point. On November 17, he began from a point S. 45° W. from the monument, ran west 7 miles, 47 chains, thence north 5 miles, 42.80 chains, to a point due west of the monument. By his computations, he was then 13 miles, 9.80 chains west of the initial point; from there he began his surveys of the baseline. Other surveys many years later ended up with two other "initial points" in addition to Washington's.

Henry Washington was an experienced surveyor who had worked extensively in Florida and Louisiana prior to emigrating to California. His work was excellent, but having to establish an initial point on a remote mountain peak was a handicap not even he could fully overcome.

The *Act of January 22, 1853,* 10 Stat. 152, amended the *Act of June 12, 1840,* and again provided for transferring the plats and field notes to the State when the public land sur-

veys were completed, on the provision that the State had to designate an office to accept the records and provided free access to them. All transfers of the survey records to State control since 1853 have been made under this law. After closure of a Surveyor General's office, the Commissioner of the GLO became "ex-officio" Surveyor General.

The *Act of March 2, 1853,* 10 Stat. 172, created the Territory of Washington, beginning the breakup of the Oregon Territory. The new territory included all the country west of the Continental Divide, north of the Columbia River and the 46th parallel of latitude.

The *Act of March 3, 1853,* 10 Stat. 244, is probably responsible for the partial surveys of townships and the problems which that practice has caused ever since. The title "An Act to provide for the survey of the Public Lands in California, the granting of Pre-emption Rights therein, and other purposes," may be misleading because most of the provisions were put into practice elsewhere under the wording of the appropriations acts.

The act provides for the duties of the Surveyor General in California. He is to execute the public land surveys and survey the confirmed private land claims and has all the authority that had been given to the Surveyor General in Louisiana. The provision in Sec. 3 of the act states: "That none other than the township lines shall be surveyed when lands are *mineral* or are *deemed unfit for cultivation;* and no allowance shall be made for such lines as are not actually run and marked in the field, and where *necessary to run.*"

The mineral lands had been excluded from the Donation Land Claims in Oregon. Now the mineral lands were being excluded from the surveys in California as were lands "deemed unfit for cultivation." The deputy surveyors were being placed in the land classification business, the result being that only the more easily surveyed lines not known to contain gold or other valuable minerals were run in the field. The surveyors were being paid by the mile and picked the gravy; they ran only those lines they found to be necessary in surveying the section lines. These partially subdivided townships with protracted outlying quarter-sections have caused many problems in the present-day resurveys.

Sec. 4 of the act allowed for use of the geodetic method of surveying and it also allowed for a departure from the rectangular mode of surveying and subdividing the public lands. There is no known instance in which those two provisions were used. Except for the private land claims (Spanish and Mexican grants) and later the mineral surveys, all of the public lands in California were surveyed by the rectangular system.

Sec. 6 of the act provided for preemption on the surveyed or unsurveyed public lands, except private claims, school or other state lands, and the mineral lands. Thus the mineral lands in California were excluded from both survey and preemption.

On October 6, 1853, Colonel Henry Washington established the initial point of the Humboldt Meridian on the summit of Mount Pierce in north-western California. Once again, a nearly inaccessible mountain peak was used for erecting the initial monument. Washington began the survey of the Humboldt Meridian from a point on line north of the initial point, but because of the ruggedness of the terrain, dense brush and timber, very few surveys were made in the Humboldt system until many years later. The Surveyor General couldn't get deputies to contract for surveys there at the price allowed by law, which was $15 per mile.

On October 17, 1853, Wilson instructed Lewis in Dubuque and John Loughborough in St. Louis to survey some islands in the Mississippi River and "other navigable streams" during the ensuing winter months, on the ice. Wilson thought it much easier to do it that way and they could get the work done for $6 per mile as a result. Of course, everyone knew that the regular township and section lines and meanders of lakes were often being surveyed in the winter in Michigan, Wisconsin, and Iowa. If the snow wasn't too deep, it was much easier to get around when the ground was frozen. But this is the first instance in which the practice was given official sanction by the Commissioner.

In the Annual Reports of 1853, George Milbourne in Little Rock and Loughborough in St. Louis reported that Arkansas, Illinois, and Missouri had refused to accept the field notes as a basis of swamp land lists. They also reported that levees had been or were being built along the Mississippi River. Levees and cut-offs were being made along the Red River in Arkansas, which would shorten that river by some 92 miles. Ditches were being dug to drain the lands, thus changing their character; after drainage took place, it wasn't very easy to tell what was swamp land before drainage. Manmade avulsions would throw ownerships on the other side of the river.

On December 31, 1853, Wilson wrote to Loughborough on the subject of resurveys. The settlers in T. 48 N., R. 5 E., Fifth Principal Meridian, had petitioned for a resurvey. Private land claims were involved; apparently there was no government land remaining. Wilson refused to approve a resurvey on several grounds. He thought the *Act of February 11, 1805,* was specific because the measurements and areas returned by the Surveyor General on the original plat were final. Only in extreme cases should the government become involved in boundary disputes and then, only with specific approval by Congress, along with funding. He thought that unless Congress passed a law relative to resurveys and how they should be done, the problem should be left up to a "competent and trusty" surveyor, who could prove that a resurvey was really necessary, in which case the settlers could petition Congress for the resurvey. He concluded the letter by saying, "With the foregoing remarks I dismiss the subject for the present. . ."

From then on, very few resurveys were made unless public lands were largely involved; instead, the work was diverted to the County and other local Surveyors. These men began almost immediately to write letters to the Commissioner requesting advice on how to do resurveys, restore "lost" corners, and subdivide sections. There were no official instructions for resurveys, such as the Manual was for surveys. Due to the history of the many corrective resurveys, many County Surveyors tried to and often did move original corners to their "proper" position, particularly quarter-section corners. Various methods were used to restore lost corners; confusion and litigation soon followed.

The *Act of May 30, 1854,* 10 Stat. 277, created the territories of Nebraska and Kansas. The Nebraska Territory included the vast area north of 40° north latitude between the Continental Divide and the Missouri and White Earth Rivers. The Kansas Territory was approximately the area be-

tween 37° and 40° north latitude between the State of Missouri and the Continental Divide.

The *Act of July 17, 1854,* 10 Stat. 305, extended the Donation Land Claims to Washington Territory and estabished the office of Surveyor General there.

On August 12, 1854, James Tilton was notified of his appointment to be Surveyor General of Washington. His instructions were sent on August 31; to continue with the surveys west of the Cascades and the Willamette Meridian network. He was to get manuals from Gardner in Oregon and use the same platting style. Tilton was especially warned to "secure" his office against fire. "No explosive fluid is ever to be used in lighting the office, and the hearth of the fireplace or stove should be so guarded as to the possibility of fire coming into contact with the floor."

After the Florence fire in 1827, orders were issued to all Surveyors General to rent separate buildings for their offices, not connected to or closely adjoining any other building. No one was allowed to live in the same building that the Surveyor General's office occupied. Several plans were devised for constructing fireproof buildings and metal-encased vaults to house the records, but none of those plans were ever funded. The Surveyor General had to rent space at the lowest reasonable rate, which was about $500 per year. The warning to Tilton was prophetic. He opened his office in Olympia by March 1855. From Charles K. Gardner in Oregon he got the Washington plats, field notes and supplies, and continued the established survey operations in Washington.

The *Act of July 22, 1854,* 10 Stat. 308, established the office of Surveyor General in New Mexico and another for the territories of Kansas and Nebraska. It also granted Donation Land Claims, similar to the Oregon donations, to actual settlers in New Mexico. It isn't immediately known how many such claims were taken up in New Mexico which included what is now Arizona. In 1880, Donaldson reported 135 such claims, which were to be taken by legal subdivisions.

The Surveyor General of New Mexico was given double duty—he had to examine and determine the validity of private land claims under Spanish and Mexican grants. In effect, he was Land Commissioner as well as Surveyor General.

On August 5, 1854, William Pelham was notified of his appointment to be Surveyor General of New Mexico. He was a good choice because he had been Surveyor General of Arkansas from 1841 through 1849 and was experienced with the system and private land claims. Further instructions were sent on August 21, 1854; Pelham was to establish a meridian and baseline to govern the New Mexico Territory surveys. He was to fully acquaint himself with the Spanish laws and court decisions relating to them, and collect the documents on which the claims were based. It was a horrendous job that Pelham never fully accomplished, but he jumped in with both feet. He arrived in Santa Fe on December 28, 1854, and immediately opened his office; on his way he made a reconnaissance of the Rio Grande Valley. In his *1855 Annual Report,* Pelham said,

> "Agreeable to your instructions I selected a hill about six miles below the mouth of the Puerco River, which is two hundred feet high and of a rocky formation. This hill is nearly round, and is washed at its base by the Rio Grande. I have therefore established this hill as the initial point, and have caused a suitable monument to be erected on its summit."

On March 9, 1855, Pelham contracted with John W. Garretson for the survey of the New Mexico Principal Meridian and baseline. In April, Garretson actually erected the initial monument and began the surveys of the meridian from it; this meridian system controls all the surveys in New Mexico and southwestern Colorado. The New Mexico surveys were to be done in accordance with the Oregon Manual.

John Calhoun was appointed Surveyor General of Nebraska and Kansas. Wilson sent him instructions on August 26, 1854. The parallel of 40° north latitude was to be surveyed west from the Missouri River as a baseline of the Sixth Principal Meridian for a distance of 108 miles or, 18 townships, where the initial point of the Sixth Principal Meridian was to be established. A "durable" monument was to be established on the Missouri River as the southeast corner of T. 1 N., R. 18 E., Sixth Principal Meridian. From this baseline, the township boundaries were to be surveyed north and south in accordance with the Oregon Manual. Since 40° north latitude was the boundary between the two territories and later the State line, it was to be carefully surveyed and monumented.

Calhoun established his office in Fort Leavenworth, Kansas Territory, and on November 2, 1854, contracted with J.P. Johnson for the survey of the 108 miles of baseline. He contracted with Charles A. Manners for erecting the durable monument on the Missouri River and examination of Johnston's work. A castiron post was set 52.55 chains west of the river to keep it from washing away. Johnson's survey upon examination proved to be "grossly in error." In April 1855, Calhoun contracted with Manners for the resurvey or correction of the baseline, which Manners did in July of that year. However, because of the delay caused by the corrective survey, the first guide meridian of the Sixth Principal Meridian was established 60 miles west of the river instead of 108 miles. Manners surveyed the meridian line north into Nebraska and other deputies went to work on the township lines in Kansas and Nebraska in August 1855. Work progressed rapidly in the open prairies of those territories, hampered only by the Indians.

The *Act of August 4, 1854,* 10 Stat. 575, added the Gadsden Purchase to the Territory of New Mexico and many more private land claims.

Surveyor General Gardner of Oregon complained in his annual report of the problems he was having with the Donation Land Claims (DLC), which were supposed to be taken as nearly as possible by legal subdivisions of sections. But in fact, the occupied claim lines laid in all directions, or if generally east and west, they didn't conform to the subdivision lines. Not very many settlers were coming in and filing their claims so Gardner didn't know where they were located. The township and section line surveys were being held up as a result. If Gardner surveyed the claims as staked on the ground, many small fractions would be left within a section.

As it turned out, the solution was quite simple. Gardner and his successors surveyed all of the township and section lines first without regard to the claims, but made notes of where the lines apparently entered and left an occupied

claim. Later, as the claims were actually filed and verified, the DLC boundaries were surveyed and tied to the existing rectangular surveys. The first claim surveyed in a township was designated No. 37, the second No. 38, and so on. When all claims in a township were surveyed, a DLC plat was made. The fractions remaining in a section were lotted with a lot number and area, which could then be sold by the land office. A separate set of field notes were made, called simply the "DLC Notes." It eventually worked out quite well; one interesting item, however, did occur. In 1859, Surveyor General William W. Chapman reported that he had surveyed a DLC which laid across a navigable river, the Umpqua, without meandering the river through it, and returned the portion within the river as part of the total area of the DLC. Thus, the bed of a navigable river was patented; it is presumed that this could pose an interesting legal problem of ownership, especially if accretion was involved.

The DLC plats in Oregon were basically on the same plan as the system used in Florida, except that the claims were not called sections. An 1849 Florida plat is shown in Fig. 40.

An Oregon DLC plat of T. 23 S., R. 7 W., Willamette Meridian, is shown in Fig. 41. Comparison of these plats readily reveal the similarities.

The *Appropriations Act of March 3, 1855,* 10 Stat. 643, provided funds for the Surveyor General and for surveys of Utah Territory. David H. Burr was appointed Surveyor General and established his office in Salt Lake City on July 27, 1855; he designated the southeast corner of the "Temple Block" as the initial point for the Salt Lake Meridian. The survey of the baseline and meridian was begun by Deputy Surveyor Frederick H. Burr in 1856. By the end of September, he had surveyed the baseline four miles east and 36 miles west and the meridian had been run 84 miles north and 72 miles south. Not much more was done before 1857.

The same appropriations act provided funds for the survey of the "Outlines of Indian Reservations" in Kansas and Nebraska. During the later part of 1855 and most of 1856, Calhoun had most of his deputies working on the exterior boundaries of Indian reservations so that he could avoid them in the regular rectangular work. In the ensuing years, more and more reservation boundaries were surveyed in Nebraska, Kansas, and Minnesota territories, but the responsibility was divided between Indian Affairs and the GLO for nearly ten more years.

The *1855 Manual of Surveying Instructions,* an expansion of the *Oregon Manual of 1851,* again prepared by John M. Moore, Principal Clerk of Surveys, was officially issued on February 22, 1855. It established the present system of baselines, principal meridians, spacing of standard parallels, and guide meridians.

Although technical details of monumentation, rectangular and closing limits, equipment, and the like have evolved since that time, the basic system of rectangular surveys has remained the same since this manual was issued. The 1855 Manual, Diagram B, shows the unusual numbering of lots bordering on the north and west boundaries of the township. Those we now call lots 1 and 2 are labeled No. 2, and those we now call lots 3 and 4, are also labeled No. 2. It is unknown why this method of designating those lots was used; it was a change from that used after 1832 and it continued until 1866. Fig. 42 is a copy of Diagram B, from the 1855 Manual.

The 1855 Manual by inference indicates that only navigable streams were to be meandered on both banks. Perhaps only one bank of a non-navigable river was to be meandered; only the field notes of a particular township surveyed during the period would reveal the true policy adopted. This manual does indicate that a true line across meandered streams was only surveyed on township boundaries and meridional section lines. On latitudinal lines (east-west section lines) the line was run west from a section corner to the meandered stream and east from the section corner (a mile to the west), to the meandered stream and meander corners established, with a tie made across the stream. This practice almost invariably created a kink in the section line crossing the stream. For other details, the Manual should be consulted, including the specimen field notes.

Thomas A. Hendricks was appointed Commissioner of the GLO on August 8, 1855; he was the first commissioner who apparently had no background or qualifications for the job. He was born near Zanesville, Ohio, on September 7, 1819, and graduated from South Hanover College, Indiana in 1841. He was elected successively to both houses of the Indiana Legislature and to the U.S. House of Representatives in 1851. Hendricks was a politician of the Democratic Party with no real background in surveying and the land laws. He later became a U.S. Senator, Governor of Indiana, and ran for President in 1868, 1876, 1880, and 1884, when he was elected Vice President and died in 1885. Some of the rulings and letters during Hendrick's tenure were not always correct.

On February 6, 1856, Hendricks replied to Leander Chapman at Detroit regarding the proper method of restoring the lost quarter corners on the east and west boundaries of section 4, T. 34 N., R. 10 E., Second Principal Meridian, Indiana. The original survey had returned the east line as 79.96 chains and the west line as 79.90 chains. The County Surveyor had found those lines to measure 72.84 chains and 73.71 chains respectively, between found section corners. The local Circuit Court had ruled that because the 1800 law said the excess or deficiency was to be placed in the last half mile going into the north and west boundaries, the quarter corners should be restored exactly 40 chains north of the southeast and southwest corners of Section 4. That, of course, put all the error in the last or north half mile. Chapman and the County Surveyor disagreed with the decision by the court and asked Hendricks' opinion. He replied that the *Act of February 11, 1805,* controlled because the lengths of the lines returned on the plat were by law the true length, and therefore the lost quarter corners should be restored by single proportionate measure. This would place the east quarter corner at 36.44 chains north and the west quarter corner at 36.90 chains north of the section corners.

This letter is included here to illustrate the type of questions or problems which began flooding the Commissioner's office after the suspension of resurveys in 1853. It also illustrates the gross misunderstanding of the various surveying laws by many surveyors and even the courts. There were no rules for restoring lost corners by Congress; they had to be developed as they had been in part by the Commissioner and the courts. The Commissioner rendered these rulings without any legal authority to do so; they could only be opinions unless public lands were involved. However, the reader should always keep in mind that the Commissioner was a

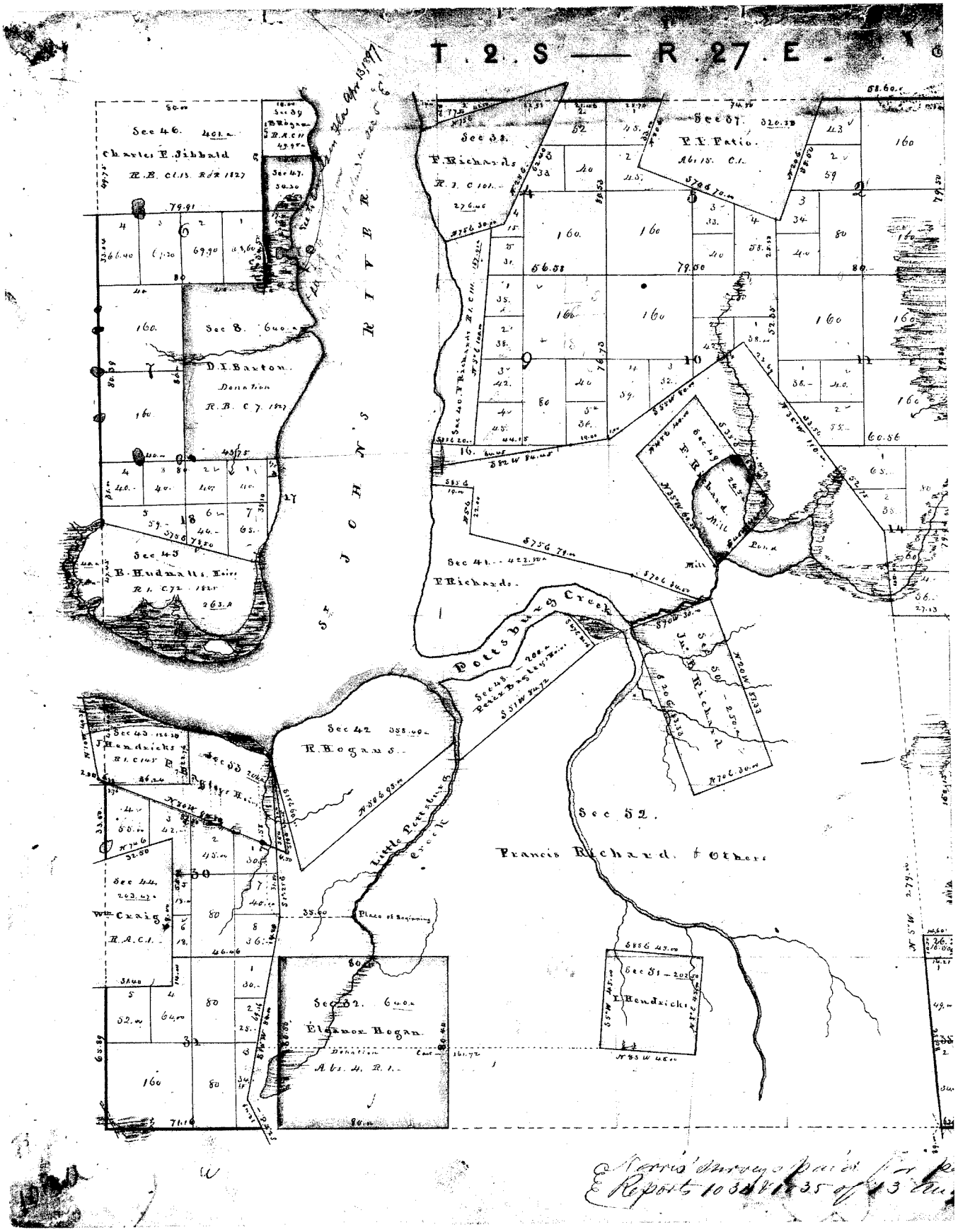
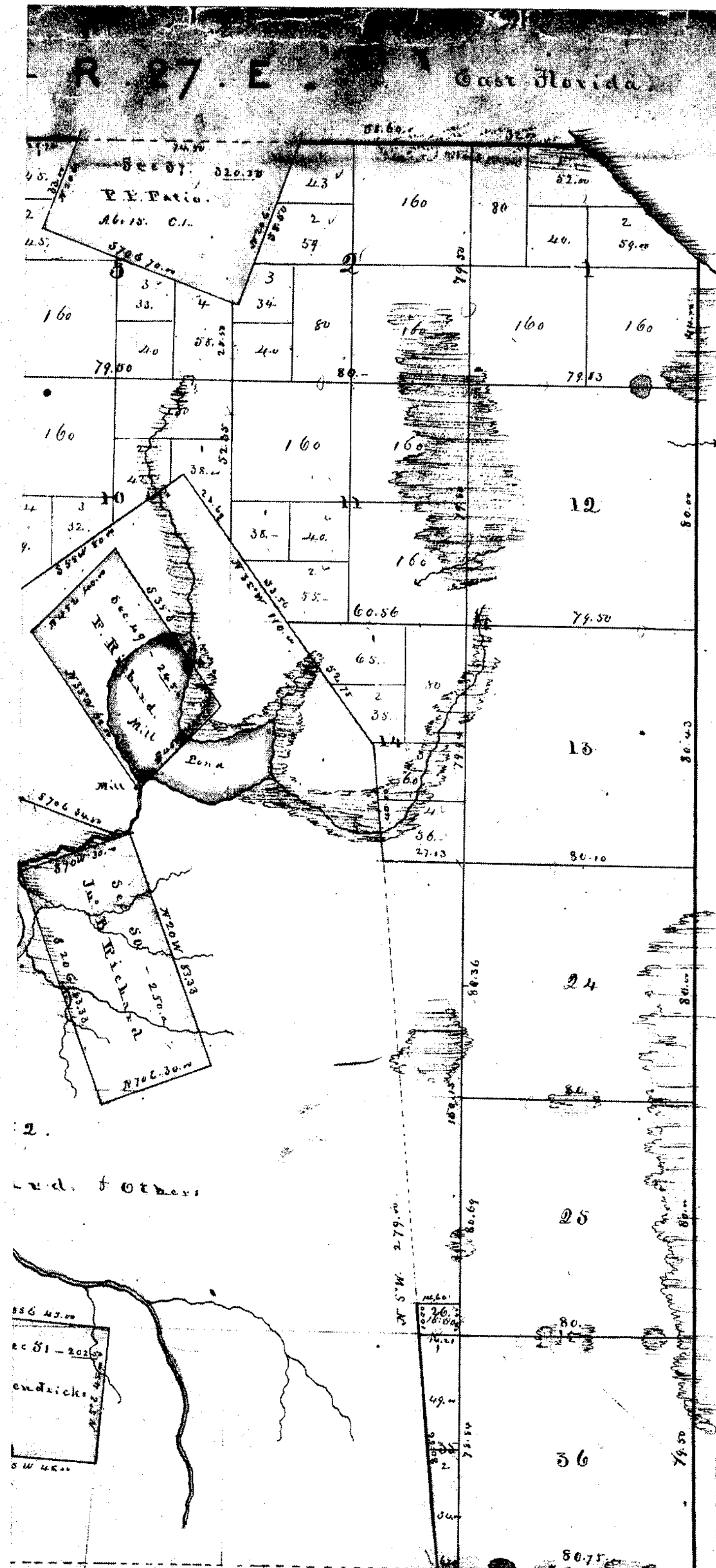


Figure 40. Florida Township with Private Claims and Mixed Section Numbers.



FLORIDA

CONTENTS					
Sec	Area	Sec	Area	Sec	Area
1	511.00	10	411.	18	328.
2	376.00	11	613.	24	640.90
3	381.00	12	635.20	25	641.30
4	331.00	13	639.90	26	16.63
6	272.10	14	296.	30	361.00
7	320.00	16	34.00	31	324.00
9	476.00	17	18.20	35	83.00
				36	635.10
	2667.10		2636.30		3232.80
Total Area of Public Land 8,730.20 acres					

Variation 5° East.

Scale 40 chains to an Inch

Traverse			
Course	Dis	Course	Dis
Sec 39		Sec 40.	
S 33½ E	8.	S 16 E	19.
S 18 E	6.	S 25 E	10.
S 42½ W	3.50	South	10.
S 27 W	9.	S 40 W	20.
S 60 E	7.	South	8.
Sec 47		S 25 W	6.
South	8.	S 40 E	11.
S 64½ W	4.80	S 25 W	7.
S 45 W	14.	S 15 W	7.
Sec 8		S 30 W	5.
S 64 W	8.	Sec 16	
S 5 W	6.	South	10.
S 13½ E	9.	Secs 37.41.42 on River	
S 85 W	6.	S 2 E	5.
S 25 W	5.	S 1½ E	4.
S 65 E	3.	S 2½ W	4.
S 87½ E	11.50	S 2¾ W	10.
S 10 W	8.50	S 20 E	4.
S 5 E	8.	S 45 W	1.50
S 35 E	15.	S 2 W	19.
S 19 W	5.	S 15½ W	25.
S 35 E	8.	S 5½ E	7.
S 33 W	18.	S 30 W	25.30
S 26 W	12.	S 80 W	6.50
S 38 W	14.	S 55½ W	9.00
S 7½ E	11.50	S 46½ W	16.50
Sec 17		S 67¾ W	37.50
South	10.	S 6 W	5.74
S 16 E	8.	Secs 53, 43	
S 15 W	13.00	S 70 E	33.30
S 20 W	7.50	S 74 E	37.
Sec 18		S 67 E	12.
S 31 W	9.50	N 74½ E	3.50
S 10 E	5.00	Sec 41	
Sec 45		S 11 E	8.
S 5 W	7.50	S 65 E	5.
S 21 W	3.	N 87½ E	25
S 75 W	4.	N 41 E	20.
N 84 W	11.	N 75 E	7.
N 35½ W	3.	N 35 E	13.
North	5.	N 81 E	7.
N 24 W	6.	S 73 E	7.
N 44½ W	4.	S 68 E	10.10
N 24 W	13.	S 58 E	19.
N 76½ W	2.50	S 20 E	17.12
S 37 W	5.	Sec 53	
S 75 W	4.50	S 70 W	5.
S 83½ W	4.	N 20 W	17.10
N 27 W	2.50	N 71 W	28.30
North	2.50	Sec 44	
West	2.50	N 69 W	5.
S 51 W	8.	S 64 W	[illegible]
S 67½ W	7.50	S [illegible] W	[illegible]
S 80 W	5.	S [illegible]	[illegible]
N 80 W	11.50	S 69 W	13.
Sec 38 E of River		N 77 W	7.
S 10 W	16.	S 73 W	8.
S 20 E	16.	S 59 E	7.
S 5 E	12.	S 16½ E	7.
S 38 E	7.	S 51 E	9.
S 12 E	5.	S 16½ W	6.
		South	

Private Claims				Report			State Papers	
Confirmee	Present Owner	Sec	Area	No	Date	C	Vol	Page
P. J. Fatio		37	320.10	15	1826	1	5	425
F Richard		38	276.40	1	1825	101	4	280
B Hogans.		39	43.95	A	1827	11	5	37
F Richard		40.	137.91	1	1825	114	4	280
F Richard		41	422.50					
R Hogan		42	358.40	2	1824	23	3	643
Hendricks or Bagley's Hs		43	136.30	1	1825	147	4	281
Wm Craig		44	208.47	A	1827	1	5	37
E Hudnells Heirs		45	263.00	1	1825	72	4	280
Charles F Sibbald		46	401.00	C	1827	13	5	73
Boston or Sibbald		47	34.30	—	—	—	—	—
D I Barton		8	605.70	B	1827	7	5	64
Peter Bagley's Heirs		48	200.00	2	1824	20	3	643
F Richard		49	280.00	A	1827	74	5	58
J B Richard		50	253.00	1	1826	9	5	376
I Hendricks		51	202.00	1	1825	144	4	281
Francis Richard		52	7396.00	Sup Court US Jany Term 1834				
P Bagley's Heirs		53	200.00	1	1825	8	4	278
Bagley or Richard		54	9.00	—	—	—	—	—
Eleanor Hogan		32	640.00	4	1828	1	5	
Total Area of Private Claims			12,362.93	Acres				

The Exterior and Sectional lines of this Township including Claims Secs 37. 38. 39. 40. 41. 42. 43 & 44 were Surveyed by David Thomas in the Year 1833.

The Claims Secs 45 & 46 were Surveyed and Claims Secs 39. 47. 58 and that part of the Township west of the River were resurveyed in the Year 1849 by David H Burr under Contract with Surv Genl Land Office of Nov 4th 1848.

The Claims Secs 48. 49. 50. 51. 52. 53 & 54 were Surveyed and the Township & Section lines East of the River (excluding the claim lines) were re-surveyed by R W Norris in the Year 1849 under Contract with Surv Genl Land Office of Nov 7. 1848

Examined Compared with the field notes and approved.

7th July 1849 B. A. Putnam
Surv Genl.

rris' Surveys Paid for per G. L. Office
ports 1034 & 1035 of 13 Aug: 1849

6

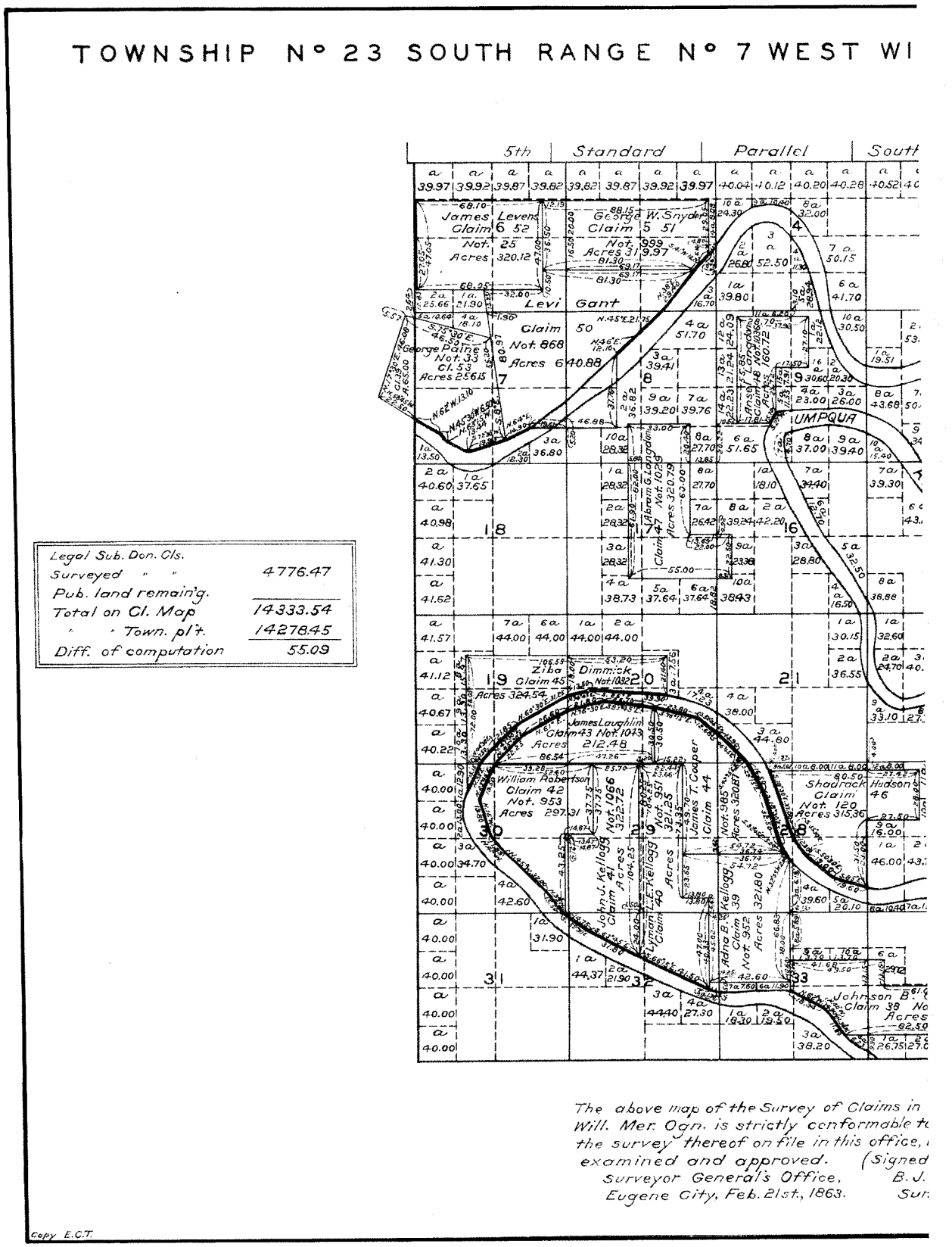
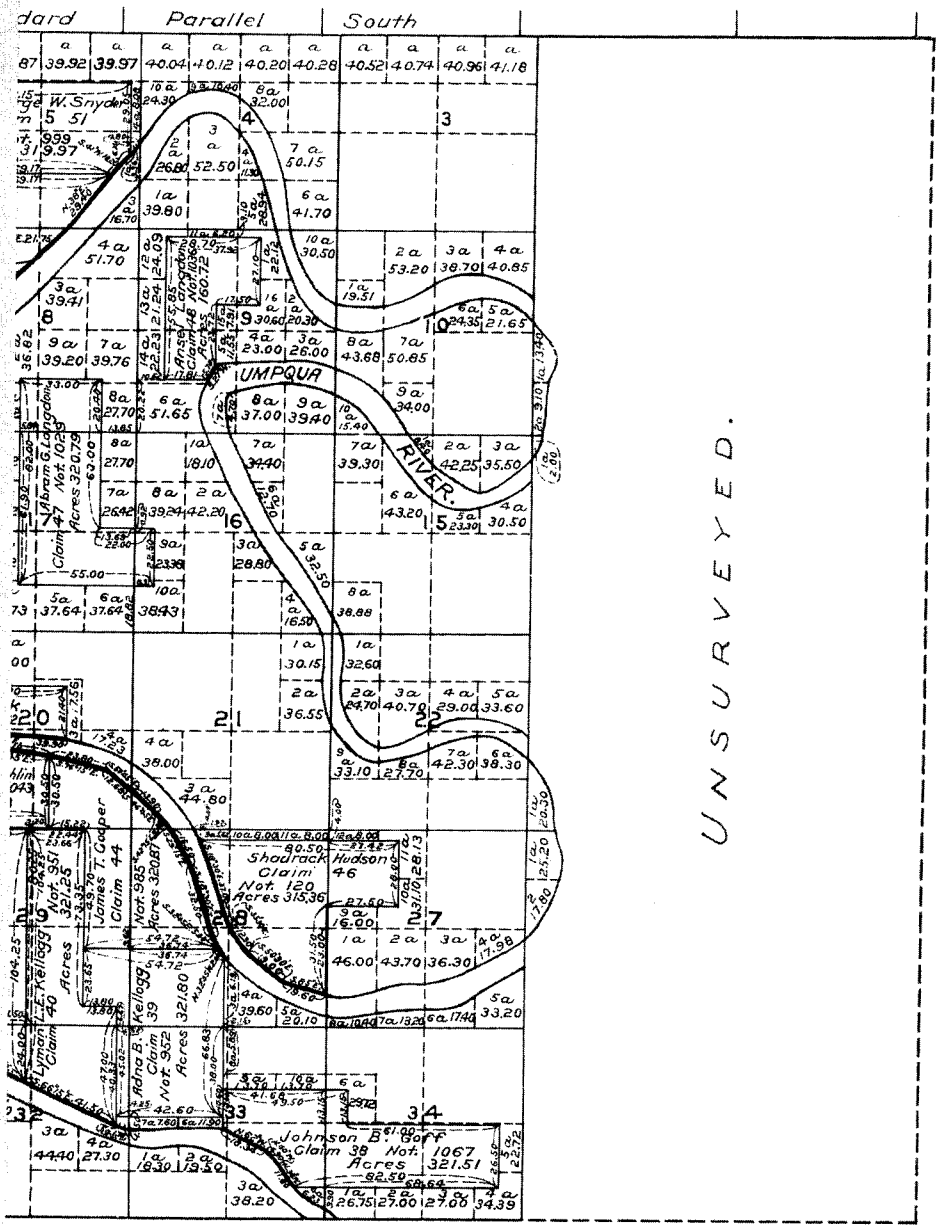


Figure 41. D.L.C. Plat T.23S., R.7W., Willamette Meridian.

E Nº 7 WEST WILLAMETTE MERIDIAN OREGON



bove map of the Survey of Claims in Town. 23 S. R. 7 W.
Mer. Ogn. is strictly conformable to the field notes of
rvey thereof on file in this office, which have been
ined and approved. (Signed)
rveyor General's Office, B. J. Pengra
gene City, Feb. 21st, 1863. Sur. Gen. of Ogn.

Public Survey Office,
Portland, Oregon, Jan. 9, 1930.
I certify the above to be a correct
copy of the original plat on file in
this office Joseph A. Young
Office Cadastral Engineer

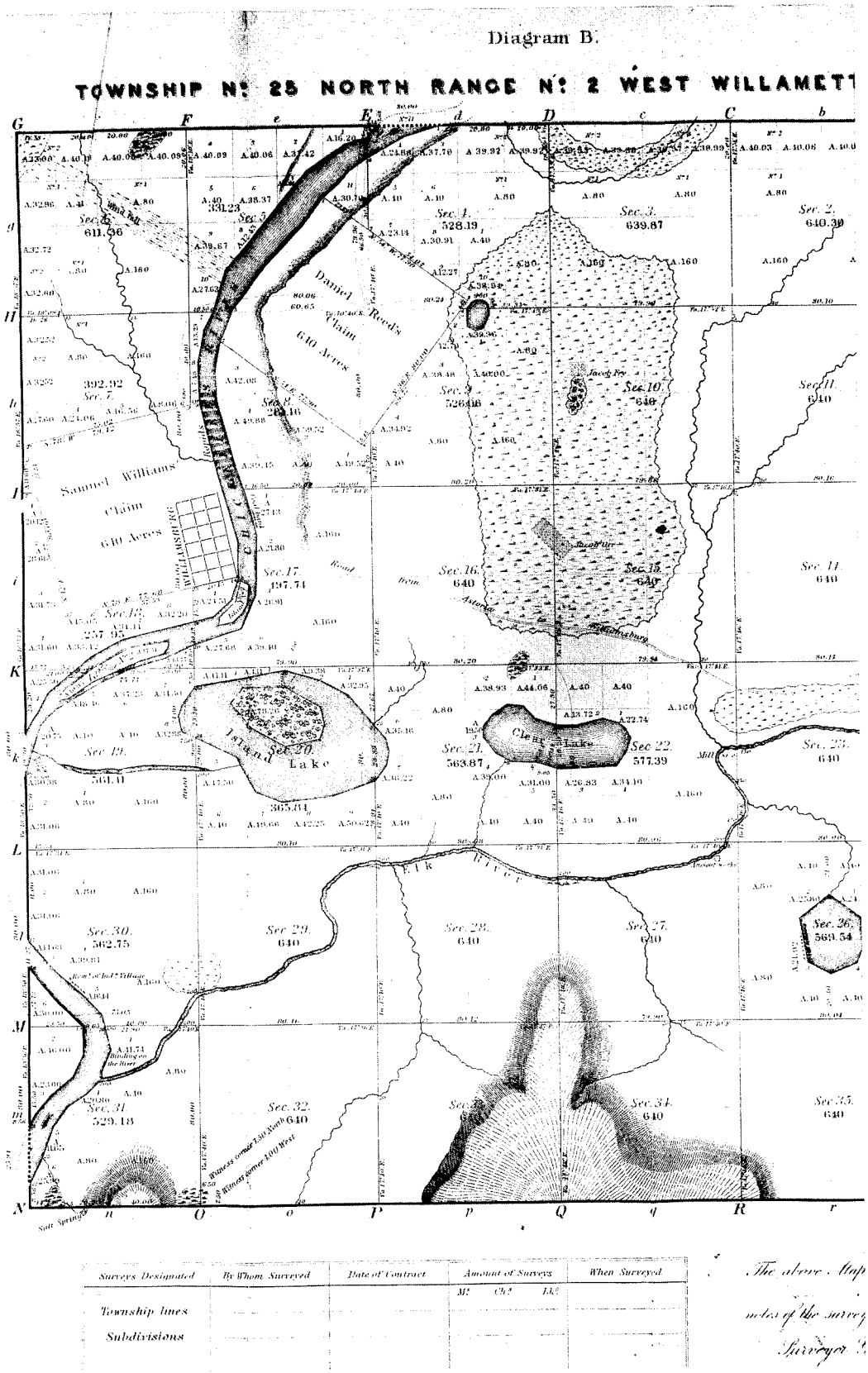
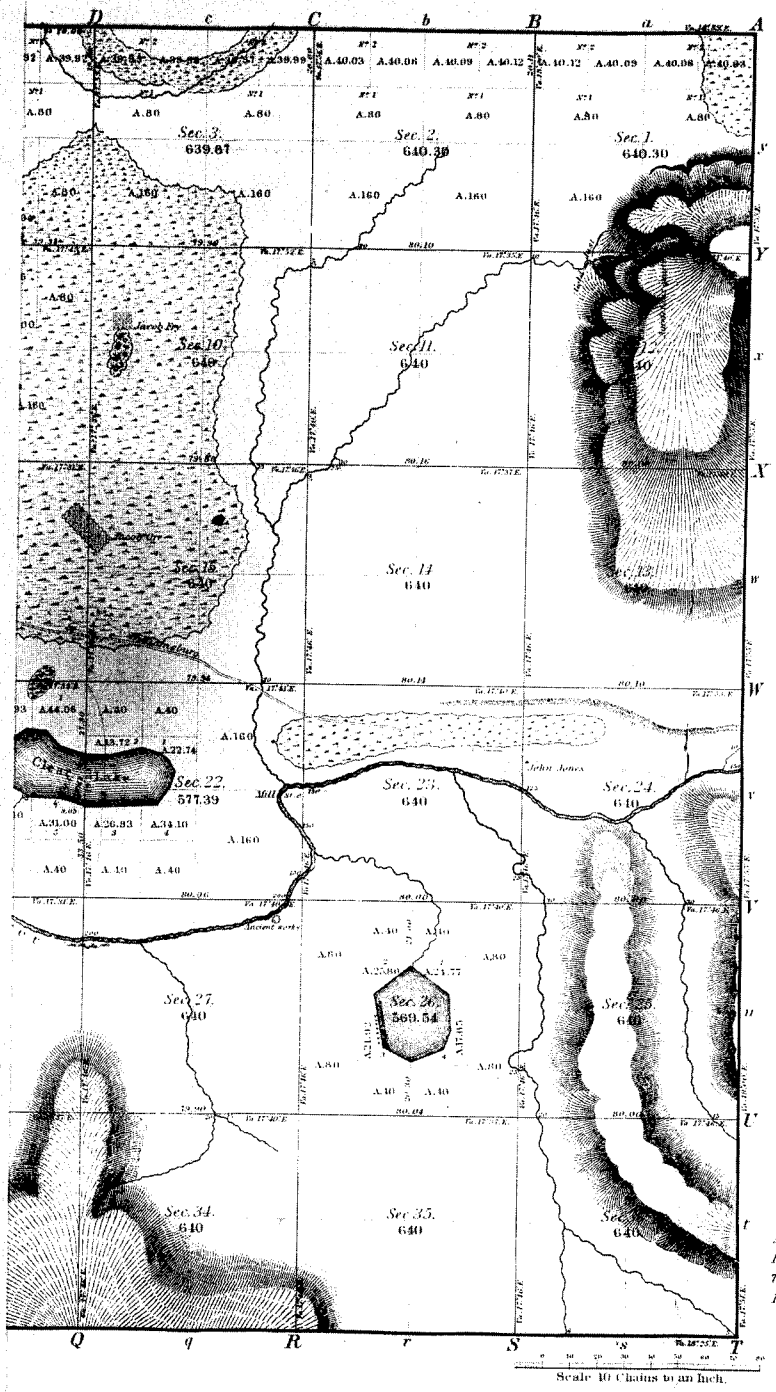


Figure 42. Diagram "B" from 1855 Manual.

Diagram B.

GE No. 2 WEST WILLAMETTE MERIDIAN.



Aggregate Area of Public lands 20598.26
Private Surveys 1280.00
Total number of Acres 21878.26
Estimated Area of river and Lakes 951.98
Aggregate 22830.24

of Surveys	When Surveyed
Lk.	

The above Map of Township No. of Range No. Meridian is strictly conformable to the field notes of the survey thereof on file in this Office, which have been examined and approved

Surveyor Generals Office at

185

Sur. Genl.

very busy man with many activities under his supervision. The opinions written were probably written by the Principal Clerk of Surveys; unless litigation was pending, they were probably signed by the Commissioner without careful analysis.

In the spring of 1856, John Loughborough, Surveyor General of Illinois and Missouri, prepared his *Instructions to Deputy Surveyors*. He sent a draft of these instructions to Hendricks for approval and requested permission to have them printed. Hendricks approved and requested Loughborough to send him 200 copies when they came off the press, which Loughborough did later in the year. These Instructions were basically in agreement with the 1855 official Manual, but in conflict in the limits of closure for a township (Manual, 3½ chains; Instructions, 5 chains). Also, the Manual required lines into the north and west boundaries to be run random and true with closing corners only on standard parallels. The Instructions called for closing (double) corners against the north and west boundaries, which was the "old practice" before 1846. Much more importantly, however, was the appendix to Loughborough's Instructions, pages 47 through 64, which outlined an opinion on the proper method of restoring lost corners and subdividing sections. Basically, section corners are to be restored by single proportion between found corners to the north and south of the missing corners, but there is some hedging and, depending upon interpretation, suggests a double proportion under certain circumstances. Under Item [23] on page 55, the following statement is made, "None of the Acts of Congress, in relation to the Public Lands, make any special provision in respect to the manner in which the subdivisions of Sections should be made by Deputy Surveyors." This seems incredible in view of the fact that all Surveyors General were supplied with copies of the acts of Congress, including the *Act of February 11, 1805,* and the *Act of April 5, 1832,* which most certainly states how sections are to be subdivided. These Instructions should be studied in their entirety to fully understand what the suggested methods of subdividing sections were. The most controversial was that the center quarter-section corner should be established at midpoint on the east-west centerline and the center of the quarter sections (NE 1/16) should be established in the same manner.

After receiving the 200 copies of Loughborough's Instructions, Hendricks began immediately to send a copy to County Surveyors who generally inquired about how to subdivide sections; he referred them to pages 47-62 of the Instructions. This policy continued until about 1863 when the supply of the 1856 Instructions became exhausted. The policy of restoring lost section corners primarily by single proportion between found corners to the north and south was continued until 1882. The argument for the method was usually given about as follows: It is well known that the meridional section lines are actually run in the field, due north, with quarter and section corners established at 40 and 80 chains. These lines are always run. It is also well known that most deputies do not run the east-west section lines all the way, instead they stub out from a section corner just 40 chains and set the quarter corners on the east-west lines, but return field notes with the quarter corner as being at midpoint and on a true line. Therefore, a quarter corner to the east or west would not be a proper basis for restoring a lost section corner in its original position. The same basic argument was used for establishing the center quarter corner at midpoint on the east-west centerline and connecting the north and south centerlines therefrom to the original quarter corners on the north and south sides of the section. The method outlined was believed to make a more equitable division of the section into quarter sections, and on down into one-sixteenth sections.

Looking at the subject from a point of equity, the argument has some understandable merit, but to scholars of the law, as enacted by Congress, the method of subdividing sections was erroneous. It was this whole argument that prompted the now famous letter of opinion written by Abraham Lincoln on January 6, 1859, in which he said the center quarter corner should be placed at the intersection of straight centerlines connecting the original quarter-section corners.

On January 6, 1857, Loughborough was instructed to prepare the Illinois and Missouri records for transmittal to the State authorities and close the St. Louis office by June 30, 1857. The surveys in those States were still not complete and no State legislation had been passed for acceptance of the records. The order was not implemented.

The *Legislative, Executive, and Judicial Appropriations Act of March 3, 1857,* 11 Stat. 206, under "Surveyors General and their Clerks." directs the Secretary of the Interior to cause the "Surveyor General northwest of the Ohio" (at Detroit, Michigan) to be moved to St. Paul, Minnesota. On March 27, 1857, Charles L. Emerson was notified of his appointment to be Surveyor General of Minnesota at Detroit; he actually replaced Chapman on April 12, 1857, and closed the Detroit office on May 11. He opened the Minnesota office in St. Paul on May 23, 1857 and he transferred most of the Michigan records to the State at that time. After bringing all arrears up to snuff, he completed transfer of the Michigan records in May 1858. He received the Minnesota survey records from Lewis in Dubuque and continued the Minnesota surveys without any particular trouble.

In July 1857, David H. Burr, Surveyor General of Utah, was run out of Salt Lake City by militant Mormans. John C. Hays from California was appointed to officially fill the vacant post but apparently never went to Utah. Burr eventually sent his son to Salt Lake City, who turned over the Utah records to the Territorial Governor on April 5, 1858. The Utah office remained vacant until September 29, 1859, when Samuel C. Stambaugh took over the post; but he quit in 1861 and for all practical purposes, no rectangular surveys were made in Utah until 1869.

The *1857 Annual Report* indicated that some 17,000 miles of survey lines had been run in Kansas and 7,000 miles in Nebraska, which is indicative of the speed in which those plains were being surveyed.

On May 25, 1857, Hendricks gave approval and instructions to William J. McCulloh, Surveyor General of Louisiana, for the survey of dried-up "Spanish Lake" in townships 9 and 10 north, range 9 west, Louisiana Meridian. The lake had been meandered during the original survey but had dried up due to drainage, and the plat was approved October 27, 1857. This is the first of the dried-up lake surveys that were discovered.

The Commissioner considered all non-navigable lakes to be public land subject to survey and disposal the same as any other unsurveyed public land. Prior to 1825, only the very

large lakes were meandered; after 1825, lakes of 40 acres and upward in size were meandered, and these only, because settlers didn't want to pay for land they couldn't farm. So the lakes were meandered and left unsold, but were still public land subject to survey and disposal when and if they dried up, or if the government chose to survey and sell them. Surveying a body of water wasn't very practical until after it dried up, for whatever reason. The States tried to claim lakes under the *Swamp Lands Act,* but the claims were rejected because they weren't "swamp land," nor "overflowed," under the meaning of those acts. The position was that shallow lakes, ponds, and marshes were to be surveyed whenever the Commissioner chose to approve a survey, because they were not navigable and were not streams as defined by Sec. 9 of the *Act of May 18, 1796.* Therefore, the abutting owners could not own them in common to the center of the stream. Since the government had merely meandered them to segregate them from lands being sold, the adjoiners could not and did not have any riparian rights.

In retrospect, knowing the basis of the elimination of these small lakes from land sales, the argument was valid. Ironically, the 1851 and 1855 Manuals had lowered the size of lakes to be meandered to 25 acres, but then cautioned that "shallow ponds, readily to be drained, or likely to dry up, are not to be meandered." Perhaps John Moore harbored doubts about the validity of the contention that dried-up meandered lakes would remain public land. The survey of some of the more important dried-up lakes will be mentioned herein as they occurred. With very few exceptions, only lakes that were completely dried up were surveyed.

Minnesota was admitted to the Union on *May 11, 1858,* 11 Stat. 285, with its present boundaries.

The *Acts of May 18, 1858,* 11 Stat. 289-290, pertain to California. The first act makes authenticated copies of the Surveyor General's records admissable as evidence in a court of law. The second act makes it a crime to falsify documents to establish land claims, which was precipitated by persons faking papers and documents in attempts to enlarge or establish claims under Spanish or Mexican laws.

The *Act of May 29, 1858,* 11 Stat. 293, extended the public land laws and surveys to the lands east of the Cascade Mountains in Washington and Oregon territories. In late 1858, David P. Thompson, Deputy Surveyor, extended the Willamette Baseline across the mountains to the southeast corner of T. 1 N., R. 32 E., and ran the Columbia Guide Meridian north for 25 miles. The large area east of the Cascades was finally being opened for survey and settlement.

The *1858 Annual Report* indicates that 20,000 miles had been surveyed during the year in Kansas-Nebraska, the solar compass was being used on all surveys in New Mexico, and all land offices had been ordered to police the public timber lands and stop the stealing of timber, especially pine, from the public domain. Timber thefts were particularly great in Wisconsin, Minnesota, and parts of Florida.

On July 23, 1858, Hendricks issued *Special Instructions* to a County Surveyor in Michigan for the survey of some islands in Thunder Bay. The letter contains the following statement:

> "I would inform you in reply, that upon the terms proposed you can proceed to survey those islands and for your guidance in the work I herewith enclose a copy of the Instructions that were issued some years ago to the United States Deputy Surveyors in the District of Illinois and Missouri and which instructions are applicable to all of the other Surveying Districts."

The Instructions referred to are those by Loughborough in 1856. The 1855 Manual contained some instructions and field note examples for the survey of islands. The 1856 Instructions, page 33 [85] and [86], are better written and easier to understand concerning island surveys, but the letter does not mention the 1855 Manual and implies that the 1856 Instructions are applicable in full to all surveying districts. Perhaps it was meant to be only so in relation to island surveys. Incidentally, the authority for this survey was revoked because the County Surveyor wanted half interest ownership of the islands from the applicants in payment for doing the survey. The Commissioner considered such arrangements illegal.

On August 12, 1858, Hendricks wrote to a man in Ohio who reported a hiatus, 40 to 50 rods wide, between T. 10 N., Rs. 1 and 2 E., Michigan Meridian, and wanted the strip surveyed so he could buy it. The man reported two separate and distinct range lines. Hendricks refused the request on the grounds that the original survey plats did not show any unsurveyed strip; therefore there was none.

On February 7, 1859, Surveyor General Henry M. Rector in Little Rock, Arkansas, resigned. The Little Rock office was closed on March 12, 1859, and the records were turned over to the Register and Receiver of the Land Office for safekeeping. In 1876, many of the Arkansas records were in the Washington office being properly filed and organized; the remainder were in Little Rock. Donaldson reported that the Register turned over the Arkansas records to the State in 1861 during the Civil War.

Oregon was admitted to the Union on *February 14, 1859,* 11 Stat. 383, with its present boundaries.

In August 1859, the west boundary of Minnesota was surveyed south from Big Stone Lake by Chauncey Snow and Henry Hutton to the Iowa line, under contract with the Commissioner. Iron posts were used in places on that boundary.

In 1859, the parallel of 43° 30′ latitude, the south boundary of Minnesota, was extended west into the Dakota Territory, under contract with the Surveyor General of Wisconsin and Iowa, and township boundaries north of that line were surveyed, which began the surveys in a virgin area.

On October 18, 1859, Samuel A. Smith, a politician, became Commissioner of the GLO, replacing Hendricks. In the *1859 Annual Report,* Smith discussed the proposed Homestead Law being debated in Congress. Rumors of this law, which Smith opposed, were greatly reducing land sales.

On February 23, 1860, Joseph S. Wilson, who had been Chief Clerk in the GLO until his appointment, replaced Smith as Commissioner of the GLO.

The *Swamp Lands Act* was extended to the states of Minnesota and Oregon by the *Act of March 12, 1860,* 12 Stat. 3. None of the states admitted after this date are "swamp land states."

On October 27, 1860, Wilson wrote the following letter in regard to dried-up lakes:

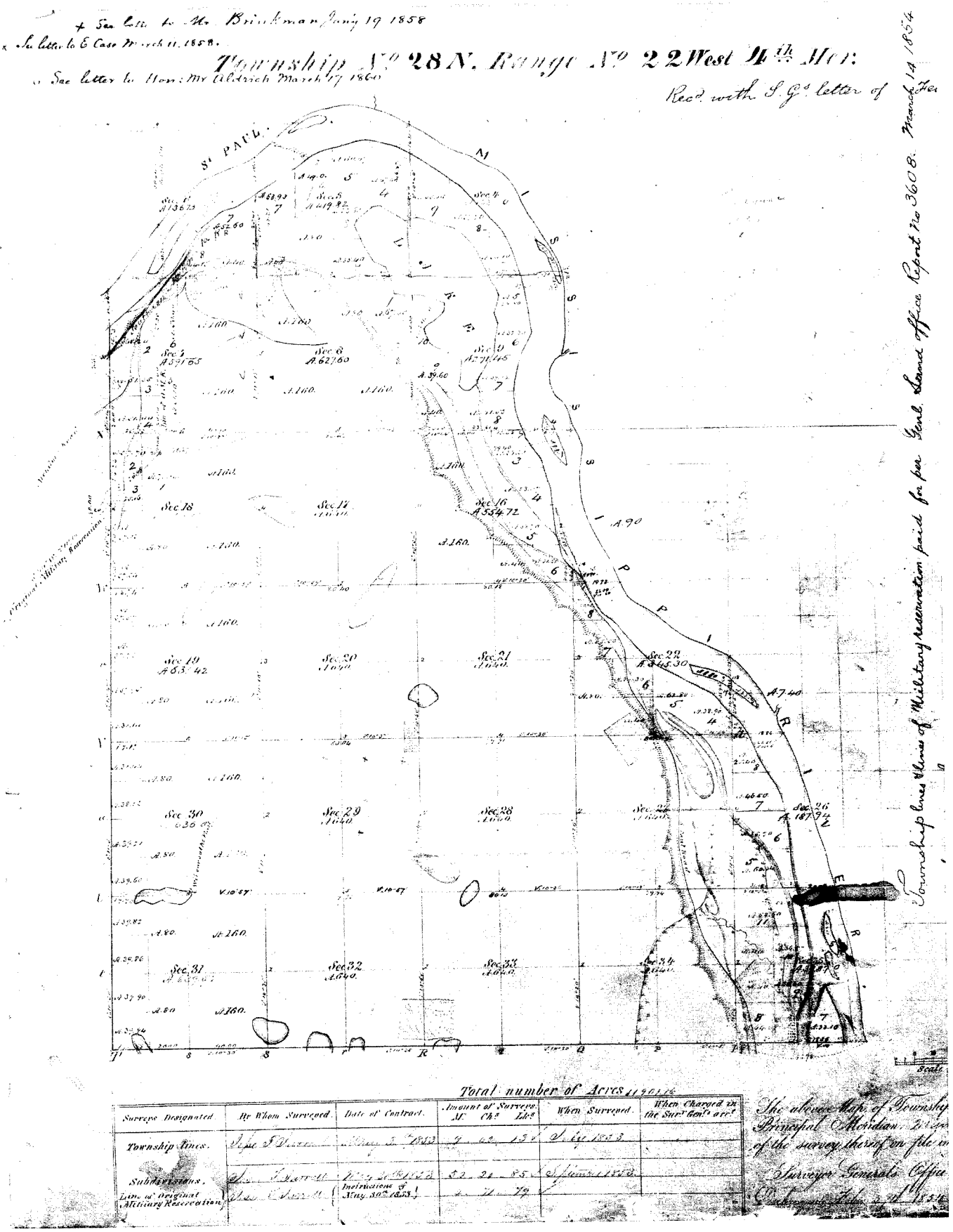


Figure 43. T.28N., R.22W., Fourth Principal Meridian, Minnesota Plat Approved February 24, 1854.

No 22 West 4th Mer:

Recd. with S. G.s letter of Feby 27th 1854

H. M.

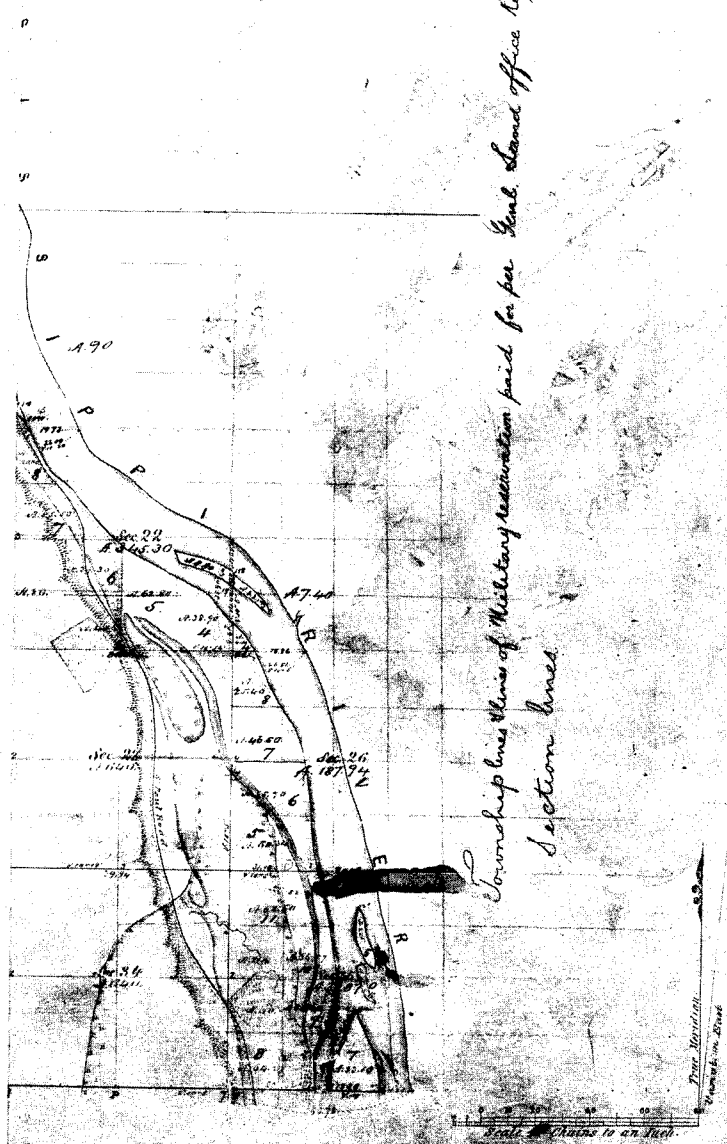
Township lines thus ——— of Military reservation paid for per Genl. Land Office Report No 3608. March 14 1854

Section lines

MINNESOTA

Meanders of Mississippi River, Islands & Lake.

Posts	Courses	Ch.s Lks	Posts	Courses	Ch.s Lks	Posts	Courses	Ch.s Lks
	Mississippi River. Right Bank up Stream			S 50° W	15.00		S 48° E	4.00
				S 29° W	13.50		N 12½° E	2.00
				S 36½° W	16.50		N 41° W	3.50
1	N 6° W	11.00	11	S 55° W	4.00		N 29½° W	3.00
	N 27½° E	17.50					N 10° 30' W	6.50
	N 10½° E	10.50		S 46° W	10.00	21	S 46° 30' W	3.45
	N 5° W	12.00	12	S 51° W	22.50			
	N 9° W	6.00					Island in section 35.	
	N 14° 30' W	10.00		Island in Mississippi River in Sections 4 & 9.				
	N 6° W	6.50				22	S 69° W	1.50
	N 16° W	6.35					S 47½° E	[illegible]
			13	N 22° W	13.50		S 17° E	
	N 11° W	12.50		N 45° W	4.00		S 55° E	
	N 4° W	20.00		N 24° W	6.00		N 17° W	
	N 12° W	21.00		S 55° E	6.00		South	
	N 32° W	19.00		S 35° E	7.00		N 17° W	
	N 21½° W	10.00		S 32° E	8.00	24	N 50° W	
3	N 33° W	3.55	14	S 6° E	3.50			
							Island in Lake between Sections [illegible]	
	N 33° W	6.00		South	3.50			
4	N 44° W	6.44		West	1.50			
			13	N 27° W	4.00	24	East	
	N 41° W	15.00					N 17° W	
	N 62½° W	35.00		Island on line of Secs. 9 & 16 in Miss. River.			N 23½° E	[illegible]
	N 41° W	32.00					S 40° W	
	N 56½° W	7.00					S 20° W	
5	N 32° W	17.50	15	N 5° W	5.50		N 26° W	
				N 24° E	3.20		S 14½° W	
	N 25° 30' W	2.00		S 45° E	2.00	23	S 7° 15' E	
6	N 45° 30' W	3.73	16	S 29½° E	7.10			
							Lake in Sections [illegible]	
	N 41° W	9.00		S 27° E	6.50			
	N 20½° W	14.50		S 16° E	6.50	26	N 30° W	
	N 6° E	7.00		S 6° E	7.00		N 22½° W	
	N 7° W	14.00		S 43° 30' W	10.00		N 27° W	
	N 19° W	21.00		N 22° W	5.00		N 12° E	
	N 33½° W	10.00	15	N 24½° W	8.00		N 55° E	
	N 27° W	4.00					N 57½° E	5.50
7	N 6½° W	3.10		Island in Section 16			S 53½° E	14.00
						25	N 75° E	6.50
	N 16½° W	12.00	17	N 15½° W	12.00			
	N 3° E	7.50		N 25° W	5.50		S 46° E	13.00
	N 15° E	14.00		N 15½° W	16.50		S 78° E	[illegible]
	N 20½° E	8.50		S 6° E	17.50		S 54° E	10.00
	N 15° E	5.00		S 27° E	5.00		S 31° E	12.00
	N 5° W	3.50		S 23½° E	7.50	26	S 51° E	10.00
8	N 10½° W	26.50	17	S 34° E	1.90			
							S 23° E	11.50
	N 21½° W	5.50		Island in Sections 22 & 23			N 4° W	11.00
	N 24° W	5.00					S 20° E	5.00
	N 27° 30' W	6.50	15	N 45° W	4.00		S 8° W	11.00
	N 36° W	12.00		N 60½° W	4.50		S 37° W	10.00
	N 42° W	16.00		N 72° W	15.00		S 36° W	[illegible]
	N 47° W	14.00		S 21½° E	3.50		S 13° W	[illegible]
	N 35° W	11.00		S 53° E	3.50		S 70° W	[illegible]
9	N 60½° W	6.75		S 72° E	6.50		N 62½° W	5.00
			14	S 63° E	12.50		N 10° E	10.00
	N 61° W	11.50					N 65° W	[illegible]
	N 73½° W	12.00		S 53° E	15.00		N 24° W	[illegible]
	N 54° W	11.00		N 25° W	3.50		N 52° E	[illegible]
	S 50° W	6.00		N 37° W	5.00		East	[illegible]
	S 75° W	5.00	18	N 54° W	9.00	27	N 72° W	[illegible]
	S 67½° W	7.50						
	S 55° W	25.00		Island in Section 35.			N 2° W	[illegible]
10	S 58° W	10.50				28	N 10° W	[illegible]
			20	S 15° W	6.50			
	S 57° W	17.00		South	6.50	28	Ch.	[illegible]
	S 52° 30' W	5.50		S 23½° E	10.50	Ch.	[illegible]	[illegible]



Acres	
Surveyed.	When Charged in the Stat. Gen.l acct.
1853.	
1854.	

The above Map of Township No 22 North of Range No 22 West 4th Principal Meridian, Minnesota is strictly conformable to the field notes of the survey thereof on file in this Office, which have been examined and approved.

Surveyor General's Office, St. Paul, Feb. 22nd 1854.

Warner Lewis Jun.r Genl.

POOR COPY

A. C. Root, Esq.
Lyons, Iowa
Sir:

I have to acknowledge the receipt of yours of Oct. 22nd in which you state that a small Lake in Township 83 North, of Range five East, at the time of the Government Survey has since been drained owing to ditches made by the adjoining land owners (yourself being one) and that being desirous to enter it you apply to this office for instructions how to proceed in order to do so.

In reply I have to state, that whenever one or more persons living adjacent to a lake or pond, which by nature or other causes, such as evaporation, etc. becomes dry, wish to purchase the whole or any part of it, and with that view, desire it to be surveyed, he or they must file an application in writing, accompanied by an affidavit of at least two respectable persons, that they have made a personal inspection of the premises, and setting forth the facts of the disappearance of the water and the arable character of the land, and that the applicant has given notice to the coterminous proprietors, of his proposed application to the Surveyor General for the extension of the lines of the Public Surveys.

At any time after two months from the filing of said application, should no objection be made, the Surveyor General may extend the lines over the tract in question, and this Office will authorize the Register and Receiver to open the lands to sale or location.

No Survey however can be ordered, unless the water has *wholly* and *permanently disappeared.*

Very Respectfully
Your Ob't Servant
Jos. S. Wilson
Commissioner

This letter is nearly identical to following letters of the period concerning the survey of dried-up lakes. Some letters pointed out that a survey did not give the applicant any special rights and that the land temporarily enured to the benefit of abutting owners until the lake was totally and permanently dried up. In the closed States, application was made directly to the Commissioner who would then contract for the survey, if it had been approved.

The survey of the lake in T. 83 N., R. 5 E., was apparently not made until many years later. An 1879 letter listed the plat of it as having been approved March 21, 1876.

On December 19, 1860, Wilson authorized Emerson in St. Paul to have surveyed a drained and dried-up lake in sections 4, 5, 8, and 9, T. 28 N., R. 22 W., Fourth Principal Meridian, Minnesota. The lake was meandered in the original survey of 1853. The survey was made by C. W. Iddings, Deputy Surveyor, and the plat approved by Emerson on January 4, 1861. These plats are shown in Figs. 43 and 44. The land in the former lake is now part of an airport in South St. Paul, Minnesota.

The *1860 Annual Report* indicated that most of the surveys in Iowa were completed and that the surveys in Dakota were progressing rapidly, but with no land office, sales could not be made. Wilson also reported that many unauthorized and illegal surveys were being made in Carson Valley, Nevada by "County Surveyors." In 1860, Nevada was still not actually organized into a surveying district and many miners took it on themselves to have the land surveyed.

Kansas was admitted to the Union on *January 29, 1861,* 12 Stat. 126, with its present boundaries.

The preliminaries to the Civil War were felt in February 1861. South Carolina had seceded from the Union on December 20, 1860; this action was followed in January by the secession of the other Southern States including Florida and Louisiana.

On February 6, 1861, the Surveyor General of Louisiana, William J. McCulloh, notified Wilson that he had resigned his position and had turned over the Louisiana records to State authorities.

On February 10, 1861, Francis L. Dancy, Surveyor General of Florida, sent similar notification. The "bond book" lists Dancy as officially resigning on March 4, 1861. However, in April, he actually approved a survey that had been made in April. After the war, the deputy tried to collect on the contract without any luck. The survey was also never honored and was done over in the 1870's.

The Civil War started on April 12, 1861, and ended April 9, 1865. The surveys suffered due to reduced appropriations and consolidation of offices but did proceed at a slower pace.

The *Act of February 28, 1861,* 12 Stat. 172, organized the Territory of Colorado, with the same boundaries as that State now has. Colorado Territory was created out of lands that had been in the territories of Utah, New Mexico, Kansas, and Nebraska. The act established the office of Surveyor General for the new territory, and Francis M. Case, appointed the first Surveyor General of Colorado on April 5, 1861, established his office in Denver on June 17, 1861. The baseline of the Sixth Principal Meridian had been extended along the 40th parallel to the summit of the Rocky Mountains under the Surveyor General of Kansas and Nebraska, Ward B. Burnett, in 1859, so Case had only to contract for expansion of the existing rectangular system.

The *Act of March 2, 1861,* 12 Stat. 209, created both the Territory of Nevada and the office of Surveyor General. Nevada consisted of lands taken from Utah. John W. North was appointed Surveyor General on March 28, 1861, and established his office at Carson City on June 22, 1861. North contracted with Butler Ives for the extension of the Mount Diablo Meridian into Nevada from California. Ives ran the second, third and fourth standard parallels into Nevada and executed other rectangular surveys around the Carson Valley area in 1861. No new meridian and baseline was created. All of Nevada is on the Mount Diablo system.

Also on *March 2, 1861,* 12 Stat. 239, the Dakota Territory and the office of Surveyor General were created; the Dakota Territory included all the Nebraska Territory between Minnesota and the Rocky Mountains and between 43° and 49° north latitude. George D. Hill was appointed the first Surveyor General of Dakota Territory and he took office on June 27, 1861. He established his office at Yankton, South Dakota, on July 1, 1861. No new meridians or baselines were established at the time. The south boundary of Minnesota was extended west as a Standard Parallel of the Fifth Principal Meridian and used as an auxiliary baseline for extending the surveys in the Dakotas.

On March 16, 1861, James M. Edmunds replaced Wilson as

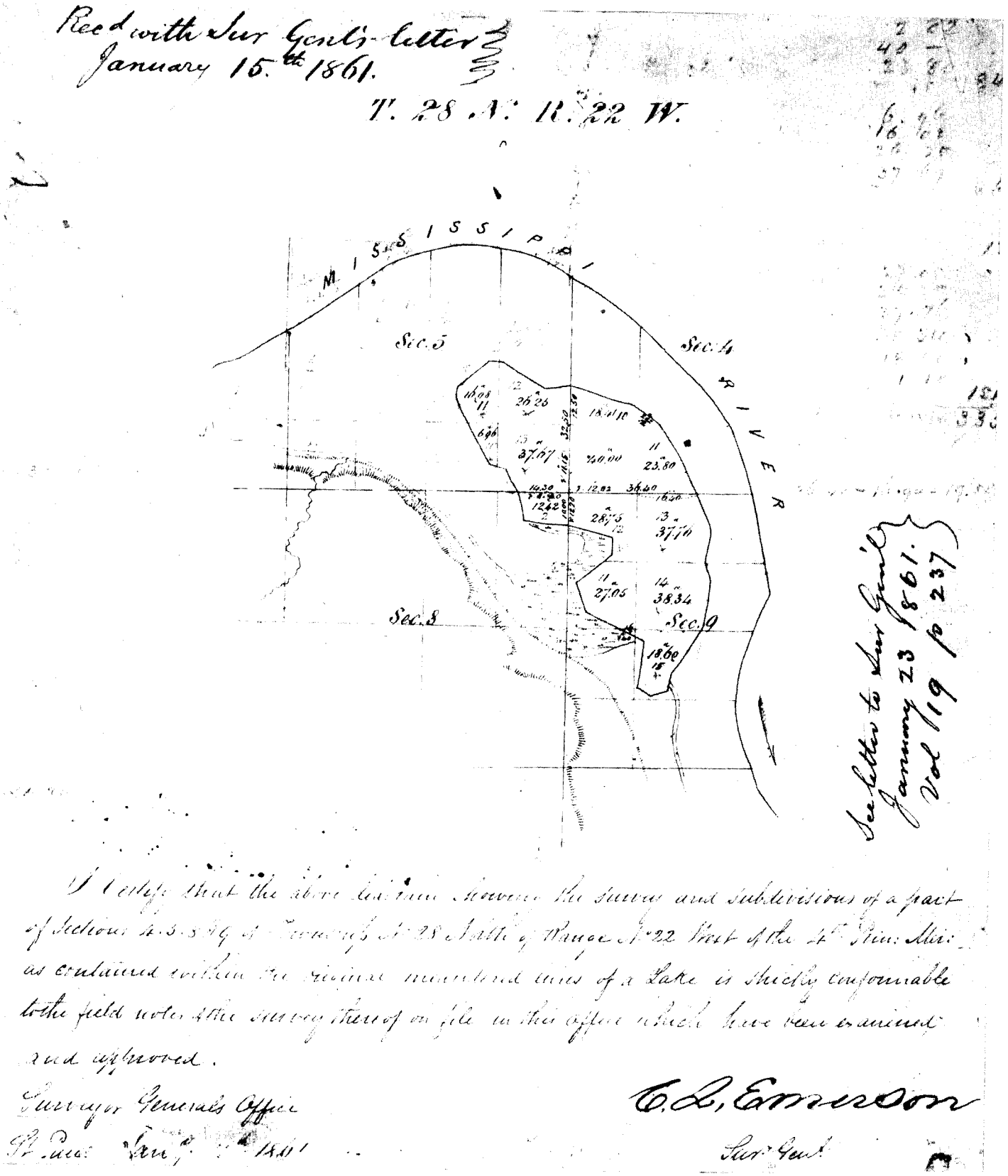


Figure 44. T.28N., R.22W., Fourth Principal Meridian, Minn. Completion Survey of Lake. Plat Approved January 4, 1861.

Commissioner of the GLO. Wilson returned to the position of Chief Clerk in the GLO.

On June 20, 1861, Edmunds notified William Cuddy, the new Surveyor General in St. Louis, that no appropriation had been made for the operation of his office and it would probably have to close by the end of June. On September 15, Cuddy was notified that $6,800 was allotted to him "for preparing the records to be turned over to the States." Cuddy operated for the next two years on "slush fund" moneys.

On February 17, 1862, the Supreme Court of the United States rendered the final decision in the case of *Johnston vs. Jones,* 66 U.S. 117, which involved a dispute over the division and ownership of lands formed by accretion along the waterfront in Chicago, Illinois. The court ruled that the accretion should be divided along the new waterline in proportion to the original holding along the old. The case is the basis of the "apportionment of frontage" rule, the method used today when applicable. The rule is well described in Sections 7-58 and 7-59 of the 1973 Manual.

On March 3, 1862, John A. Clark, Surveyor General of New Mexico, fled from Santa Fe because it had been invaded by Texas soldiers of the Confederacy. Clark packed up most of the records, except some of the Spanish Archives, and sent them to Fort Union. He returned to Santa Fe on May 20, 1862, and found almost everything in good order; the Texans had taken most of the furniture but had left the records unmolested.

By Sec. 4 of the *Act of March 14, 1862,* 12 Stat. 369, Nevada was made part of the California surveying district under the Surveyor General in San Francisco. The office in Carson City was closed after operating only six months. Confusion in the Nevada surveys followed.

The *Act of May 15, 1862,* 12 Stat. 387, created the Department of Agriculture, which would one day take administrative control of large areas of the public lands, and, in some cases, survey parts of those lands.

The *Homestead Law* was enacted by Congress on *May 20, 1862,* 12 Stat. 392. The law applied to persons over 21 years of age, "who has never borne arms against the United States Government or given aid and comfort to its enemies." The homesteader could acquire patent to 160 acres, upon proof of settlement and cultivation, conforming to legal subdivisions, after the lands had been surveyed. An original township survey in Nevada in 1948 was executed to allow patent on a homestead, filed on in 1923. The homestead patent could not issue until the land was officially surveyed. Patent to surveyed homesteads could be accelerated by a cash entry payment of $1.25 or $2.50 per acre. Although the Homestead Law was amended many times in later years, the basic law remained the same; 160 acres of agricultural land was given to anyone who would settle on it and plant a crop there. The law greatly increased the need for extension of the rectangular public land surveys.

The *Act of May 30, 1862,* 12 Stat. 409, was entitled "An Act to reduce the Expenses of Survey and Sale of the Public Lands in the United States."

Sec. 1 of the act states that contracts for surveys would not be binding on the United States until approved by the Commissioner of the GLO. Great delays in execution of the fieldwork resulted because of the lapse in time between a contract being negotiated by a Surveyor General, transmittal to and approval by Washington, return to the Surveyor General, and then finally a party outfitted and sent to the field. The fieldwork was usually executed the following field season, perhaps a year or more after the initial signing of the contract. But all subsequent contracts were approved in Washington until the contract system was abolished in 1910.

Sec. 2 of the act made the *1855 Manual of Surveying Instructions* part of every contract. The Manual, *Special Instructions of the Surveyor General,* when not in conflict with the Manual, and Instructions from the Commissioner, were also made part of the contracts. Thus, in theory at least, the conflicts between the 1855 Manual and the 1856 Instructions for Illinois and Missouri, were eliminated by law. The 1855 Manual was the controlling document and the Surveyors General could not issue instructions in conflict with it. But, as previously noted, the 1855 Manual contained no instructions for restoration of lost corners and subdivision of sections. Those rules continued to be formulated by the Commissioner with little consistency.

Sec. 3 gave the Commissioner full power to establish surveying fees within the maximum allowed and also required that the cost of surveying and platting private land claims be paid by the claimant before a patent could be issued.

Sec. 4 combined Utah and Colorado into one surveying district under the Surveyor General of Colorado; it also combined Nevada and California, as previously noted.

Sec. 8 gave the Surveyor General of New Mexico the additional duties of Register and Receiver. He was then in effect the entire land office in that large territory.

Sec. 10 of the act provided for the first of the "deposit surveys." Settlers wishing to speed up the surveys could apply and deposit a sum sufficient to pay the cost. The Surveyor General could then survey the township at the expense of the settlers; however, not many settlers chose to pay the costs this would incur.

The *Act of June 14, 1862,* 12 Stat. 427, was entitled "An Act to protect the Property of Indians who have adopted the habits of civilized life." The act provided for protection of those Indians who had received an allotment of tribal lands according to treaty stipulations. The Indian agent was to protect the allottee from trespass, etc. Nothing was said about how the agent was to determine the boundaries of an allotment and thus prove a trespass occurred. The method of surveying allotment boundaries was not spelled out by statute until the *Act of April 8, 1864.*

The *Act of July 1, 1862,* 12 Stat. 489, added another duty to the hard-pressed Surveyors General. The act was the huge railroad land grant to subsidize the construction of the Union Pacific and Central Pacific Railroads from the Missouri River to the Pacific Ocean. A right-of-way 200 feet in width on each side of the track and all odd-numbered sections for 10 miles each side of the track were granted. The grant did not apply to mineral lands. If necessary, the railroad was given the right of eminent domain (they could condemn private lands). Sec. 7 of the act required that the lands be surveyed as soon as any portion of track was completed.

This act and subsequent, similar, railroad grants placed a heavy burden on the surveyors. It also caused the partial survey of many townships. The act is very long and complex, prohibiting a synopsis here. For full details of this and other railroad grants, the acts themselves should be reviewed.

October 8, 1862, Thomas A. Townsend, the Surveyor General at Dubuque, suddenly died. James M. Edmunds directed Isaac N. Higbee, the Chief Clerk to operate the office, but Higbee could not approve surveys or enter into contracts. The law did not allow for an "acting" Surveyor General. Higbee conducted the business until Henry A. Wiltse was appointed to the post on January 29, 1863.

The *Act of February 24, 1863,* 12 Stat. 664, established the Territory of Arizona and the office of Surveyor General. All of the New Mexico Territory lying west of the present Arizona-New Mexico boundary, including part of present Nevada, was included in Arizona Territory. Levi Bashford was appointed Surveyor General in August 1863 and opened an office in Tucson on January 25, 1864. Apparently he never executed any surveys for there is no record of any. The *Appropriations Act of July 2, 1864,* 13 Stat. 344, attached Arizona to New Mexico under Clark at Santa Fe. Bashford was terminated and closed the office on July 4, 1864. The same act attached Nevada and Idaho to the Colorado surveying district and made Montana part of the the Dakota surveying district.

Some confusion may have resulted. Colorado was so remote from Nevada that John Pierce in Denver could hardly contract for surveys there. Plats of Nevada surveys were approved by Lauren Upson, Surveyor General of California, from 1864 to 1866.

The *Act of March 3, 1863,* 12 Stat. 754, required the President to reserve lands for townsites on rivers, harbors, and other prospective centers of population. The townsites were to be surveyed by the government into "urban and suburban lots of suitable size." This act was the origin of the so-called "Presidential Townsite", now codified in *43 U.S.C. 711-712.* The first townsite surveyed and lots sold under this act was the Townsite of Port Angeles in the present State of Washington.

The *Act of March 3, 1863,* 12 Stat. 808, established the Territory of Idaho, and included the area which is now the States of Idaho, Montana, and Wyoming. No provision was made for surveys.

On March 24, 1863, Edmunds replied to John Cross, County Surveyor of Page County, Iowa, on how to subdivide sections. Edmunds stated that the center quarter corner should be at the intersection of centerlines run between original quarter-section corners, with the exception of sections on exterior boundaries or where the sections were otherwise not normal. This letter was the first step away from the method used according to the 1856 Instructions.

On June 29, 1863, the following letter was written, probably by J. H. Hawes, who was the Principal Clerk of Surveys, in regard to the restoration of lost corners.

General Land Office
June 29th, 1863.

D. W. Maxon, Esq.,
Cedar Creek, Washington, Co., Wis.

Sir:

Your letter of the 12th inst., asking for information as to the proper mode of establishing lost corners of the public surveys, etc., is received. As stated in my communication of the 2d inst., this office does not assume to exercise any control over the surveying operations of county surveyors.

For the information of surveyors who may be called upon to re-establish lost corners of the public surveys or subdivide sections, the following general principles, based upon the laws of Congress and the regulations of the land department in accordance therewith, may be stated:

1st. Section and quarter section corners as established by the government survey, must, by law of Congress, stand as the true corners.

2d. Missing corners must be re-established at the identical point where the original posts were planted by the U.S. deputy surveyors.

3d. The legal presumption is, in the absence of any evidence to the contrary, that lost section and quarter section posts were originally established at the distances indicated in the field notes.

4th. Half quarter section corners must be established equidistant from the section and quarter section posts.

The first proposition above is in accordance with a law of Congress approved February 11th, 1805. To divide a section into quarters a *right line* should be run from the quarter section posts in one section line to the corresponding quarter section post in the opposite section line, even though one or more of these posts may have been established nearer to one section corner than the other, thereby giving to one quarter section more than 160 acres and to another less.

The second proposition grows out of the first, and is in accordance with the laws of Congress. It is the duty of the surveyor to re-establish missing posts in the exact locality where they were originally placed in the government survey. The proof of locality first sought to be obtained should be the "witness trees," or any other means of identification contained *in the field notes,* and next, clear and unquestionable testimony of any other kind. If no bearing trees, or other evidences in the field notes or elsewhere exist, by which the locality of the missing posts can be identified or determined in the field, then, as stated under the third head, the legal presumption is, that the missing section or quarter section corners were originally established in conformity with the distances expressed in the field notes, and the surveyor should so re-establish them.

Extinct quarter section corners, except on fractional section lines, when they cannot be identified as above, should be re-established equidistant between the section corners, in a right line between the nearest noted "line trees" each side of it, if there are any, but if none are found, then in a right line between the section corners. Extinct quarter section posts on section lines which close on the north and west, boundaries of townships, should be re-established, according to the original measurement there of, at 40 chains from the last interior section corner.

Extinct section corners may be re-established by running a right line between the nearest noted "line trees" north and south and east and west of the lost corner, if there be any such trees within the distance of the nearest quarter section, or section corners; but if no "line trees" be found, then between the nearest quarter section or section corners, and at the point of intersec-

tion of the two lines thus run, establish the section corner, with new bearings, to the nearest and most desirable objects.

The quarter mile posts are not established in government surveys, but are, by law, understood to be equidistant from the section and quarter section corners, as stated under the fourth head, and should be so established by the county surveyor.

It may be remarked, that where the measurement of any section line by the county surveyor does not correspond with the original measurement recorded in the field notes, lost corners should be re-established at *proportional distances* from each other between the known corners.

A proper application of the principles embraced herein will enable the practical surveyor to subdivide the public lands and re-establish the lost corners of the public surveys, in conformity with law and the regulations and usages of the land department.

There are some anomalous cases, such, for instance, as double corners on the north and west boundary lines of townships, an explanation of which must be omitted owing to the length of this communication. The general principles which should govern the county surveyor are, however, indicated with sufficient clearness to guide him in the rightful performance of his duties.

Very respectfully, etc.,
Jas. M. Edmunds, Commissioner.

The letter illustrates the problem of restoring lost corners and the value placed on "line trees", which were held to control the direction of a section line but not to control distance or proportion along that line. A lost quarter corner was restored at proportionate distance between the section corners.

The letter says that section corners should be restored by direct evidence first, and in accordance with the proportioned field notes second. Then it goes on to say the corner may be re-established at the intersection of east-west and north-south lines determined by line trees, quarter corners, or other section corners. The intersection method was enacted into law by the Missouri State Legislature (Missouri Statutes, Sec. 60.290) and was upheld by decisions of the State courts. However, the law could only apply to private lands in that state, not to public lands. This State statute was changed in 1979 and the laws there are now in close conformity with the 1973 Manual.

The Indian Reservation problem became more acute in 1863. Mark W. Delahay, Surveyor General at Leavenworth, Kansas, complained of the hodge-podge system to Secretary of the Interior J. P. Usher, who sent the complaint down to Edmunds for reply. Edmunds explained on July 30, 1863, that Indian boundaries were surveyed under various acts of Congress, some with Indian Office money and under Indian Office supervision, some by order of the President, some by order of the Secretary, and others by the Commissioner and/or a Surveyor General. There was no consistency in the methods of surveys or field notes and plats if any. Edmunds recommended a single law placing all the Indian surveys under the supervision of the Commissioner, it was passed a year later.

On August 10, 1863, *Special Instructions* were issued to J. H. Hawes, Principal Clerk of Surveys in the GLO, for the survey of Fort Howard Military Reserve at Green Bay, Wisconsin, and the Fort Crawford Reserve at Prairie du Chein on the Mississippi River. These old reserves were to be surveyed and disposed of under the public land laws, just two of many Military Reserve surveys which were to follow over the next 70 years or more. Those two surveys by Hawes were also made by a direct employee, not under a contract.

A letter dated September 3, 1863, written to Frank Dorr, County Surveyor, West Liberty, Iowa, advised him to double proportion the lost southeast corner of Sec. 28.

On October 26, 1863, Edmunds ordered Cuddy at St. Louis to close his office and turn over the Illinois and Missouri records to the Recorder of Land Titles in St. Louis; it was closed October 31, 1863. The Missouri records were finally transmitted to State authorities in August 1874. The Illinois records were transferred to State authorities in July 1869.

In the *1863 Annual Report,* Edmunds stated that island surveys were too expensive in relation to the money derived from the sale of small islands. Therefore, regulations were adopted requiring the applicant to pay for the survey.

On January 4, 1864, Edmunds replied to a man in Illinois who had requested a copy of the 1856 Instructions. He said these Instructions were no longer in accord with the rules and regulations of the Department but it was the only one available. They were now out of stock, more were to be printed, and he would send a copy when available. No copies of the 1856 Instructions were ever sent. In July 1871, a reprint of the 1855 Manual was made and copies were sent to all people who had requested instructions up to that time.

The *Act of March 21, 1864,* 13 Stat. 30, enabled Nevada to become a State. It was admitted by Presidential Proclamation on October 31, 1864, and was enlarged to its present boundaries by the *Act of May 5, 1866,* 14 Stat. 43.

The *Colorado Enabling Act* was also approved on *March 21, 1864,* 13 Stat. 32. The residents couldn't agree on a form of government. Congress approved the final enabling act on *March 3, 1875,* 18 Stat. 474, and Colorado was admitted by Presidential Proclamation on August 1, 1876. The surveys had been in progress since 1861.

The following letter was sent to Warren Beckwith on March 30, 1864, in response to his inquiry about the proper method of subdividing a section:

General Land Office
March 30th, 1864.

WARREN BECKWITH, Esq.,
Geneva, Wis.

Sir:

I am in receipt of your communication of the 23d inst., inquiring as to the proper mode of subdividing sections into legal subdivisions. The law of Congress approved Feb. 11th, 1805 (U.S. Statutes, page 313, Little & Brown's edition), gives explicit directions how this shall be done. This law has not since been repealed or modified, and hence the true and only lawful mode of subdividing sections is the one described therein.

By this law the following definite and fixed rules are enunciated, to wit:

1st. All corners once established in the field, and approved and returned by the proper officers, shall

stand as the true corners they were intended to designate, even though the intervals do not correspond with the measurements in the field notes.

2d. All boundary lines of legal subdivisions which shall not have been actually run and marked in the field, shall be ascertained by running straight lines from the established corner to the opposite corresponding corner.

It will be seen from the foregoing rules that the correct mode of dividing sections is by running straight lines from quarter post to opposite quarter posts, the common center being determined by the intersection of the lines so run. Great care should be taken in running such subdivisional boundaries to first identify the existing corners as the true original corners established by the U.S. surveyor.

Very respectfully, etc.,
Joseph S. Wilson,
Acting Commissioner.

An identical letter was sent to L. M. Dyer at White Hull, Green County, Illinois, on April 13, 1864. Although signed by Chief Clerk Wilson, they were no doubt written by J. H. Hawes, Principal Clerk of Surveys.

The *Act of April 8, 1864,* 13 Stat. 39, was entitled "An Act to provide for the better Organization of Indian Affairs in California." The main part of the act deals with Indian reservations and affairs in that State. But Sec. 6 of the act states:

> "That hereafter, when it shall become necessary to survey an Indian or other reservations, or any lands, the same shall be surveyed under the direction and control of the general land-office, and as nearly as may be in conformity to the rules and regulations under which other public lands are surveyed."

This section is now codified in *25 U.S.C. 176.*

The act clearly places the survey of Indian and other reservations under the regulations and methods of the regular public land surveys. After passage of the act, the boundary surveys were made under contracts with the Surveyors General or under contract with the Commissioner of the GLO. When township, sections, and section subdivisional lines were surveyed within reservations, it was nearly always by contract with a Surveyor General, except for those made in the Indian Territory (Oklahoma).

On April 28, 1864, Edmunds wrote to the Chairman of the Committee on Public Lands. He was proud of a departure from the rectangular system in mountains and valleys, done in accordance with Sec. 4 of the *Act of March 3, 1853,* 10 Stat. 244, which allowed such departure; he recommended the idea.

Edward F. Beale in California had contracted for the survey of lands around Honey Lake in California and in the Humboldt River Valley in Nevada. These were deemed to be "lands fit for agriculture" and were also along the route of the Pacific Railroad. Mineral lands and lands "unfit for cultivation" were precluded by law from the surveys. Desert mountains certainly were unfit for cultivation and may have contained minerals as well. How were the surveys to be extended into Honey Lake and Humboldt Valley? Using the provisions of Sec. 4 of the 1853 law, Beale told the deputies to run an offset by traverse lines. The Fourth Standard Parallel North was extended into Honey Lake by 52 miles of traverse along the eastern base of the Sierra Nevada. The Sixth Standard Parallel North was extended easterly for 115 miles by traverse around the base of the mountains into Humboldt Valley. But, no corners were established along those traverse lines. Ironically, the Commissioner would not allow a $1,725 payment for those 167 miles of "line" because of no corners being set to monument them. That didn't make the deputies very happy, nor the new Surveyor General, Lauren Upson. Had corners been established, perhaps payment would have been allowed.

No instance is known in which traversing the base of mountains was later used in California and Nevada, but the method was used in New Mexico, at least in 1873. There a "meander line" (actually a traverse) was run along the base of the mountains and fractional lots returned against the meanders as though the mountains were similar to a lake. Where the section lines intersected the base of the mountains, "Fractional Section Corners" (marked FS) were set and the meanders run between them. Careful research has not found a law specifically approving this procedure; perhaps the Committee on Public Lands didn't consider it necessary or if a law was recommended, Congress declined to enact it.

The *Act of May 26, 1864,* 13 Stat. 85, established the Territory of Montana, greatly reducing the Idaho Territory, and authorized appointment of a Surveyor General for Montana. But on July 2, 1864, Montana was attached to the surveying district of Dakota. No Surveyor General was appointed until 1867.

On June 1, 1864, Commissioner Edmunds issued instructions to the Surveyors General relating to the surveys that updated the 1855 Manual in many respects.

The main changes by item number were:

7. Small islands were to be surveyed at cost to the applicant and procedures were given for obtaining such survey.
8. Notes and procedures were to be kept for determining "swamp lands."
9. Non-navigable rivers were to be meandered along only one bank, the right bank if possible.
10. Increase the size of lakes to be meandered to 40 acres; long narrow lakes were not to be meandered and payment was not to be allowed for measuring across or offsetting around a lake.
18. Correcting back on true line is to be by bearing instead of a change in variation.
20. Prescribes closing limits and limits on length of section lines in clearer form than the 1855 Manual.

These instructions or manual modifications were reissued in 1871 in the same form and are included in the Appendix for full review.

The *Act of July 1, 1864,* 13 Stat. 343, placed the coal lands that had been reserved since 1841 on sale by legal subdivision at a minimum price of $20 per acre. Sec. 2 and the remainder of the act are general townsite laws pertaining to townsites on the surveyed or unsurveyed public lands. Townsites up to 640 acres with boundaries conforming to the rectangular surveys were authorized. It is probable that most of the townsites on public lands were made under this act. It is codified in *43 U.S.C. 713-717.*

The *Act of July 2, 1864,* 13 Stat. 356, extended the Union Pacific Railroad land grant to all the odd-numbered sections, for 20 miles on each side of the right-of-way, up from the previous 10 miles.

Also on *July 2, 1864,* 13 Stat. 365, Congress granted lands to subsidize construction of the Northern Pacific Railroad. The grant was for a right-of-way 200 feet on each side of the track and all odd-numbered sections for 20 miles on each side of the right-of-way.

In the *1864 Annual Report,* Edmunds requested a law allowing for traverses along the base of mountains, as detailed above. He reported that the Big Tree Grove and Yosemite Valley in California had been granted to the State by *Act of June 30, 1864,* 13 Stat. 325, and that the *Act of May 5, 1864,* 13 Stat. 63, provided for the survey of certain Indian reservations in Utah into allotments. The Yosemite Valley would eventually be returned to government ownership as part of Yosemite National Park. The move to conservation and preservation of the natural wonders had begun in earnest.

In January 1865, Nathan Butler in Indiana asked advice on the proper method of subdividing a section into quarter-quarter sections. On January 20, 1865, the following reply was sent:

Department of the Interior
General Land Office
January 20, 1865

Nathan Butler, Esq.
Fort Wayne, Ind.

Sir:

In answer to your letter of the 11th inst., I have to state that to subdivide a quarter section in accordance principles established by law of Congress for the survey of the public lands, the proper mode is to run a straight line from a point *equidistant* between the ¼ post and section corner to a point equidistant between the opposite ¼ post and section corner, such lines to be run either east and west *or north and south* as the case may be, when it is desired to bisect the quarter section, and both north and south *and* east and west when it is desired to divide the quarter section into four legal subdivisions.

It must be observed however, if the section is on the north boundary of the Township the east and west line bisecting the *north* half of the section must be run from a point 20 chains north of the ¼ post in the east boundary of the section to a point 20 chains north of the ¼ post in the west boundary; so too if the section is on the west boundary of a Township the north-and-south line bisecting the west half of the section must be run from a point 20 chains west of the ¼ post in the south boundary line to a point 20 chains west of the ¼ post in the north section line.

It is proper to remark that if in the above cases the distance from the ¼ post to the section corner is found by the surveyors measurement to be more or less than the distance stated in the government survey, the subdivision point should be fixed proportionately between the corners. For illustration, if the distance between the ¼ post and section corner is stated in the government survey to be 41.14 chains and by the surveyors measurement it is 40.76 chains then:

as 41.14:20::40.76: the true starting point north or west of the ¼ post.

The lawful mode of subdividing a section into quarters is by running a straight line from ¼ post to ¼ post.

Very respectfully
Your Obt. Ser't
J. M. Edmunds
Commissioner

Butler wrote back on February 6, 1865, disagreeing with the above method, suggesting that the quarter section should be subdivided in the same manner as the section itself was subdivided into quarter sections. He received the following letter in response:

Department of the Interior
General Land Office
February 16, 1865

Nathan Butler, Esq.
Fort Wayne, Ind.

Sir:

I have your letter of the 6th inst., referring to the mode of subdividing a quarter section into quarters. The mode you suggest is not, in the opinion of this office, the proper one. The principles which should govern in dividing sections into legal subdivisions are laid down in the law of February 11, 1805. The rule there given is, that "the boundary lines, which shall not have been actually run and marked, shall be ascertained by running straight lines from the established corners to the opposite corresponding corners".

While this rule has more especial reference to the division of the section into quarters, it is based upon certain principles enumerated in another part of the same law, and the subdivision of a section into quarters under this rule involves percisely the same points of objection and inequality that occur in the subdivision of the quarter section.

The law nowhere provides for the establishing of corners in the interior of a section, but it does point out specifically how the section, quarter section and quarter quarter section corners shall be established on the exterior lines of the sections and it also directs that the quarter section shall be bounded by straight lines running from ¼ post to ¼ post. This rule is equally applicable where one ¼ post is not precisely in place; the division in that case must give to one quarter more and to the other less than the 160 acres contemplated in the law. I think the same principles should be applied to the subdivision of a quarter section. The quarter mile posts should be established equidistant from the section and quarter section corners as the law specifically directs, and straight lines should be run from one post to its opposite corresponding post, *through the section* and those lines will be the true and lawful boundaries of the 40 acre subdivisions.

The objection which you suggest, that the owner of an adjoining quarter section might object to the surveyor crossing his lands if it were tenable, would in certain cases also prevent the subdivision of a section into quarters in accordance with the law above cited. As for instance, where one party has purchased the *north half* of a section, and two other parties owning the S. E. and

S. W. quarters, desire the boundary line between them established. The law in this case is plain, the line must be run from the ¼ post in the north boundary, and to establish this line in pursuance of the law the surveyor must cross the north half of the section.

In the opinion of this office the corners established on the section lines should govern the subdivision of sections, and the boundaries of all legal subdivisions should be determine by running straight lines through the section from one corner to its opposite corresponding corner.

Your application. . . .

Very respectfully
Your Ob't Ser't
J. M. Edmunds
Commissioner

Although signed by Edmunds, these letters were undoubtedly written by J. H. Hawes, Principal Clerk of Surveys. In them, Hawes correctly quoted and pointed out the principles given by the *Act of February 11, 1805,* which specifically dealt with the subdivision of the old two-mile blocks into individual sections and the subdivision of sections into half or quarter sections, the smallest legal subdivision at that time. What Hawes completely overlooked was the *Act of April 5, 1832,* which specifically stated that the "contents of quarter-quarter sections, which may thereafter (after May 1st) be sold, shall be ascertained as nearly as may be, in the *manner,* and *on the principles,* directed and prescribed by the second section" of the *Act of 1805*. The quarter sections are also to be subdivided in the same manner as the sections were subdivided. Butler was advocating the proper method of subdividing a quarter section on different grounds—equity and economy (only one mile of survey instead of two miles to subdivide a given quarter section). Although equity and economy are good reasons, even though the result be the same, they were not the basis for the law, which was written to settle boundary disputes by statute and end contentions. Yet, as we see in this exchange, only 30 or 60 years later, different individuals interpreted the law as they chose to view it, rather than look to its roots for the answers. This improper method of subdividing a normal quarter section pervailed, as a general policy until 1871.

By Sec. 3 of the *Appropriations Act of March 2, 1865,* 13 Stat. 460, Nevada was reattached to the surveying district of California. Upson was instructed to extend the surveys along the line of the Pacific Railroad but received no money for the work.

In the latter part of March 1865, John A. Clark, Surveyor General of New Mexico, took an inspection trip through Arizona. He visited the area southwest of Phoenix at the junction of the Gila and Salt Rivers. On a conical hill just south of the junction and south of the Gila River, a boundary monument had been erected by the Mexican Boundary Commission in 1851, which marked the U.S.-Mexico boundary prior to the Gadsden Purchase in 1853. Clark reported on May 24, 1865, that he had adopted this monument as the initial point for the Gila and Salt River Meridian in Arizona, but he had no funds, so no surveys were run from that monument until two years later.

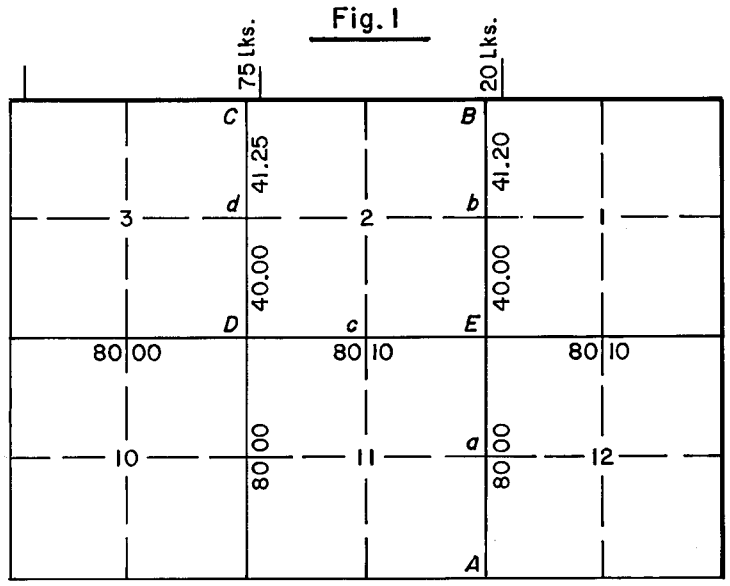
On April 10 and April 20, 1865, John Pierce in Denver contracted with Joseph Clark, Deputy Surveyor, for the survey of the exterior boundaries and subdivisional lines of the Spanish Fork, Cow Creek, San Pete, and Deep Creek Indian reservations in Utah. Clark began these surveys in July 1865 and completed them in October 1866. He first ran the exterior boundaries, setting a monument every 20 chains, then subdivided them into 40-acre tracts, again setting monuments every 20 chains, the first of the Indian Allotment surveys that were discovered. The reservations were not subdivided into regular sections first, however, and in fact were not tied to the rectangular surveys until three years later. Clark reported that all the rectangular corners had been destroyed by either time, weather, or the settlers.

On July 30, 1865, Anson G. Henry, Surveyor General of Washington Territory, drowned when the steamship Brother Jonathan struck the Point St. George Reef near Crescent City, California, and sank. One hundred and ten people including Henry were lost. The Olympia Office was operated by Edward Giddings, Chief Clerk, until Selucius Garfield was appointed and filled the vacancy in April 1866.

In the *1865 Annual Report,* Edmunds reported that since no appropriation for surveys had been made, very few were done except those in the Indian reservations, and what few had been made, were done with leftover funds. He also reported that the California-Nevada boundary had been surveyed north from Lake Bigler, now Tahoe, and southeast for 102 miles along the oblique line, but that these boundary lines were not acceptable to the GLO. The line north from Lake Tahoe is still in dispute.

On April 9, 1866, the following instructions were sent to H. M. Cankin at Greenville, Michigan, in reply to his request about the proper method to be used in restoring lost corners. These instructions were a stock answer being used at that time in reply to such requests.

"The following examples will illustrate some of the more difficult of the rules for restoring corners.



Example 1. — Required to restore the missing section corners *B, C, D, E,* and the quarter sections corners *a, b, c, d.* Fig. I.

Mode. — In this example it will be observed that two sets of section corners were established on the north boundary of the township. From the original field notes it appears that the section line between sections 1 and 2 intersected the township line 20 links west of the corner established when said township line was run. Therefore plant the corner *B* 20 links west of such corner; then proceed to the corner *A* and run a random line north, setting temporary posts at 40 chains, 80 chains, and 120 chains, noting the excess or deficiency on the last half mile, and the falling east or west of the newly erected corner.

Calculate a course that will run a true line from *B* to *A*, and if the distance by the present measurement be more or less than that stated in the original field notes, plant the permanent quarter section corner b at a proportional distance:

Thus; the original distance from *A* to *B* was 161 chains and 20 links: suppose the distance by the resurvey to be 162 chains 10 links, then-

As 161.20:162.10::41.20 (*B* to *b*, original measurement) = 41.43. The permanent quarter section corner *b* should therefore be re-established 41 chains 43 links south from *B*.

The distance by present measurement from *b* to *A* will of course be (162.10-41.43 =) 120 chains and 67 links. The remaining corners *B* and *a* must likewise be restored at proportionate intervals, but as these intervals were equal in the original survey they will be equal in the resurvey; therefore, by dividing the remaining distance into three equal parts we shall have the correct distance at which these corners should be re-established, to wit: 120.67 ÷ 3 = 40.22½ = the true distance from *b* to *E* and also from *E* to *a* and *a* to *A*.

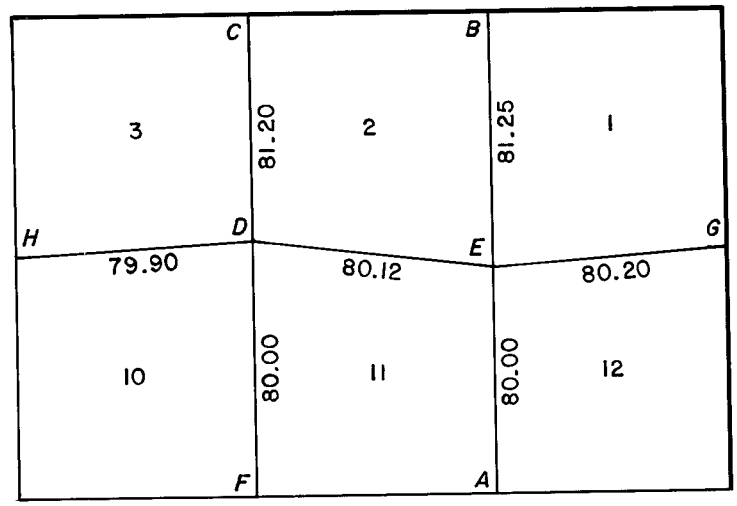
Proceed in the same manner to restore the corners *C*, *D*, *d*, after which plant the quarter section corner *c* equidistant between the section corners *D* and *E*.

In the foregoing example it will be observed that the boundary lines of the sections are of uniform length east and west. Were these lines of various lengths, say from 5 to 75 links, the mode described in the preceding example would not be correct, for it will be remembered that *all* corners are to be restored at *proportional* distances. This is as true in regard to east and west lines as it is of north and south lines; there is no difference in this respect. When, therefore, there is any material difference in the intervals between the section corners east and west, as is frequently the case, the distances must be made proportional east and west as well as north and south, even though at the expense of regularity in the configuration. The mode of proceeding in such cases will be better understood by reference to the following illustration:

Example 2. — Required to restore the section corners *D* and *E* and all the quarter section corners. Fig. II.

Mode. — It appears from the field notes of the United States survey that the original intervals between these *section* corners were unequal, therefore they cannot be restored equidistant, but the proportional distances

Fig. 2



must be preserved. To this end the county surveyor should remeasure the section lines *A B*, *C F*, and *G H*. This done he will have the data from which to make the necessary calculations to enable him to re-establish the lines and corners correctly.

Suppose the result of the remeasurements to be as follows: *A B*, 162.20 chains; *C F*, 160.80 chains; and *G H*, 242.40 chains. Now the distance from *A* to *B* is set down in the original field notes at 161 chains 25 links. Therefore,

As 161.25:162.20::80.00 = 80.47 = the true length of the line *A E*, according to present measurement, and 162.20- 80.47 = 81.73 chs. from *E* to *B*. So also —

As 161.20:160.80::80.00:79.80 chs. *F* to *D*.

And 160.80-79.80 = 81.00 chs. *D* to *C*.

The distance from *G* to *H* as indicated in the original field notes, was 240.22 chs. Then,

As 240.22:242.40::80.20:80.92¾ chs. *E* to *G*.

240.22:242.40::80.12:80.84 chs. *D* to *E*.

and 242.50-(80.92¾ + 80.84 =) 161.76¾ = 80.63¼ chs. *D* to *H*.

Having provided the above data, proceed to *A* and remeasure the south boundary of section 12. Having calculated *a* course that will run from *A* to *E*, plant the ¼ section corner at 40.86½ chs., and the section corner *E* at 81.73 chs. Then run a random line to G, planting the ¼ section corner at 40.46⅜ chs., and correct back on a true line.

The original distance from *E* to the ¼ section corner north of it was, of course, 40 chs. The distance from *E* to *B*, by present measurement, is 81.73 chs. Then,

As 81.25:81.73::40.00:40.23½.

Calculate a course which will run from *E* to *B*, and establish the quarter section corner 40.23½ chs. north from *E*.

Return to *F* and proceed in the same manner to restore the corners on the section line from *F* to *C*.

By this mode, the quarter section corners between *E B* and *D C* will have been established at proportionate distances between the respective section corners, and

all the other ¼ section corners equidistant between their respective section corners, in conformity with the law."

As can be seen, in Example 1 the restoration is by single proportionate measurement along a straight north-south line between found corners, treating the closing corner at "B" as found. This method is justified inexplicably because the east-west section lines were originally the same length. Example 2 is a strict double proportionate restoration of the lost corners between the found original corners based on the original record. This general policy, outlined in these instructions on restoration of lost section corners, would remain in effect until about 1880.

On June 19, 1866, Henry Wiltse at Dubuque was ordered to close his office by June 30 and turn over the Wisconsin records to the State and Iowa records to William Johnson, the Custodian in Dubuque, for safekeeping. The Dubuque office was closed and the Wisconsin survey records and plats were turned over to that State on August 1, 1866. After Iowa passed the necessary legislation, the records were turned over to its authorities in March 1868. Subsequent surveys in Iowa were executed under the Surveyor General of Nebraska until 1886.

The *Act of June 29, 1866,* 14 Stat. 77, authorized appointment of a Surveyor General for Idaho. Lafayette Cartee, who had been a deputy surveyor in Oregon for many years, was appointed and established his office in Boise City on November 7, 1866. The initial point for the Boise Meridian, which controls all the rectangular surveys in Idaho, was established in April 1867 on a rocky butte about 19 miles southwest of Boise. Deputy Surveyors Peter W. Bell and Allen M. Thompson began the survey of the baseline and meridian from that point.

The *Act of July 4, 1866,* 14 Stat. 85, reestablished the Surveyor General for Nevada; William B. Thornburgh was appointed and opened his office in Carson City on November 27, 1866. The act allowed for a departure from the rectangular system for the surveys in Nevada if the situation warranted the change. This may have been authorizing the use of traverse lines to get the surveys into remote areas; if so, there is no indication that it was used. The act also withdrew all mineral lands from survey and entry under the public land surveys.

A change in the method of subdividing sections was made on July 6, 1866, as will be seen by the following letter:

H. S. Hoover, Esq.
Waverly, Bremer Co.
Iowa

Department of the Interior
General Land Office
July 6, 1866

Sir:

In your letter of the 16th ultimo you inquire how sections of the public lands should be subdivided. As you do not refer to any particular section, I assume that your inquiry does not relate to peculiar or anomalous sections but to the regular sections containing 640 acres. The law prescribes the following rules for subdividing sections: —

The section and quarter section corners established by the U.S. Deputy must stand as the true corners. To divide the sections into halves or quarters *straight lines* must be run from the established corners to opposite corresponding corners, the intersection of the lines so run will be the legal center of the section. The quarters may be again divided into half quarters or quarter quarters by straight lines run from points equidistant from the center of the section and the quarter section post to their corresponding opposite points equidistant between the section corners, and intersection of lines thus run will be the legal center point of the quarter section.

Very Respectfully
Your Ob't Ser't
J. M. Edmunds
Commissioner

This is the exact method that was prescribed by law and the same method that is used today, but it didn't stay that way, as will be seen.

The *Act of July 25, 1866,* 14 Stat. 239, granted lands to the Oregon and California Railroad. All odd-numbered sections, ten miles on each side of the right-of-way, were granted with indemnity selection to an additional ten miles. Actually the railroad received all odd-numbered sections for 20 miles each side of the railroad, which were not already claimed or mineral in character. The railroad defaulted on conditions of the grant and the unsold lands in the grant were revested to the United States in 1916. These Oregon and California ("O. & C.") lands are administered by the BLM and constitute a large part of the dependent resurveys presently executed in the State of Oregon.

Also on *July* 25, *1866,* 14 Stat. 242, Congress passed an act granting to Adolph Sutro a right-of-way and up to two sections of land (to be paid for at $1.25 per acre) to construct an exploration and drainage tunnel to the Comstock Lode at Virginia City, Nevada. The long silence on the mineral lands was being broken.

The *Act of July 26, 1866,* 14 Stat. 251, was the first lode mining law. Prior to this law, all mineral lands were sold by legal subdivisions of the rectangular system. This act provided for a right-of-way for the construction of ditches and canals across the public domain and for metes and bounds surveys of lode mining claims up to 200 feet in length. The Surveyors General were made responsible for the surveying and platting of the claims; the costs were to be paid by the claimant.

Sec. 4 of the act is perplexing, and reads in part:

"That when such location and entry of a mine shall be upon unsurveyed lands, it shall and may be lawful, after the extension thereto of the public surveys, to *adjust the surveys* to limits of the premises according to the location and possession and plat aforesaid, and the Surveyor-General may, in extending the surveys, *vary the same from a rectangular form* to suit the circumstances of the country and the local rules, laws, and customs of miners . . ."

This could be interpreted to mean that the rectangular surveys could be varied and adjusted to fit with the mining claims; if it did, it isn't known how such an adjustment could have been accomplished.

There is no known record of a Surveyor General attempting to utilize the provision during the six-year life of the act.

When the rectangular surveys were extended through a mining claim area, it was done in the normal manner without regard to the claims themselves, which were then segregated from the sections.

Sec. 8 of the act reads:

> "That the right-of-way for the construction of *highways* over public lands, not reserved for public uses, is hereby granted."

This section is the basis of many thousands of miles of roads and highways built across the public domain. All that really had to be done to acquire a highway right-of-way under this act was to build one. Subsequent patents were automatically subject to an existing highway across the land. If a State or territory passed legislation accepting the grant and specified the location and width of a right-of-way for highways, all subsequent patents were subject to it. For example, in 1871 the Dakota Territory declared by law a road right-of-way 66 feet in width along all section lines. All subsequent patents were taken subject to that reservation. Sec. 8 of this important act is now codified in *43 U.S.C. 932*.

Sec. 9 made reservation for construction of ditches and canals across public lands. Miners were allowed to construct ditches to bring water to their claims. Further legislation on ditches and canals came in 1890.

Secs. 10 and 11 of the act allowed preemption and homestead on the agricultural lands in the known mineral areas if the lands were shown to be nonmineral bearing. This provision would later require mineral segregation surveys.

Sec. 16 of the act extends the rectangular system over the mineral lands, which had been excluded from survey since 1853.

The *Act of July 28, 1866,* 14 Stat. 339, legalized the metric system of measurements in the United States; however, as of 1980, the metric unit has not been used in the Public Land Surveys in this country.

Another *Act of July 28, 1866,* 14 Stat. 344, directed that the Surveyor General's office for Iowa and Wisconsin at Dubuque, Iowa, should be closed and moved to Nebraska with a new surveying district to include Nebraska and Iowa. The closure had already occurred, as previously noted. Phineas W. Hitchcock was appointed the new Surveyor General on April 4, 1867; he got the furniture from Johnson in Dubuque and established his office in Plattsmouth, Nebraska, in June. Kansas became a separate surveying district and the Surveyor General remained at Leavenworth.

On July 28, 1866, Edmunds issued a *Circular* to all Surveyors General which amended Diagram B of the 1855 Manual. The system of lot numbering was changed to that still used today; the odd system of having two Lots 1 and two Lots 2 in a section was eliminated.

On September 1, 1866, Joseph S. Wilson again became Commissioner of the GLO; he was the only Commissioner ever to serve two separate terms in that office.

On December 1, 1866, Wilson sent a Special Agent to New Orleans with instructions to recover the Louisiana records from the State authorities, inventory them, and prepare lists.

On December 11, 1866, Wilson ordered Thornburgh to move the Nevada Office from Carson City to Virginia City. Perhaps Thornburgh refused, because on May 27, 1867, Anson P. K. Safford became Surveyor General of Nevada and made that move.

In January 1867, William H. Pierce, Deputy Surveyor, began the survey of the Gila and Salt River Baseline in Arizona, starting from the initial monument selected by Clark. The surveys of township and range lines were extended from the baseline by Wilfred F. and George P. Ingalls, under contract with the Surveyor General of California. The Arizona surveys were finally under way.

The *Act of February 9, 1867,* 14 Stat. 391, enabled Nebraska to become a state and was admitted by Presidential Proclamation on *March 1, 1867,* 14 Stat. 820.

The *Act of February 25, 1867,* 14 Stat. 409, granted lands for three miles on each side of a military road which was to be constructed from The Dalles, Oregon, to Boise, Idaho. Again as in the railroad grants, the Surveyor General had to survey the section lines as soon as possible after any portion of the road was completed. This was just one of many such wagon road grants.

The *Appropriations Acts of March 2, 1867,* 14 Stat. 440 and 457, provided funds for, and authorized, topographical and geological surveys to be made in Nebraska, and between the Rocky Mountains and the Sierra Nevada in California. These geological surveys were made under supervision of the GLO and were made by expeditions under the direction of Ferdinand V. Hayden. In 1869, further explorations were authorized, which were conducted by John Wesley Powell from 1869-1875. The Hayden and Powell surveys were the forerunners of the U.S. Geological Survey (USGS). By this act, Arizona was attached to the California surveying district.

The *Act of March 2, 1867,* 14 Stat. 542, again authorized the appointment of a Surveyor General for Montana Territory and made it a separate district; Soloman Meredith was appointed on April 18, 1867, and subsequently established the office at Helena. Commissioner Wilson had directed Meredith to establish a Principal Meridian on Beaver Head Rock about 12 miles north of Dillon, Montana. Instead, Meredith established the initial point on a limestone hill, 800 feet high, about 12 miles southwest of the junction of the three forks of the Missouri River. The Principal Meridian and Baseline surveys were begun by Benjamin F. Marsh in August 1867. The Principal Meridian in Montana has no given name or number; it is identified just as the Principal Meridian, Montana, and controls all of the rectangular surveys within that State and none other.

Another *Act of March 2, 1867,* 14 Stat. 541, was another law for townsites on the public lands. It is the basis of what is now called a Trustee Townsite, and is codified in *43 U.S.C. 718-721*. The maximum of 2,560 acres could be taken up by legal subdivision as a townsite under this act.

On March 13, 1867, Wilson dispatched a Special Agent to Florida with instructions to gather and inventory the Spanish Archives on private land claims. On August 5, he ordered the agent to get the Surveyor General's records from the State Register, inventory and list them, and then turn them over to the U.S. Attorney for safekeeping.

On March 30, 1867, the United States purchased Alaska from Russia, adding that huge territory to the public domain.

A slight softening of the former hard stand on dried-up lakes occurred in 1867, as indicated by the following letter:

T. N. Stevens, Esq.
Greenville,
Michigan
Sir:

Department of the Interior
General Land Office
June 4, 1867

I am in receipt of your letter of the 21st Ulto. in reference to a lake originally meandered, and subsequently partially drained, situated in sections 1, 2 and 11 of T. 9 N., R. 9 West, Michigan.

In reply I have to state that where lakes originally meandered become dry land, by any cause, the land no longer subject to overflow, and suitable for cultivation, it is regarded as public land over which the lines of the public surveys should be extended and the same disposed of as other public lands.

But where such lakes become partially drained by evaporation or other causes the land from which the water has receded inures to the respective riparian proprietors for their use and occupancy.

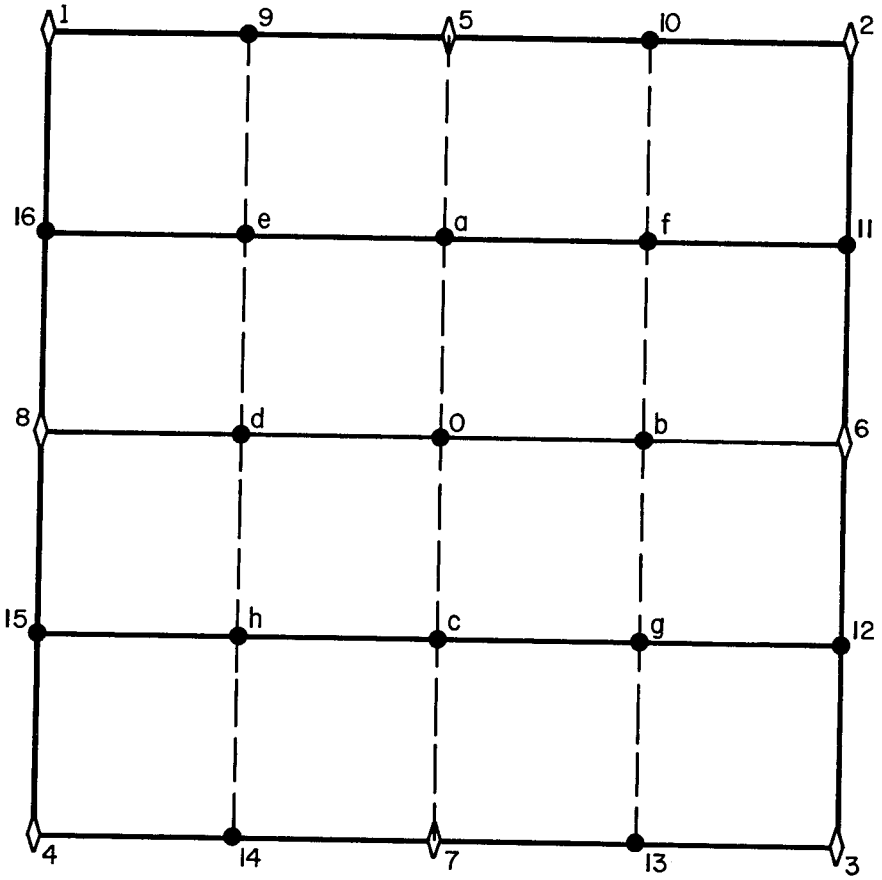
In reference to the common boundary of lots 2 in sections 1 and 2 if the water between them had entirely disappeared the extension of the section line between those two sections would constitute the common boundary of such lots; but as there yet remains a portion between the lots covered by water the margin of the slough or stream constitutes the boundary of those lots, and the remaining portion covered by water maintains its original status as meandered water.

So long, therefore, as any portion of the lake as originally meandered remains covered by water or subject to periodical overflow the lines of the public surveys cannot be extended over it nor the land disposed of by the government.

I am Sir —
Very Respectfully
Your Ob't Ser't
Jos. S. Wilson
Commissioner

This has been recognized as a "Catch 22" policy. The riparian adjoiner has temporary riparian rights, can use the land exposed by reliction, but when it all dries up, he loses it to the government. It would be to his advantage to make sure the lake never did completely dry up, even if he had to dig a pond

CORNER IDENTIFICATION ON INDIAN RESERVATIONS



= Surveyed lines
= Section and 1/4 corners
= Corners at equidistant position
1, 2, a, b = Identifying designation

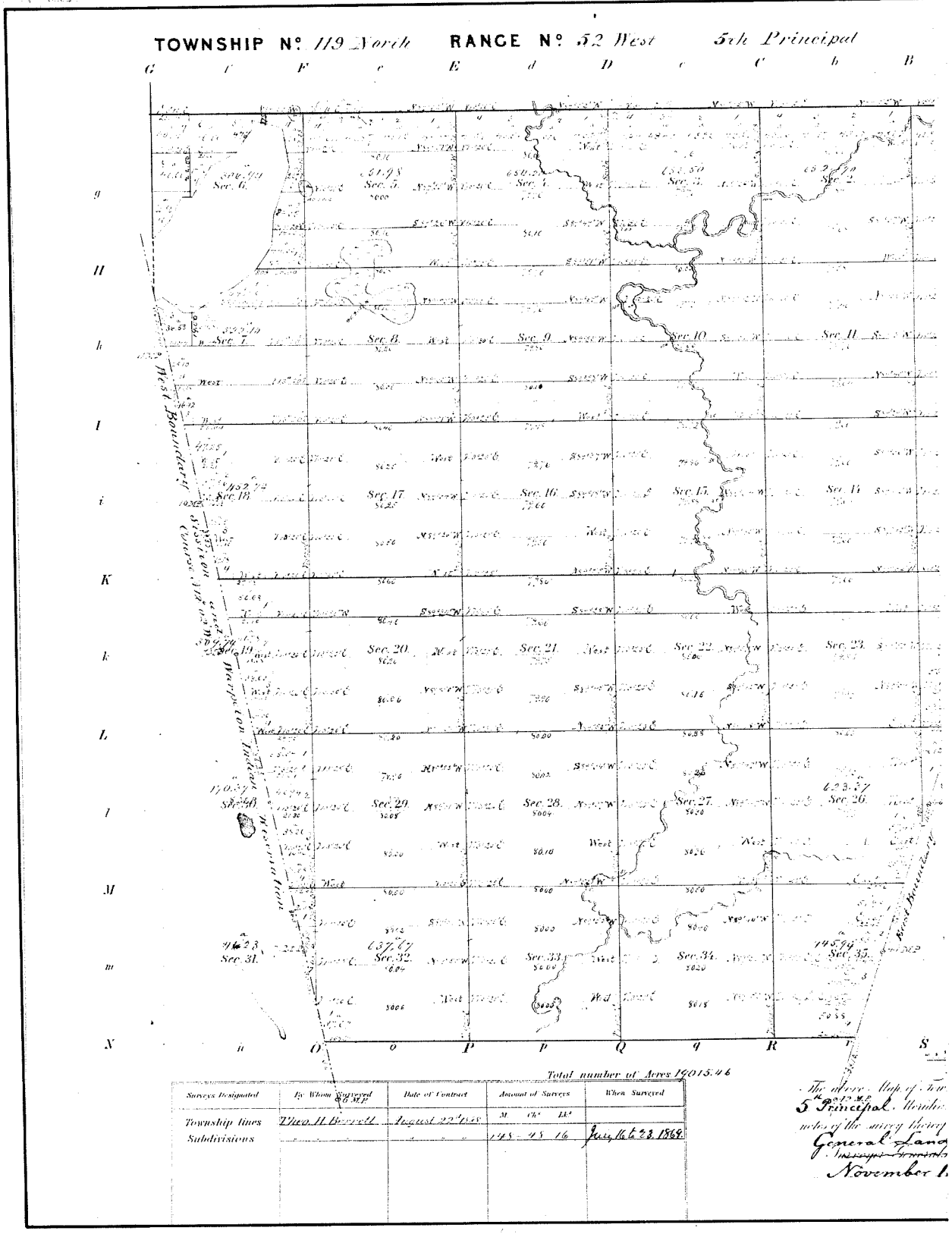
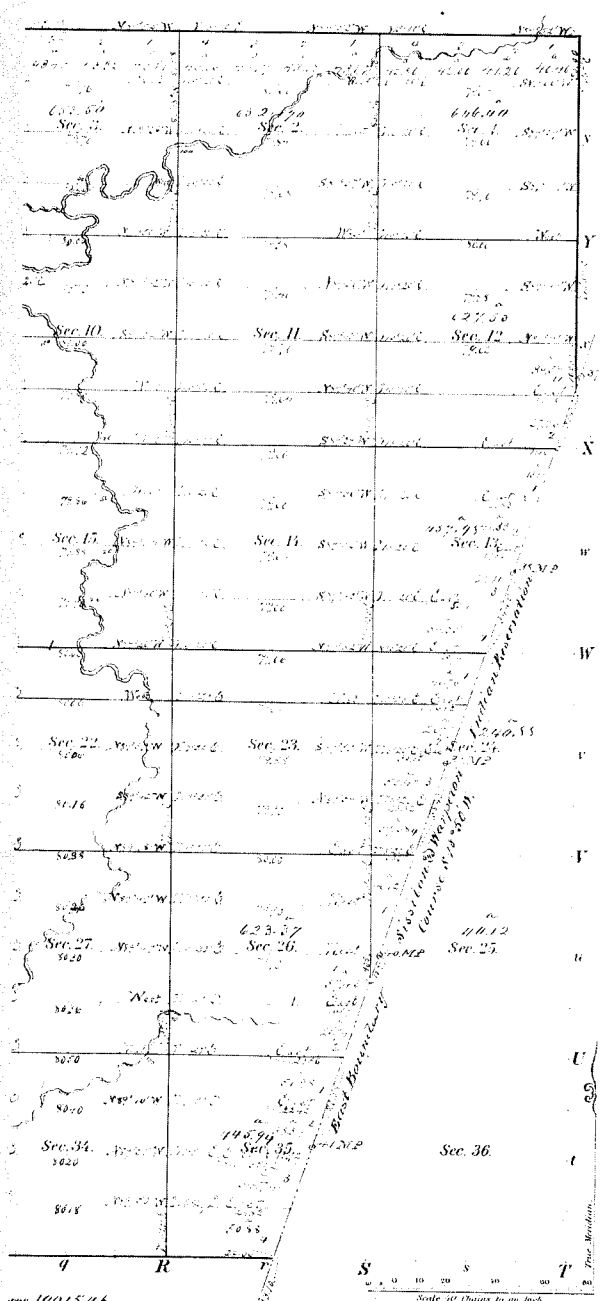


Figure 46. Warpeton and Sissiton Reservation with "Three Mile" Subdivisions.

Lowell's letter Oct 23 1874

st 5th Principal MERIDIAN Dakota.



Meanders of Lake part in T. 119 N. R. 52 W.

Posts	Courses	Ch. Lks.	Posts	Courses	Ch. Lks.	Posts	Courses	Ch. Lks.
in Sec. 4								
Total								

The above Map of Township No. 119 N. of Range No. 52 W. of the 5th P.M. Meridian Dakota T. is strictly conformable to the field notes of the survey thereof on file in this Office, which have been examined and approved.

General Land Office
November 11 1869

Commissioner.

Posted Aug. 20/92
J.A.D.

to retain some water. But this was the first admission by the GLO that owners adjoining a non-navigable lake may have riparian rights. This "temporary use" policy remained in effect to the end.

After Wilson became Commissioner for the second time, J. H. Hawes left the GLO. In 1867, he began writing his *Manual of United States Surveying* and had it published in 1868. Several inquiries were received in the GLO about the book requesting a copy of it. Each inquiry received a reply which denied at first any knowledge of the work and that it was not an official publication and was not recognized as having any authenticity. Actually, the Hawes Manual is an excellent reference to the policies in effect while Hawes was Principal Clerk of Surveys. Several of the same letters used in this book were printed in Hawes' Manual.

The *1867 Annual Report* indicated that after passage of the *Lode Mining Law* in 1866, the mineral States were organized into Mineral Districts by the Surveyors General. These were not miners' mining districts, they were simply geographic areas set up by the Surveyor General for filing and recording purposes, and appointment or commissioning of Mineral Surveyors. Nevada was organized into eight mineral districts; California was divided into nine districts.

On June 10, 1868, Commissioner Wilson issued *Circular No. 22,* detailing the process to be used in surveying small, unsurveyed islands which had been omitted in the original surveys. No change in policy was made; the islands were deemed public land subject to survey and disposal. The applicant had to deposit the money necessary to pay for the survey under the *Deposit Survey Law of May 30, 1862,* but received no rights to the island because of such payment. These instructions are given in the Appendix.

On July 13, 1868, L. M. Frierson of Booneville, Missouri, applied for the survey of an island in the Missouri River. Frierson alleged that the island had always been in existence but that at low water it was attached to the mainland which was patented. Wilson denied the application and ruled that the island inured to the riparian owner because of the accretion which caused the connection. This decision is indicative of the misunderstanding and confusion which prevailed with respect to riparian rights.

The *Act of July 25, 1868,* 15 Stat. 178, established the Territory of Wyoming. The territorial boundaries were the same as the present State boundaries.

On August 22, 1868, Wilson entered into a contract with and issued Special Instructions to Theodore H. Barrett, a surveyor from St. Cloud, Minnesota. Barrett was to survey the exterior boundaries, township and section lines, and subdivision of sections of the Sissiton and Warpeton Indian Reservation, located west of Lake Traverse in the Dakota Territory, now South Dakota. Barrett surveyed the exterior boundaries of the reservation first, then subdivided it into regular townships and sections of the Fifth Principal Meridian. Barrett then subdivided the sections into 40-acre allotments by the so-called "Three Mile Method", as instructed by the Commissioner, which simply means that he ran the north one-sixteenth line, the east-west centerline and south one-sixteenth line across the section (three miles total) and set the one-sixteenth section corners and center quarter corner at equidistant positions. None of the north-south lines through the section were surveyed. In every other respect the surveys were made in accordance with the public land laws on surveying.

This Three Mile Method of subdividing sections was used only on Indian reservations. All reservations subdivided into allotments were done by this method and variations of it until about 1920. When subdivided into 40-acre allotments, the one sixteenth corners were usually referred to as "1/8 corner." If subdivided into 20-acre allotments the one-sixty-fourth corners were usually called "1/32 corner." The Bureau of Indian Affairs (BIA) allotting agents devised a number and letter designation for the corners around the exterior boundaries and interior corners of a section. Fig. 45 is a sketch showing the system used to designate the corners and the lines surveyed. Fig. 46 is the plat of T. 119 N., R. 52 W., Fifth Principal Meridian, Dakota, as surveyed by Barrett.

Be aware that if interior corners of sections subdivided in this manner are now lost and are to be restored during a resurvey, they must be restored by proportionate measurement in the same manner that they were originally established, not by the rules of subdivision of sections as required by the 1973 Manual. More discussion of Indian allotments will appear as they occurred, especially after 1887.

On July 28, 1868, John A. Clark was commissioned Surveyor General of Utah and opened the office in Salt Lake City. Benjamin C. Cutler replaced Clark as Surveyor General at Santa Fe on August 26, 1868. But Clark only stayed in Salt Lake City until July 1869, at which time Courtland C. Clements took charge of the Utah office.

On November 18, 1868, Wilson replied to an inquiry from Silas Reed at Stanton, Missouri, on how to subdivide a section two. The north quarter corner of the section had not been established in the original survey and the north boundary of the township had double corners. Wilson advised Reed to survey the east-west centerline between the original quarter corners (normal) and run the north-south centerline due north from the south quarter corner to an intersection with the north boundary of the township and establish the north quarter corner at said point of intersection. Where the centerlines had been run and would intersect is where the center of the section would be established. Most other letters written in 1868 on the same subject received similar replies.

On December 24, 1868, in reply to W. P. Hobson of Savannah, Missouri, Wilson stated that whenever a meandered stream "entirely forsakes the former bed" then the land left exposed and the streambed were public land and subject to survey and sale. This was a case of avulsion of a stream, not the drying up (reliction) of a lake, and the expressed opinion was obviously contrary to law.

Wilson held very strong and somewhat biased opinions on riparian rights. The *1868 Annual Report* contains more than ten pages on riparian rights in which Wilson very strongly stresses his stand on the subject; it also indicates that dried-up lake surveys were made at cost to the applicant, the money was to be deposited before the survey would be ordered.

A letter dated March 11, 1869, addressed to Myron McLaren, Mt. Pleasant, Michigan, advised McLaren to establish the quarter-quarter (one-sixteenth) corners of sections against the north and west boundaries of the township (north one-sixteenth and west one-sixteenth) "at precisely 20 chains from the 1/4 posts," placing the excess or deficiency in the last quarter mile. All others should be placed at equidistant posi-

tion between the quarter corners and section corners. Proportioning was not considered in that opinion.

In a letter to George W. Cooley of Minneapolis, Minnesota, dated March 25, 1869, Cooley was advised to establish the north quarter corner of a section two at midpoint between the closing corners at the northeast and northwest corners of the section. The east-west centerline should be run on true line between the east and west quarter corners. The north-south centerline was to be run due south from the established quarter corner on the north boundary to an intersection with the east-west centerline where the center quarter corner would be established. (Apparently the quarter corner of sections 2 and 11 did not exist—perhaps it was in a lake.) This was the first letter found that advocates the proper present-day method of establishing a north quarter corner between closing corners. Hawes' Manual judiciously avoided the subject.

During 1868 and 1869, an increasing number of letters arrived in the GLO from people complaining about County Surveyors and others who were moving the original quarter section corners from their original location to a position midpoint and on line between the section corners. In each reply, the Commissioner stated that the practice was objectionable and illegal, but that he had no jurisdiction over County Surveyors; he recommended that the complainant refer the matter to a court of competent jurisdiction. Most of this "corner moving" took place in the Plains States west of the Mississippi River.

On April 26, 1869, M. L. Stearns was notified of his appointment to be Surveyor General of Florida and was ordered to open his office in Tallahasse. In his *Annual Instructions* of June 22, 1868, Wilson told him to get the Surveyor General's records and Spanish Archives from the U.S. Attorney and go into business.

On June 8, 1869, John Lynch was notified of his appointment to be Surveyor General of Louisiana. His *Instructions* dated July 12th ordered him to open the office in New Orleans. Thus, the Florida and Louisiana offices were back in business after an eight-year hiatus due to the Civil War.

A letter dated July 21, 1869, to Jeremiah Stumm of Rushville, Illinois, directed him that to subdivide section 30, he should run the north-south centerline between original quarter corners and run the east-west centerline due west to an intersection with the west boundary where the west quarter corner would be established. The center quarter corner would thus be at the intersection of the centerlines.

A letter dated July 26, 1869, to Hiram Barney, in Menominee, Michigan, advised him on the proper method of subdividing a fractional section two, which contained a lake. Barney was to retrace the section lines to determine the variation of his compass, then run the east-west centerline east on a mean bearing to the lake and the north-south center north on a mean bearing to the lake. This was the first letter found during this period that introduced the concept of mean bearing over the due north, south, east, and west wording of the law.

In August 1869, the boundary survey of the Navajo Indian Reservation was begun by Ehud N. Darling under contract with Commissioner Wilson. Darling had surveyed the Colorado-New Mexico Boundary in 1867 and many other Indian reservations also. Darling designated the southeast corner of the Navajo Indian Reservation as the initial point of the Navajo Baseline and the east boundary was used as the reference meridian. The Navajo Reservation was surveyed and subdivided as a separate rectangular survey system in Arizona and New Mexico. The New Mexico portion of these surveys was cancelled by letter dated June 17, 1936. Officially, New Mexico is surveyed entirely on the New Mexico Principal Meridian system, whereas Arizona retains surveys on the Navajo Baseline.

On July 8, 1869, D. M. Chapman of Bushnell, Illinois, requested advice on the proper method of subdividing section 1, T. 5 N., R. 2 W., Fourth Principal Meridian. The reply dated September 6 instructed him to establish the one-sixteenth corners at midpoint between quarters corners and section corners, except the north one-sixteenth corners which were to be proportioned. He was to adjust his variation to retrace the section lines during that process; then run the east one-sixteenth line, north-south centerline, and west one-sixteenth lines due north to an intersection with the north boundary. Next, run the north one-sixteenth east-west centerline and south one-sixteenth lines across the section to the opposite corresponding corners. Where all of these lines intersected would be the position of the interior one-sixteenth corners and center quarter corner.

Several other letters during August and September sent to County Surveyors instructed them to restore lost section corners by single proportionate measurement on a "right line" between the found corners to the north and south of the missing section corners. Double proportioning was not mentioned as a proper method.

In the *1869 Annual Report,* Wilson mentions the survey of an avulsion of the Missouri River. The centerline of the abandoned channel had been surveyed and then the lands in the old bed had been surveyed and platted. He also reported that the Union Pacific and Central Pacific Railroads had hooked up at Promontory Point, Utah, on May 10, 1869, which would greatly increase settlement of the West and increase the need for surveys.

The *Act of February 2, 1870,* 16 Stat. 64, authorized appointment of a Surveyor General in Wyoming. Silas Reed from Missouri was appointed Surveyor General in March and established his office in Cheyenne. The first surveys in Wyoming were actually made by accident. In 1867, William Ashley had surveyed the Eighth Guide Meridian West under contract with the Surveyor General in Colorado. Ashley extended the guide meridian some three miles into Wyoming, thinking he was still in Colorado. The boundary between Colorado and Wyoming was not surveyed until 1873.

In June 1870, under a contract with Reed, Edwin James extended the Eighth Guide Meridian West northerly further into Wyoming. He also surveyed a portion of the Third Standard Parallel North, and the rectangular surveys in Wyoming were underway. All of the first surveys are numbered from the Sixth Principal Meridian, as are most surveys of the rectangular system in that State.

The *Act of May 4, 1870,* 16 Stat. 96, provided for a commission to revise the Statutes of the United States. After three years of work, the statute laws including the public land laws were codified and published as the Revised Statutes in 1874.

On May 21, 1870, a letter went to G. S. Killiam, County Surveyor, at Fort Dodge, Iowa, with regard to restoring lost

meander corners. Wilson stated that in the case cited by Killiam (not described), the proper method would be to run a straight line between the found section corners and restore the lost meander corners on that line at intersection with the banks of the river. This method would also be applicable in all similar cases; however, proportioning of the lost meander corners was not considered.

The following letter was a major break in the right direction in regard to corners on the north and west boundaries of the township, even though it wasn't abided by in later letters:

C. C. Carpenter, Esq.
Register of the State
Land Office
Des Moines, Iowa

Department of the Interior
General Land Office
May 26, 1870

Sir:

I am in receipt of your letter of the 18th instant desiring information in regard to the proper method of establishing the quarter corners on the northern tier of sections in a township where there is a double set of section corners on the township line. . .

In reply, I have to say that the quarter corners should be established at points equidistant between the N. E. and N. W. corners of the sections, *except* in section *six* where the quarter corner should be placed at precisely forty chains (original measurement) west of the N. E. corner of the section.

Very respectfully,
Your Obt. Servant
Jos. S. Wilson
Commissioner

The letter is simply stated and is of course the correct method to follow in most "normal" situations. Another letter dated May 31, 1870, sent to a surveyor in Illinois gave exactly the same rule for establishing the quarter corners on the west boundary of a township, which was also correct for a normal situation.

The matter of omitted lands between the meander line and actual shoreline and subsequent reliction came to a head in June 1870. In a letter to T. W. Ferry, Congressman from Michigan, Wilson described the situation:

Hon. T. W. Ferry
House of Representatives

General Land Office
June 10, 1870

Sir:

By reference to our letter, to you, of March 15th last, relating to the protest of Rev. H. C. Van Raalte, of Holland, Michigan, against the survey, by George Lander, of the same place, of a tract of alleged unsurveyed land in, what would be if surveyed, the S. W. frl. ¼ of Sec. 20, T. 5 N., R. 15 W. at the head of Black Lake, Michigan, who asks that an order issue to John F. Finkham, surveyor, of Grand Rapids, Michigan, for the proper survey of the same in order that it may be brought into market and sold according to law. I have the honor to say that additional evidence having been furnished by Mr. Van Raalte in reference to the case, this office is now prepared to examine the same, and submit the following: —

The N. W. frl. ¼ of Sec. 29, Tp. and Range aforesaid, was purchased at private entry in 1836, by Samuel McHyes and patented to him in 1839, and in 1847 was purchased by the Rev. H. C. Van Raalte.

It appears however, that during the progress of the resurvey of the City of Holland, located in the above named tract of land, in the year 1860, a small tract of alleged unsurveyed land was discovered in, what would be if surveyed, the S. W. ¼ of Sec. 20, immediately North of the tract purchased by Mr. Van Raalte, and between the government meander line and the water of the Lake.

Some time subsequent to the resurvey, the aforesaid George Lander, proposed to preempt this tract of alleged unsurveyed land and filed his application for survey of the same, in this office, September 3rd 1869, in regard to which, protest was entered by the Rev. H. C. Van Raalte upon the ground of riparian ownership.

The application for survey is accompanied by the affidavits of three persons, Civil Engineers, to the effect that the said tract of land is North of the government meander line — is high and dry land, from 1 to 15 feet above the level of the Lake — is of gravel formation on which the stumps of trees are yet standing, from 1 to 2 feet in diameter and that they are certain that no part of the high, dry land is accretion or could be so considered in any sense of the word.

It appears however, upon examination of the original field notes on file in this office, that, at the time of the survey, in 1832, no dry land was found between the meander line and the bed of the Lake: and, as the survey was made in the season when the waters of Lakes, and other bodies of water, are much higher than at ordinary stages, it is fair to presume that the survey was made in accordance with instructions from this office and in the proper manner, as certified by the Surveyor General.

Taking into consideration all of the facts in the case it appears that Mr. Van Raalte purchased all of the surveyed land in the N. W. frl. ¼ of Sec. 29, T. 5 N., R. 15 W., in good faith, and to the border of the Lake: and it would seem that his long and undisputed occupancy of the same as well as, his disposal of certain portions of it to different parties, including the supposed unsurveyed tract, ought to be protected against the uncertain tenure of subsequent claimants.

From all the evidence adduced in this case, it appears that the waters at the head of Black Lake have receded and formed into well defined channels, leaving a considerable tract of high and dry as well as swamp land South of what is now *Black River,* in the N. W. ¼ of Sec. 29, and S. W. ¼ of Sec. 20, T. 5 N., R. 15 W., so formed by the operation of natural or other causes, and it is now the policy of the government, under the recent *ruling* of the *Hon. Secretary* of the Interior in an analagous case, that when any *considerable* body of high land is formed in this manner, to have the lines of the public surveys extended over the premises.

Application for the survey of the same having been made by Mr. Landers, and John F. Finkham, Surveyor, of Grand Rapids, Mich., having made a proposition in writing specifying the amount for which he is willing to execute the survey and certificate of deposit having been made for the amount required with a U.S. Deposi-

tory to the credit of the U.S. on account of the appropriation for surveying the public lands, the Commissioner will forward at the earliest day practicable the necessary instructions for survey in accordance with the public land system.

Lands of this class when surveyed become subject to the operation of the homestead and preemption laws, or after due notice by the local land officers, pursuant to instructions from the Commissioner as contemplated by Sec. 5, Act of Aug. 3, 1846, may be sold for cash to the highest bidder and if not disposed of in this way will then become subject to private cash entry, warrant, or scrip location

I have the honor to be
Very respectfully
Jos. S. Wilson
Commissioner

Copies of the decision were sent to George Landers and the Rev. Van Raalte, but no "order" to Finkham was ever sent. In June 1871, (then) Senator Ferry again inquired about the matter. Willis Drummond replied that Lander must have misunderstood the decision (very understandable) and sent a copy of the decision to Lander. Lander then again requested the survey on September 4, 1871, but once again no order was issued. On February 14, 1872, in reply to another inquiry from Ferry, Drummond declined to order the survey. He explained that there were many cases pending before the Department in which the survey of lands, where the water had receded, were contested on the grounds of riparian rights. Drummond had recommended to the Committee on Public Lands that Congress pass legislation on the matter of dried-up lakes and relicted lands. Drummond thought that this class of lands should be granted to the States (similar to the swamp land grants). As far as can be determined, no survey was ever made, and there was no indication that Lander ever got his deposit back.

Oddly enough, in the above letter a policy change was made—to survey relicted land even though the water had not completely disappeared. The letter was also contrary to common sense. Wilson decides that Van Raalte had riparian rights to a small strip of omitted land, between the meander line and actual shore of the lake, but that he had no riparian rights to the relicted land in front of the old shoreline, even though there was water remaining, the Black River, which was a stream, not a lake.

One other item of interest seems appropriate at this time. Before any dried-up lake or island survey could be made, the applicant had to "prove" to the Commissioner that the application was legitimate, such as the fact the island was actually omitted and not formed by accretion or avulsion after the original survey, or that a lake was *all* dried up, not just partly so. To submit such proof, a map was frequently made by a local or County Surveyor at the request of the applicant, and this map would be sent to the Commissioner along with all of the affidavits. Nine times out of ten, the applicant would suggest that the survey be made by the Surveyor who made the map for him. If the Commissioner approved the application, he would then contract with the Surveyor for the "official" survey and field notes. In this manner a great many County Surveyors and others became "U.S. Deputy Surveyors" and that title carried considerable prestige among the local citizenry. If another application for an island survey was made in the same county by someone else, he would most likely hire the same "Deputy Surveyor" to make the map to accompany the application; this map would be nicely drawn, very similar to an official survey plat, and signed by "John A. Doe, Deputy Surveyor."

After examining all the evidence presented, the Commissioner might reject the application and often sent the materials submitted back to the applicant. Years later, the map, signed by "John A. Doe, Deputy Surveyor" would show up in some litigation as being a "plat" of the survey of the island, showing that so-and-so had title to it or at least color-of-title. Sometimes it takes an abnormal amount of research and digging to find out where these phony "plats" originated because the original parties are long dead, but when the origin is found, it can settle a dispute in short order; the main clue is that these "plats" were not approved by the Commissioner or a Surveyor General. Also, do not be confused by a marginal notation such as "Rec'd with Sur. Gen'ls letter, June 10, 1873."

The *Act of July 9, 1870,* 16 Stat. 217, added sections 12 thru 17 to the *Mining Act of July 26, 1866.* By this act, placer claims were added to the mining law. Placer claims could not exceed 160 acres, were to conform to the rectangular surveys, could be legal subdivisions of 40 acres, or in 10-acre aliquot parts. Sec. 16 of this act repealed part of the *Act of March 3, 1853,* and directed that the rectangular system should extend over all public lands, regardless of their mineral content, but that "waste or useless lands" were not to be surveyed.

Sec. 16 concludes with these words and is now codified in *43 U.S.C. 766:*

> "Provided, That all subdividing of surveyed lands into lots less than one hundred and sixty acres may be done by county and local surveyors at the expense of the claimants: And provided further, That nothing herein contained shall require the survey of waste or useless lands."

This act officially allowed county and local surveyors to subdivide public lands, when in actual practice they had been subdividing sections since before 1830. It isn't known when the "District Surveyors" had ceased being appointed by the Surveyors General. This act actually gave official notice of something that had been routine for a long time, and especially so after 1853.

The stipulation that wastelands not be surveyed caused further "piecemeal" township surveys. Many townships in the West are incomplete because of this elimination of "waste or useless lands" from the regular extension of the rectangular system.

By the *Act of July 11, 1870,* 16 Stat. 230, Arizona was made a separate surveying district. John Wasson was commissioned Surveyor General on July 12 but notification did not reach him until November 5, 1870, when he opened his office in Tucson. He travelled to California, brought back the Arizona records, and began contracting for surveys in that territory in March 1871.

On July 25, 1870, the Secretary of the Interior contracted with Ehud N. Darling and Theodore H. Barrett for the survey of the Chickasaw lands in the Indian Territory (now Oklaho-

ma) in accordance with the *Treaty of April 28, 1866,* concluded with the Choctaw and Chickasaw Indians, which required that the lands be surveyed and subdivided into 160-acre tracts.

On July 30, 1870, Wilson issued *Special Instructions* for the surveys. Darling was assigned to survey the Indian Meridian and the Baseline in the eastern part of the Chickasaw lands; Barrett was to survey the baseline in the western part. As instructed, Darling established the initial point between two small streams a short distance southeast of Fort Arbuckle, which he monumented with a marked stone. Darling then surveyed the baseline east to the boundary between the Chickasaws and Choctaws. He surveyed the Choctaw-Chickasaw boundary north to the Canadian River starting at the confluence of Island Bayou and the Red River, and the meridian between the Red and Canadian Rivers. He surveyed his area into townships and sections, then subdivided the sections by running the centerlines between quarter corners, establishing the center quarter section corners at the intersection of centerlines.

Barrett surveyed the baseline west to 98° west longitude, then subdivided the western part of the Chickasaw lands the same as Darling did the eastern half. Barrett found gross errors in the 1858 survey of the 98th Meridian, which had been surveyed as the west boundary of the Chickasaw lands; he did that work over so he could close against the boundary.

This was the first time found in which a "complete" survey was made of the sections from the establishment of the initial point through to the proper method of subdividing the sections into quarter sections. It was not done on public lands because Indian reservations were not "public lands" under the land laws.

In December 1870, Darling and Barrett were given contracts to survey the Indian lands between the 96th and 98th Meridians from the Canadian River north to the Kansas boundary; the Indian Territory surveys were under way.

To illustrate the inconsistency going out of the GLO at the time, the following letters are mentioned.

On August 22, 1870, H. W. Dickson, of Hillsboro, Illinois, asked advice in subdividing section 6, T. 7 N., R. 3 W., Third Principal Meridian, a normal section (not fractional). Dickson wanted to establish the north quarter corner 40 chains west of the northeast corner and the west quarter corner 40 chains north of the southwest corner of section 6, then run the centerlines accordingly. Wilson told him on August 31 that method was wrong; instead he should run due north from the South quarter corner and due west from the east quarter corner to an intersection with the exterior boundaries; where the lines crossed would be the legal center of the section.

On November 5, 1870, J. D. Carleton, of Port Huron, Michigan, was instructed to subdivide a fractional section by running from the estabished quarter section corners due north, south, east or west, as the case may be, to the water boundary, without regard to the direction of the original section lines.

On November 9, 1870, E. C. Martin, of Pontiac, Michigan, was instructed to set the north quarter corner of a section 6, exactly 40 chains west of the northeast corner of section 6, even though the original plat returned the length of the north boundary of section 6 as 80.50 chains and Martin had found it to measure only 69.30 chains.

Also on November 9, 1870, E. C. Hutchinson, of St. Louis, Missouri, was instructed to establish the north quarter corner of section 4 by running due north from the quarter corner of sections 4 and 9 to an intersection with the north boundary of the section.

On February 4, 1871, Willis Drummond was appointed Commissioner of the GLO. Generally speaking, Drummond continued Wilson's policies in regard to corner restorations but changed the policy on subdivision of sections and dried-up lakes.

The *Act of February 18, 1871,* 16 Stat. 416, ceded to the State of Ohio all of the unsold and unsurveyed lands in the Virginia Military Tract. No attempt was made to identify the lands ceded.

On February 27, 1871, the Surveyor General of Minnesota was instructed to have the sections in the White Earth Indian Reservation subdivided by the Three Mile Method and mark the quarter-quarter section corners "1/16."

The *Act of March 3, 1871,* 16 Stat. 581, added Sec. 11 to the deposit survey part of the *Act of May 30, 1862,* 12 Stat. 409. This section follows:

> "Sec. 11. And be it further enacted, That in all cases where settlers shall make deposits in accordance with this act, to the credit of the United States, for public surveys, such amounts so deposited shall go in part payment for their lands situated in the townships, and the surveying of which is paid for out of said deposits and effect shall be given to this act by regulations to be prescribed by the commissioner of the general land office."
>
> APPROVED, March 3, 1871

Very few "deposit surveys" had been made of townships and sections under the 1862 act because the cost of survey was in addition to the cost of the land. This amendment greatly increased deposit surveys because the deposits were actually a credit account toward land payment when patent issued. But the credit or deposit could only be used for land in the township applied for; it could not be used elsewhere and was not refundable if the depositor changed his mind and moved elsewhere. The whole deposit survey idea was an economy measure (at least to the well intentioned) in which the settlers put up the "front money" for the surveys instead of using appropriations from the Treasury, but the cost of survey for a whole township was too great for only one or two settlers to bear. Then too, the "waste and useless lands, unfit for cultivation" were not supposed to be surveyed, so many of the deposit surveys at this stage were made of only the "good parts" of the township, which reduced the cost and made the surveying easier for the contracting deputies. That left many townships only partly done and compounded the problem of "completion" surveys in later years. The Western States, especially Nevada and Utah, had many fragmentary surveys executed in the early 1870's.

On March 13, 1871, Drummond replied to John Taffe, a member of Congress, who stated that Carl Meyer of Yankton, South Dakota, had invented a metal "Surveyor's Mark." Taffe wanted it used in monumenting the public surveys. Cast iron monuments had been used on State boundaries and other special situations but not as a general practice in monumenting the public land surveys. Many corners in the Plains States and western deserts disappeared almost before

the surveyor got out of sight, so the argument for a metal monument was sound enough. Drummond declined the suggestion on the grounds of cost, procurement, freight, and burden to the surveyors.

In letters dated March 18, 1871, to Theodore W. Robbins, Big Rapids, Michigan, and to Asa H. Guy, County Surveyor, Georgetown, Illinois, they were directed to establish the quarter corners along the north and west boundaries of the townships at midpoint between the controlling section corners except section 6. This reversed the due north and due west method propounded in November only four months earlier.

On March 27, 1871, W. McChesney, Sagetown, Illinois, was advised to establish the west quarter corner and north quarter corner of a section 6, at 40 chains "original measure" (proportioned) north of the southwest corner and west of the northeast corner of the section, which is basically the same method used today.

In the late 1860's and early 1870's, including Drummond's administration, the surveyors were usually advised to restore obliterated monuments at the intersection of record bearings, when the record bearings and distances to found original bearing trees did not match.

On May 6, 1871, Drummond issued a *Circular* to all Surveyors General, detailing the procedures, estimating, and accounts for deposit surveys. These instructions did not affect any methods or procedures in the field execution of the rectangular surveys, except as already noted.

The following letter on how to subdivide a section describes the method used to the present day:

S.M. Delamaker, Esq. Department of the Interior
Logansport, Indiana General Land Office
Washington, D.C.June 23, 1871

Sir:

Your letter of the 15th instant addressed to the Hon. Secretary of the Interior, requesting information in regard to the proper manner of subdividing a full section of the public lands into quarter-quarters, has been referred to this office.

In reply I have to say that the sections should be first subdivided into quarters by running *straight lines* from the quarter corners to the opposite corresponding corners. The point of intersection of these lines will be the corner common to the several quarter sections.

To subdivide the quarter sections, quarter-quarter corners should be placed at points *equidistant,* on straight lines, between the corners already established, and each quarter subdivided by running straight lines from these quarter-quarter corners to the opposite corresponding corners, establishing the common center at the intersection of the lines so run.

Very Respectfully
Willis Drummond
Commissioner

On October 3, 1871, Edgar Henry, Monticello, Indiana, was advised that to restore the lost corner of sections 3 and 4 on the north boundary of a township, he should run due north from the original quarter corner of sections 3 and 4 and establish the lost closing corner at the point of intersection.

On November 11, 1871, S. J. Carter, Deputy County Surveyor, Brunswick, Missouri, was instructed to restore lost section corners at single proportionate distance on straight line between found corners to the north and south, and run the east-west section lines straight between the section corners thus restored, placing those quarter corners at midpoint. Drummond used that policy of restoring lost section corners throughout his tenure in office.

In the *1871 Annual Report,* Drummond reported that the Nez Perce Indian Reservation in Idaho had been partially subdivided into 20-acre allotments. Many other Indian reservations (too many to name here) had been subdivided into 20-, 40- and 80-acre allotments, all done by the Three Mile Method. Fig. 47 indicates the method used to subdivide a section into 20-acre allotments and to number the "lots."

Variations of this basic system were used in the different surveying districts. An example is shown by Fig. 48, a sketch taken from the *Special Instructions, Contract No. 381,* Washington, dated in 1892. In that contract, the Deputy Surveyor was instructed to mark the monuments and bearing trees as lot corners instead of the usual one-eighth or one-thirty second corner designations.

The following letter will indicate the policy generally adopted in dealing with meander corners:

Geo. W. Cooley, Esq. Department of the Interior
U.S. Deputy Surveyor General Land Office
Minneapolis, Minnsota Washington, D.C.

Sir: January 3, 1872

I am in receipt of your letter of the 23rd Ult. making inquiries concerning the re-establishment of the meander corners on the 4th Standard Parallel in Secs. 31 and 32, Tp. 117 N., R. 21 W., 5th P.M., Minn. and stating that the bearing trees on the west side of the lake do not agree with the field notes.

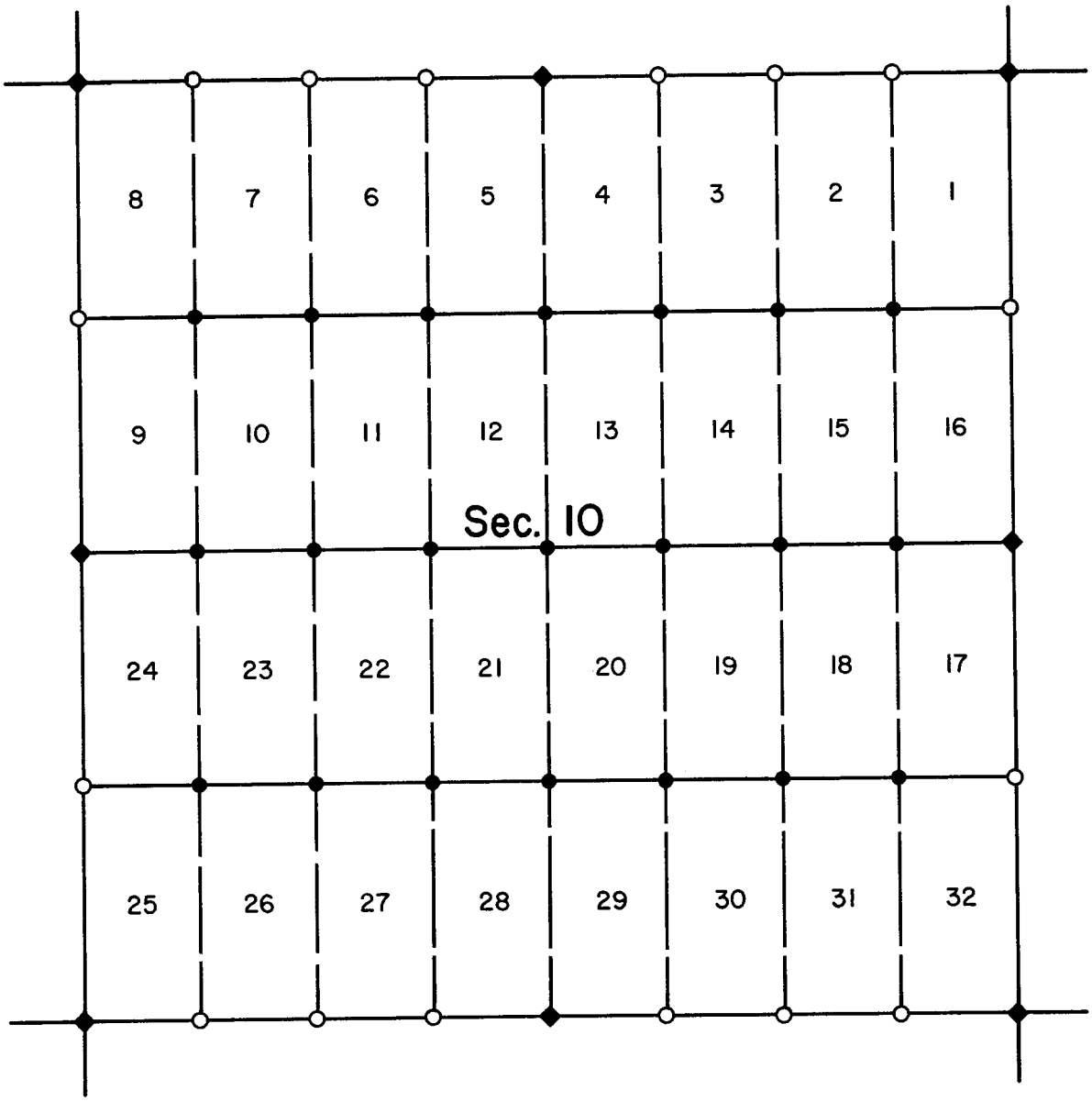
In reply I have to state that it will be necessary to re-establish the section corner to sections 31 and 32 on the Standard Parallel equidistant between the Southeast corner of Section 32 and the Southwest corner of Section 31 and establish the meander corner on the east side of the lake on the thus established Standard at a distance proportionate to the original measurement.

The meander corner on the west side of said lake should be similarly established, giving due weight to the position of the bearing trees which you have found standing.

Very Respectfully
Your Obt Servant
Willis Drummond
Commissioner

As a general statement, meander corners were not used as a basis of proportioning lost section or quarter-section corners or other meander corners. They were treated in much the same manner as line trees, controlling the direction of a line but not the proportioning along the line. No explanation of that philosophy was found; as will be seen, it was not a hard and fast rule; exceptions were made.

In January 1872, R. C. Hathaway, County Surveyor, Oconomowoc, Wisconsin, sent a survey "plat" and application for 15.69 acres of omitted land lying between the meander line and actual shoreline of "Lake LaBelle," in the northeast



◆ = Original corner
○ = Corners at equidistant positions
● = Allotment corners at equidistant positions

Figure 47. Method of Subdividing Sections on Indian Reservations.

Diagram 2

(Showing method of subdividing Sections into 10 Acre Tracts.)

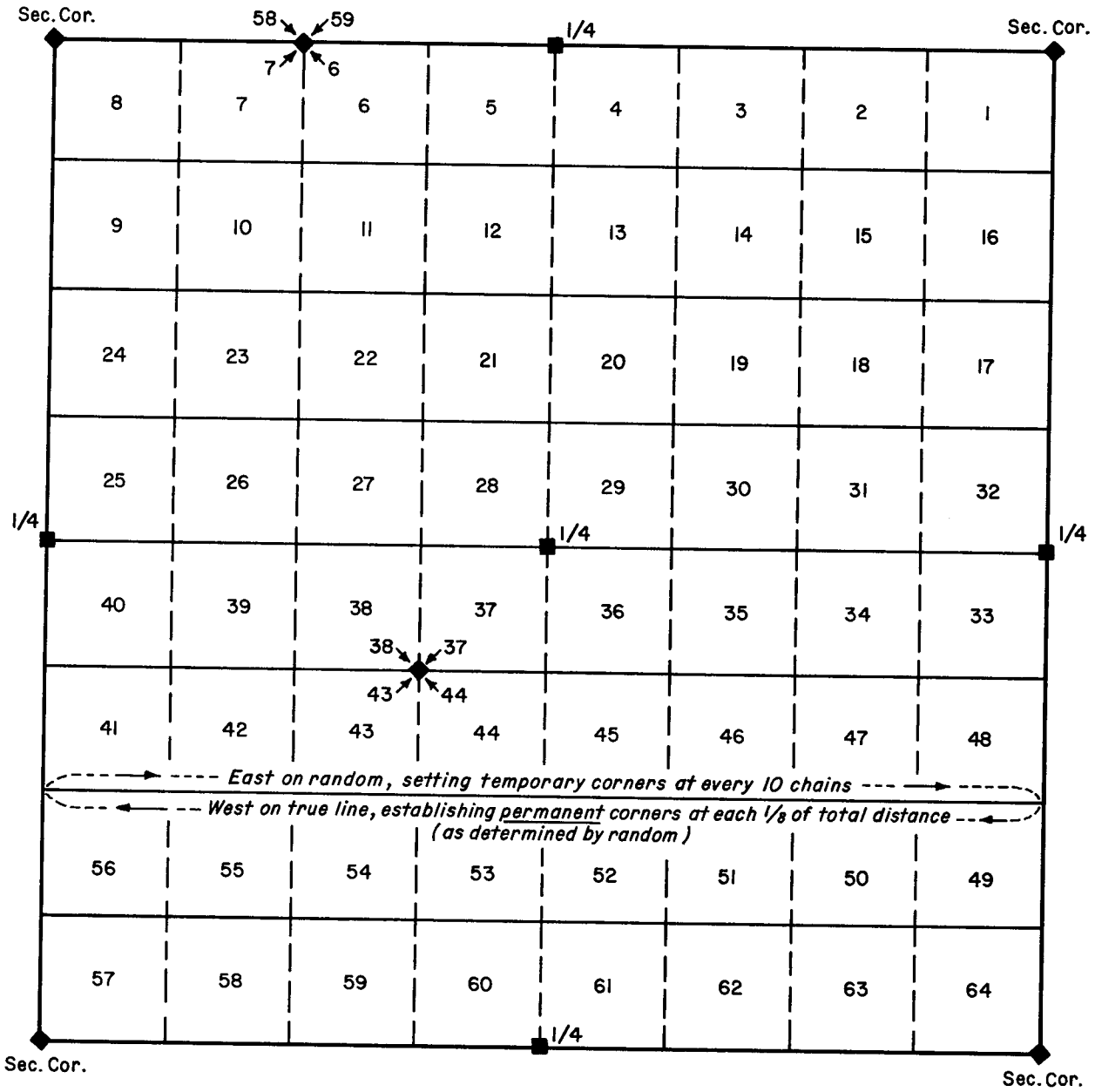


Figure 48. From Special Instructions, Contract 381, Washington — Makah Indian Reservation.

quarter of section 30, T. 8 N., R. 17 E., Fourth Principal Meridian. Hathaway wanted to purchase the land. Drummond bluntly rejected the application, said the survey by Hathaway was illegal, and that the government would not survey such small parcels of land until such time as the lake entirely dried up. (The whole lake covered over two sections of area.)

The following letter is of special interest:

Department of the Interior
General Land Office
Washington, D.C., Feby 15, 1872

Hon. H. C. Burchard
House of Representatives
Sir:

I have the honor to acknowledge the receipt, by reference from you, of a letter from Mr. M. Montelins dated Cedarville, Stephenson County, Illinois, 29th ultimo, desiring information in regard to the proper method of establishing the centers of sections, and in reply, I have to say as follows: —

This office has not authority to *issue instructions* for the subdivisions of lands which have been disposed of by the government and when called upon for an opinion in the matter, can only point out the manner in which the law requires said subdivisions to be made.

Under the provisions of the *Act* of *Congress, approved February 11, 1805,* the course to be pursued in subdivision of Sections is to run straight lines from the estabished quarter section corners — U.S. Surveys — to the opposite corresponding corners, and the *point* of *intersection* of these lines will be the *corner common to the several quarter sections.*

The "Instructions to the Deputy Surveyors of the United States for the District of Illinois and Missouri", issued in the year 1856, contains directions for the subdivision of Sections, which, though not in strict accordance with the requirements of the Act above referred to, is the method which has been adopted by many County Surveyors in Illinois.

In some cases the Surveyor General Subdivided the Sections upon the original plats by the rule laid down in said "Instructions" and the lands have been sold according to such subdivision.

Many purchasers of lands subdivided upon the plats by the Surveyor General, or subdivided by County Surveyors according to the rule given in the "Instructions" have held possession for many years, and have fenced their lands and made other improvements in such manner that, a change in the lines, in order to make them conform to the strict letter of the law, would often work great hardship and it has been the policy of this office, to recommend in such cases the maintenance of the subdivision lines as established in the field.

Mr. M's. letter to you is herewith returned.

I am Sir
Very Respectfully
your Obt Servant
Willis Drummond
Commissioner

So far as is known, this policy on "instructions for the subdivisions of lands" is still in force today in the BLM. The opinion expressed with regard to the 1856 Instructions is also abided by if and when any public lands are affected by those improperly executed section subdivisions. The BLM does not presume to tell anyone what they should or should not do on privately owned lands not affecting public lands. Any opinions expressed are still an opinion and advisory only.

The *Act of March 1, 1872,* 17 Stat. 32, created Yellowstone National Park, the first of the national parks. The boundaries of the parks were surveyed by the GLO.

On May 1, 1872, Drummond replied to M. J. Alexander of Marshall, Missouri, in regard to establishing the north quarter corner of section 2, T. 50 N., R. 21 W., Fifth Principal Meridian. The original plat showed that the subject quarter corner had been theoretically established or protracted at a point 39.11 chains west of the northeast corner and 41.19 chains east of the northwest corner of the section. Alexander was advised to establish it in that position by proportionate measurement to protect the subdivisions shown on the original plat, which is the same policy used today.

The *Act of May 10, 1872,* 17 Stat. 91, is the general *Mining Law,* still in effect—the basis of the mineral surveys made on the public lands. Although mineral surveys are not made by employees of the BLM, mineral surveyors are appointed by the BLM. While executing a mineral survey, the surveyors are technically government employees but their fees are paid by the claimant. A mineral surveyor acts in about the same capacity as did the "District Surveyors" appointed by Jared Mansfield in Ohio.

The *1872 Mining Law* covers both lode and placer claims and millsites. Lode claims are surveyed, usually without regard to the rectangular system, though they are usually tied to a rectangular corner; they are then segregated out of the sections in which they are located, leaving many odd-shaped fractional lots. Millsites are usually surveyed in a similar manner. Placer claims are now usually taken by legal subdivision or aliquot parts of legal subdivisions of a section, although thousands of "gulch" placers were also surveyed.

The BLM issues orders for mineral surveys and approves the field notes and constructs the mineral survey plats. Field surveyors are often confronted with the Dependent Resurvey of mining claims but not the original survey. Mining claims themselves have no influence on the system and extension of the rectangular surveys. An unsurveyed but marked mining claim location may be segregated from unentered public lands for administrative purposes.

On September 3, 1872, Drummond entered into a contract with and issued *Special Instructions* to Orrin T. Morrill, U.S. Surveyor, for the survey of township boundaries, section lines, and section subdivisions on the Pottawatomie Indian Reservation in the Indian Territory. The east boundary of the reservation had been surveyed in 1871 by Nathaniel Robbins as the west boundary of the Seminole Reservation. The north boundary of the Pottawatomie was the north fork of the Canadian River; the south boundary was the Canadian River. The west boundary was in the late stages of being surveyed by Barrett and Darling, who were also surveying the Second Standard Parallel North through the approximate center of the Pottawatomie Reservation, running east from the Indian Meridian.

Morrill was instructed to survey the Pottawatomie lands using the Second Standard Parallel as an "auxiliary" baseline for his work. The following paragraph from the *Special Instructions* are given verbatim:

> "The Second Standard Parallel is coincident with the line between townships eight and nine North of the Base line, it will serve you as an auxiliary base for running your district into townships lying both North and South thereform; you will close your meridional lines starting from the parallel *North* from the Standard corners and *South* from the closing corners which you will have established at proper convergency of the meridians."

Morrill was to subdivide the sections into 40-acre tracts using the Three Mile Method of subdividing sections. To accomplish that, he had to establish one-sixteenth section corners at equidistant positions between the section and quarter-section corners. Morrill was instructed to retrace the Second Standard Parallel, which had already been surveyed, and establish the one-sixteenth corners thereon, as shown on a diagram accompanying his Special Instructions.

Morrill had to retrace the Standard to set not only the one-sixteenth corners, but also the "closing corners" for the townships and sections to the south of the standard. This process was not dissimilar from that used on standard parallels, south of the baseline, under the *1851 Oregon Manual.* But the closing corners established in that manner, even though called "closing corners", are not in fact true closing corners. They are generally treated today as junior corners supposedly established on a senior line. Morrill ran south from them to the Canadian River. The Barrett-Darling survey of the Second Standard Parallel was a senior survey but would not have resulted in an approved plat, per se. The Standard Parallel was probably approved as part of the plats of the surveys of the townships as returned by Morrill. Therefore, if the presumption is true, both the standard corners and the junior corners established by Morrill would control alignment and distance along the Standard Parallel in any subsequent dependent resurvey. The field notes and plats would have to be carefully examined to establish the true status of the corners along that line.

On November 3, 1872, Morrill was instructed to write the field notes of his work in accordance with specimen field notes sent to him of the Warpeton and Sissiton Reservation in Dakota. As previously noted, that reservation was the first one subdivided by the Three Mile Method.

The *Act of February 18, 1873,* 17 Stat. 465, declared that the coal lands, and iron ore lands in Michigan, Wisconsin, and Minnesota were not subject to the *1872 Mining Law.*

In a letter to John Melendy, County Surveyor, Shawnee, Wisconsin, dated July 12, 1873, Melendy was advised to restore the lost quarter corner on the east boundary of section 24, T. 27 N., R. 15 E., Fourth Principal Meridian, at proportionate distance between the found original meander corner to the north and the original southeast corner of section 24. Thus, the meander corner was used to control the restoration of the lost quarter corner. A nearly identical letter went to a man in Kansas on June 5, 1877. This advice was a reversal of the opinion expressed to George Cooley on January 3, 1872.

The following letter concerned the proper method of subdividing a section 2:

> Department of the Interior
> General Land Office
> Washington, D.C., Sept. 12, 1873
>
> Frank Dorr
> Waupaca, Wisconsin
>
> Sir:
>
> In reply to your letter of the 1st instant, relative to the proper manner of establishing the quarter-quarter corner north of the centre of Section 2, T. 24 N., R. 14 E., 4th P.M., Wisconsin, I have to say as follows:—
> The said corner should be established at a distance of *twenty chains original measurement* north of the centre of the section—This rule will, of course, necessitate the adoption of a proportional measurement if the chaining does not agree with the original distance.
> The *original* length of the quarter line from the center of the section to the township line is the *mean* between the lengths of the East and West boundaries of the *North half* of the section or 45.85 chains, this being the length adopted in calculating the areas of the lots in said section.
> My letter of the 30th January, 1872, relative to the S. E. ¼ of the N. W. ¼ of said section 2, addressed to Mr. E. P. Perry, was based upon the presumption that the County Surveyor's chain was of the same length as that of the U.S. Deputy Surveyor.
>
> Very Respectfully
> Willis Drummond
> Commissioner

Frank Dorr was the County Surveyor. E. P. Perry was the owner of the SE ¼, NW ¼, section 2. The distance from the center quarter corner to the north quarter corner was 44.00 chains by Dorr's measurement. When proportioned, the center-north one-sixteenth was 0.81 chains south of a full 20 chains, which "deprived" Perry of land that he had "improved and rendered valuable." Perry retained a law firm to represent him in the dispute; they wrote to the Commissioner on November 28, 1873, for an explanation. Drummond replied on December 5, 1873, and stuck by his above decision.

This exchange established the principle of subdividing sections against the north and west boundaries to suit the areas as calculated on the original plat.

A somewhat similar but different problem came up at this same time. On November 22, 1872, M. J. Alexander, Marshall, Missouri, had this situation: in the original survey of T. 51 N., R. 19 W., Fifth Principal Meridian, the length of the south boundaries of sections 1, 12, 13, 24, and 25 had been returned as something greater than 81 chains in length, possibly 81.50 chains. That length was "out of limits;" it may have been caused by a crooked east boundary. (See subject of letter to Charles E. Morse, July 28, 1847, in Arkansas.) However, the original surveyor had placed the quarter section corners at midpoint in the field and returned them as such in the field notes. But in constructing the plat of the township, the draftsman had shown the quarter corners to be at 40 chains from the west and had placed all of the excess in the east half of the sections in calculating the areas. Apparently the quarter corners were lost and needed restor-

ing and Alexander was to subdivide those sections. He wanted to know what controlled, the plat or the field notes? Drummond advised him that the field notes controlled; the corners would have to be at equidistant points and the sections subdivided accordingly. Apparently there were no lots along the east boundary, just quarter sections containing more than 160 acres shown on the plat.

If confronted with that problem today, and if the east halves of the sections had been protracted into lots against the east boundary, the BLM would also restore the quarter corners at midpoint if lost, but would then establish the east one-sixteenth section corners in a position proportionate to the distances used to calculate the areas on the plat.

On *February 19, 1873,* 18 Stat. 16, Congress passed a special act, granting to Holt County, Missouri, for school purposes, the former bed of Tarkio Lake, located in the east half of T. 60 N.,R. 39 W., Fifth Principal Meridian. The lake had been meandered during the original survey in 1846. The county court designated Stephen C. Collins as a competent surveyor to execute the survey of the dried-up lake. On March 19, 1874, Drummond issued *Special Instructions* to Collins for the survey, which was to simply extend the section lines out from the meander corners, a normal completion survey. The survey of Tarkio Lake was approved June 26, 1874.

Tarkio Lake was a dried-up, meandered lake, and the lands bordering it had been patented. The government claimed ownership through the long-standing policy on dried up lakes, but dried-up lake surveys had been on a back burner since at least January 1872 (as indicated in the Black Lake case). By granting Tarkio Lake to Holt County, Congress was giving tacit recognition to government ownership of relicted lake beds, or at least that is how the Commissioner reacted to the act. More dried-up lake surveys followed.

In a letter dated March 23, 1874, Drummond advised F. Marky, the County Surveyor in Chillicothe, Missouri, to restore the northeast corner of section 4, T. 56 N., R. 25 W., Fifth Principal Meridian, by double proportion. When Marky restored the corners along the north boundary of the township on a straight line between found corners, the distance from the found quarter corner of sections 4 and 5, to the restored township line was very short, but the distance to the next found corner to the north was too long. Drummond advised him to restore the corners along the township line by proportion (east-west) but to determine the alignment of the township line by proportioning between found original corners to the north and south. This method is still provided for in the 1973 Manual, Sec. 5-37, in special cases, with conclusive proof.

In a letter to "Hunter and Page," Chicago, Illinois, dated March 24, 1874, in regard to the proper method of establishing the north quarter corner of section 6, T. 38 N., R. 12 E., Third Principal Meridian, they were advised to establish the corner at a point which would "suit the areas expressed on the official plat" at proportionate distance between the northeast and northwest corners of the section. (This opinion was corrected on April 18, 1874, for other reasons.)

In a letter dated April 14, 1874, sent to P.M. Brown, the County Surveyor in Smith's Creek, Michigan, in regard to establishing quarter corners along the west boundary of a township, the phrase "should be placed at the points indicated by the calculation of the areas of the quarter sections adjoining the range line" was used. These two phrases, identical in meaning, were used increasingly from then on when replying to similar inquiries. They have evolved over the years to the often-used phrase "protect the plat."

On July 1, 1874, Samuel S. Burdett became Commissioner of the GLO.

The following letter had to do with "off-line" closing corners:

Charles J. Wright
Deputy Co. Surveyor
Fergus Falls, Minn.

Department of the Interior
General Land Office
Washington, D.C.,
June 24, 1874

Sir: In reply to your letter of the 13th instant, alleging that the closing corners on the Standard Parallel between Tps. 132 and 133 N., R. 41 W., 5th P.M. are from two to four rods north of the Standard, I have to say that an examination of the field notes and plats in this office does not verify your statement, but in any event the *Standard Parallel* must be considered the *true boundary* between the townships referred to.

Very Respectfully
W. W. Curtis
Acting Commissioner

This policy on "off-line" closing corners has never wavered.

On July 13, 1874, Burdett issued a *Circular* (see Appendix) on policy in regard to the survey of the beds of dried-up lakes. Such lake beds or relicted lands along the shore, exceeding 40 acres, would be surveyed at the expense of the applicant, with a deposit, with the necessary proofs.

The Wolf Lake-George Lake situation became active in September 1874. On September 2, Burdett wrote to J. H. Hardin, Chicago, Illinois, concerning the navigability of Wolf Lake located in fractional T. 37 N., R. 15 E., Third Principal Meridian, Illinois. The original survey had been made in 1834 and 1835 and had meandered a lake shown as "Navigable Lake" on the plat. Lands bordering the lake had been patented in 1841. Lake George was part of the same lake but was located in T. 37 N., R. 9 W., and T. 38 N., Rs. 9 and 10 W., Second Principal Meridian, Indiana. (The state boundary crossed the lake.) Apparently the lake had receded and claims were being made on the relicted lands. Burdett correctly told Hardin that just because the plat called it a "Navigable Lake," that label didn't make it navigable in fact.

Also on September 2, Burdett issued instructions to Elisha S. Bennet of La Porte, Indiana, to investigate the conditions of the lake and make a report on the matter, basically as required by the *Circular of July 13*. Bennet must have made a rapid investigation because on September 8, 1874, *Special Instructions* went to Alexander Wolcott, County Surveyor, Cook County, Chicago, Illinois, instructing him to extend the lines of the public surveys over Wolf Lake, which Wolcott did. In letters to Hardin and others on November 30, 1874, Burdett informed them that the survey by Wolcott had been approved by him on November 28. The plats were sent to the land office on January 7, 1875. In 1875, George Lake on the Indiana side was also surveyed and approved January 12, 1876. Hardin and others protested the surveys to the Secre-

tary, who upheld the survey. At some later date, the government patented part of the surveyed relicted lands in Wolf Lake to Conrad Jordan and another part to Jabez G. Smale. Hardin sued on grounds of riparian rights, as did Charles H. Mitchell, another upland owner, and the whole matter entered the judicial process. (The Pistakee Lake case, in Lake County, Illinois, was hot at the same time and involved similar circumstances.)

The *Hardin vs. Jordan* case first went to court in 1883, and Hardin's claim to the lake bed based on riparian rights was upheld. The case went through the appeals process and came before the U.S. Supreme Court in January 1891. The Supreme Court rendered a lengthy decision on May 11, 1891 (see *Hardin vs. Jordan,* 140 U.S. 371) and ruled that Hardin did have riparian rights to the relicted lands in Wolf Lake.

The *Mitchell vs. Smale* case (140 U.S. 406) was argued before the Supreme Court at the same time. The only difference was that the original meander line of 1834 — 1835 had cut off a small tongue of land projecting out into the lake; this narrow strip of omitted land was quite small in area. The court ruled that this small area did not deprive Mitchell of his riparian rights to the lake. This decision (by which the area of the omitted land is judged in relation to the area of upland lots patented) is still the basic test used by the BLM to determine whether lands are omitted and therefore subject to survey. But a later case was more clear on the subject.

This was 1874 and the final decisions weren't made until 1891; business had to go on in the interim.

On October 30, 1874, N. P. Stilson, Jefferson, Iowa, wrote to the Secretary of the Interior, requesting advice on establishing the quarter section corner of sections 2 and 11, T. 83 N., R. 30 W., Fifth Principal Meridian. The original surveyor, in running the line between sections 2 and 11, had set a witness corner at 34.92 chains, a second witness corner at 50.38 chains, with a total length of the line as 79.76 chains. Both witness corners were found, as were the section corners. Where should the quarter corner be established? Burdett replied on November 14 that Stilson should establish the quarter corner on line between the witness corners but at midpoint between the section corners. Proportioning between the witness corners was not considered by Burdett.

The *1874 Annual Report* contained long lists and publications of the many Departmental decisions and decisions of the GLO concerning the public lands, mining claims, and private land claims. The Annual Report was being used to publish those decisions much in the same manner as the Land Decisions (LD's) and Interior Decisions (ID's) which came later. This practice continued in the annual reports for subsequent years.

The 1874 report also indicated that Charles F. Smith, Deputy Surveyor, had nearly completed the rectangular surveys of the Florida Keys. Smith had started that project in 1872 and apparently completed the work in 1876.

In a letter dated January 23, 1875, Andrew Porter, Petoskey, Michigan, was advised that to subdivide fractional section 6, T. 34 N., R. 5 W., Michigan, made fractional by Little Traverse Bay, he should run the east-west centerline between quarter corners, and to run the north-south centerline from the quarter corner of sections 6 and 7, north, "parallel with the east boundary of the section, to the Bay." This was another step away from the due north doctrine.

On February 17, 1875, a letter was sent to M. P. Brittain, County Surveyor, Summit, Alabama, in response to his request regarding the proper method of subdividing sections. The letter was practically verbatim the instructions issued as a Circular on November 1, 1879, under the heading "Subdivision of Sections." In response to similar inquiries during ensuing years, the letter to Brittain was copied verbatim until issuance of the 1879 Circular.

The *Act of March 3, 1875,* 18 Stat. 366, provided for the closing of the Office of Surveyor General of Kansas. The office at Lawrence, Kansas, was closed June 30, 1876, and the records turned over to the State. Thus, in just 21 years (a rapid rate) the State of Kansas had been surveyed. But, already a large percentage of the corners were obliterated and resurveys would be necessary.

In one of the numerous letters to Hiram W. Barney, Wonewoc, Wisconsin (this one dated March 8, 1875), the "instructions" to Brittain on subdividing sections were extended to include the "anomalous" or elongated sections in a township. The quarter-quarter corners on the centerlines were to be established at proportionate positions to suit "the calculation of the areas expressed on the plats," adopting mean lengths.

On April 12, 1875, C. W. Shoemaker, Surveyor in Waterville, Ohio, requested advice on establishing the west one-sixteenth corner between sections 6 and 7, T. 7 N., R. 8 E., First Principal Meridian, Ohio. He had found the original quarter corner, but the closing corner (double corners along the range line) of sections 6 and 7 was off-line. Where would the one-sixteenth corner be placed? Did the off-line closing corner control or the true range line? Burdett advised him on April 22 that the off-line closing corner controlled the proportionate position of the west one-sixteenth corner (i.e., it controlled the original measurement) but did not control the direction of the range line. The true southwest corner of section 6 would be at the true point of intersection of the lines. As far as it can be determined, this principle has never been abrogated by any opinions or decisions of the GLO and BLM, nor by any known court decision.

In the *Annual Instructions* of April 14, 1875, the Surveyors General were instructed to direct their deputies to build mounds of earth and dig pits at all corners monumented with stones. These instructions were later referred to as a circular. The method is shown in the 1881 Manual (Diagram C, sheet 1; see Appendix).

On June 28, 1875, M. S. McCord, County Surveyor in Nashville, Illinois, sent copies of "rules for the Subdivision of Sections" which McCord said had been "issued by the Secretary of State of Michigan, with the approval of the GLO." McCord asked if these rules were indeed in accordance with the view of the GLO. Burdett replied on July 6, 1875, that the rules were "in the main, correct," but went on to give the "following approved rules for the Subdivision of Sections and the restoration of lost corners." The rules that followed were the complete Circular issued on November 1, 1879; it was actually in effect nearly three and one-half years before the formal issuance. It did, of course, propound the single proportion north-south policy of restoring lost section corners, which had been in effect since the early 1860's, and would remain so until 1882.

On July 7, 1875, James S. Miller, U.S. Surveyor under a contract with Commissioner Burdett, dated October 2, 1874,

established the initial point of the Wind River Meridian and Baseline in Wyoming, which was established to control the surveys in the Shoshone Indian Reservation. Miller surveyed the exterior boundaries, township, and subdivisional lines. This system of surveys covers a small area in west-central Wyoming; the remainder of the State is surveyed with reference to the Sixth Principal Meridian.

On August 30, 1875, Charles L. Dubois, a Deputy Surveyor under a contract dated August 12, 1875, with the Surveyor General of Utah, established the initial point of the Uintah Meridian and Baseline, a meridian set up for the surveys in the Uintah Indian Reservation. Dubois had executed many of the surveys in the Indian Territory. The rectangular surveys, based on this initial point, are confined to a relatively small area in the northeastern part of Utah.

In the *1875 Annual Report,* Commissioner Burdett reported that the GLO had been organized into 11 separate divisions, each identified by a letter of the alphabet. The divisions, assigned different duties and responsibilities in the operations of the GLO, were as follows:

Division

A — Chief Clerk (Communications, general business)
B — Recorder (Patents and related business)
C — Public Lands (Tract books, disposals, etc.)
D — Private Land Claims (Matters relating to private claims)
E — Surveying (Surveyors General, public land surveys)
F — Railroads (Railroad grants, wagon roads, etc.)
G — Pre-emption (Preemptions, townsites, Indian lands)
K — Swamp Lands (Administration of swamp land grants)
L — Drafting (Plats, maps, etc.)
M — Accounts (Registers and Receivers, payments)
N — Minerals (Administration of mineral lands and laws)

The duties of the division "E" were given in detail as follows:

> Division E.
> In charge of the principal clerk of surveys. This division is charged with the supervision of all work relating to the public surveys. Instructions to the surveyors-general relative to the extension of surveys or the examination and correction of erroneous surveys are here prepared. All contracts for surveys by deputy surveyors are here examined and passed upon, and the adjustment of accounts for surveying service made and submitted to the Treasury Department for payment. All returns of surveys are referred to this division for examination as to correctness, and after approval are filed in the division. All records and correspondence relating to Indian, military, light-house, live oak, or other reservations are in charge of this division.
> To this division are also referred matters pertaining to the establishemnt of boundary lines, by astronomical surveys, between States and Territories of the United States.
> The plats and field-notes of all surveys are retained on the files of this division, in charge of a principal draughtsman, who supervises all work of draughting or copying plats of surveys, and who compiles and prepares the official map of the United States. There are in this division more than 50,000 plats or maps of township and other surveys.

If a division corresponded, the letter would be identified by the alphabetical designation of the division, such as, "Letter E, dated June 4, 1881." In later years, there were minor reorganizations of the divisions. Eventually, Divisions "P" and "O" were added. The surveying division was always "E."

Burdett also requested funds for the purchase of iron posts or quarried stone monuments to mark the public surveys. The loss of corners in the Plains States and California was very great. He thought the monuments should be set at alternate section corners or at least, at every township corner to preserve the surveys.

In a letter to Richard S. Hall, Oconto, Wisconsin, dated February 9, 1876, Hall was advised to restore lost closing corners along the north boundary of a township at proportionate distance from the corners controlling the township line. Prior to this time, surveyors had been advised to place the closing corners at record distance (usually a short distance) from the controlling or regular corners.

On June 24, 1876, James A. Williamson was appointed Commissioner of the GLO.

The *Civil Appropriations Act of July 31, 1876,* 19 Stat. 102, provided that the initial points of the rectangular surveys could be established by triangulation; however, none were so determined in the continguous 48 States. The act also abolished the Office of Surveyor General in Kansas, which was closed June 30, 1876.

The *Act of July 31, 1876,* 19 Stat. 121, required that railroads had to pay for the costs of surveying the lands to be conveyed under their grants. An accurate account had to be kept of the costs of survey and patent could not issue until the cost was paid into the Treasury. The Commissioner had been charging the railroads, the railroad companies appealed, and the law was passed, backing up the Commissioner.

Commissioner Williamson issued his first *Annual Instructions to the Surveyors General* on August 23, 1876, which were very lengthy; they made several changes in policy and procedures. In succeeding years, they were referred to in much the same manner as were circulars.

Among other things, the instructions listed the order of priority in the surveys in accordance with the *Appropriations Act:*

(1) Agricultural land
(2) Irrigable land
(3) Timber land
(4) Coal land
(5) Exterior boundaries of townships
(6) Private land claims

The deputies were not to begin any survey until after the contract had been approved by the Commissioner. Triangulations made to establish a remote township corner would not be paid for, effectively stopping the permission given in the *Appropriations Act.* The township lines were to be extended in the normal manner, from south to north. If at all possible, a whole township must be surveyed, not just a part of it. The

Circular of June 1, 1864, was modified. Both banks of navigable streams were to be meandered. All former or old corners started from or tied to were to be fully described in the field notes. The *Special Instructions* for any contract were to be sent to the Commissioner along with the contract for approval.

In a letter to a man in Minnesota, dated September 28, 1876, Williamson stated that the survey of dried-up lakes had been suspended in April 1876 and that island surveys in "closed" States (those with no Surveyor General) were also suspended, pending legislation on the matters by Congress. The Wolf Lake case was having its effect.

In the *1876 Annual Report,* Williamson complained that the entire Washington staff of the GLO had been reduced to only 145 people, who were all overworked and underpaid, and who had no space to work in. People and files were occupying hall space. During the year, 59,192 letters had been received and 54,127 letters written, which filled 42,315 pages of folio records.

Williamson also commented that he couldn't see any good reason why dried-up lake beds should be allowed to go to the adjacent owners and he urged legislation on the matter.

On February 17, 1877, in a letter to William Vincent, the County Surveyor in Manistee, Michigan, Williamson stated that riparian rights in a lake could only be determined by a proper court, which was a clear backing-off on the lakes issue.

The *Act of February 16, 1877,* 19 Stat. 231, appropriated $2,500 for and directed the Commissioner to have resurveyed Tps. 18 and 19 N., R. 1 W., Michigan, because they had never been "properly surveyed."

These resurveys were made by T. Gale Merrill, Deputy Surveyor, under contract dated March 3, 1877. Work began April 16, 1877, and was completed July 17, 1877. The resurveys were approved August 3, 1877. During the resurveys, many of the original corners were found and adopted by Merrill who then restored the lost corners by the current single proportion, north-south rules. The areas on the plats were changed to fit the returns of the resurvey, which caused some problem as the following letter indicates:

Department of the Interior
General Land Office
Washington, D.C.,
June 24, 1878

E. G. Goddard
East Saginaw, Michigan
Sir:

I have received your letter dated the 14th instant, requesting information as to the subdivision of Section 6, Tp. 18 N., Range 1 West, Michigan, especially as to the N. E. ¼ of N. W. ¼ and N. W. ¼ of the N. E. ¼ which you say was purchased from the State by you prior to the resurvey of said Township in 1877.

By the original plat the tracts referred to were represented as containing 80.72 acres, while by the resurvey they contain but 69.73 acres, and you ask in view of the fact that the lands were purchased by the original plat, how the section is to be subdivided.

In reply I have to say that evidence having been submitted to Congress that the survey of the section line in said township was never made, a law was passed authorizing a resurvey which was therfore made and approved, and the resurvey will govern both as to boundaries and areas of tracts.

Enclosed herewith is a diagram of said Sec. 6, showing the areas of tracts therein together with the length of the lines. The land having been purchased by you from the State, you will have to look to the State for indemnity for the deficiency.

Very Respectfully
J. A. Williamson
Commissioner

Resurveys caused many headaches and misunderstandings, so few, if any, had been done for over 20 years. Now the citizens were again pressing for resurveys, claiming that the original surveys were fraudulent or "grossly" in error, which was not always true, with the costs to be borne by the government, and with the idea that a government resurvey would be "official," ending arguments. In doing a dependent resurvey today, the BLM would never return a new area on patented lands, but this wasn't true 100 years ago. It isn't known when the practice of assigning new areas on the plats of resurveys for patented lands ceased.

The *Act of March 3, 1877,* 19 Stat. 377, is known as the "Desert Land Act." It allowed homesteading of up to 640 acres of irrigable desert land and dealt with water rights. To "prove up" on a desert homestead, the settler had to bring water to the land and irrigate and farm a portion of it; this proved difficult to do. Many of the so-called "wastelands" would now demand surveys.

On March 9, 1877, Williamson informed a man in Michigan that islands formed in a navigable lake following statehood belonged to the State under Federal Court rulings on that subject.

On December 17, 1877, Williamson replied to E. R. Robinson, County Surveyor in Boyne Falls, Michigan, in response to an inquiry about how to resurvey the meander line along a lake. The pertinent portion of that letter follows:

"... you state that having commenced at the meander corner on the East line of Sec. 32, T. 33 N., R. 6 W., you ran as the field notes require, N. 77° W., for a distance less than one call, and found the departure of the meander line from the lake beach so great as to cause dissatisfaction to the interested parties, and ask how the difficulty is to be remedied.

The examination in the field made in this case or the data furnished by you is insufficient to lead to a solution of the question.

Upon examination of the field notes, it is found by computation that the meander line will close on the meander corner on the North line of Sec. 32 within reasonable limits.

Having by reference (if possible) to a known line of the meander survey adjusted your compass and chain to correspond with the same, you will retrace the meander line in the same direction in which it was originally run from the corner on the direction in which it was originally run from the corner on the East line of Sec. 32, through its various bearings and distances to a known point on the line, and if necessary to the meander corner

on the North line of Sec. 32. (which if lost can be restored from the adjacent section corners).

Having ascertained the difference in the falling of the terminal point of your survey as compared with the actual identified point on the meander line you will then proceed to establish the corner or corners, which may be required, by well known rules of proportion.

In accordance with your request. . ."

Williamson described the principles still followed in retracing and adjusting a meander line. It is unknown what the "well known rules of proportion" were that Robinson was supposed to use. The *Circular of March 13, 1883,* on *Restoration of Lost and Obliterated Corners* (13, p. 11 and 12) describes proportioning the length of the courses in proportion to the length of the closing error and to proportion the angles to a closure. Hodgman's Manual describes a "Compass Rule" adjustment for balancing a survey in computing areas (p. 138) but describes (by BLM parlance) the "Grant Boundary Method" in adjusting the misclosure in the resurvey of an irregular-shaped tract (p. 96-99). The text *Elements of Surveying* by Charles Davies, published in 1870, describes the compass rule for adjusting the closing error in area computation (p. 94-95) but then makes an arbitrary adjustment in actual fact. The compass rule method is said to have been devised by Bowditch about 1805, but the letters, circulars and instructions up to the 1880's make no mention of it. The 1930 and subsequent *Manuals of Surveying Instructions* use the compass rule for adjusting a nonriparian meander line, which is also used to adjust misclosures in making area computations.

In the *1877 Annual Report,* both the Secretary of the Interior and Commissioner of the GLO recommended the closing of all the Offices of Surveyors General, appointing one Surveyor General to be located in Washington, D.C., abolishing the contract system, and having the surveys executed by paid employees appointed by the Surveyor General. The Commissioner again recommended legislation granting dried-up lakes and small islands to the States.

During the 1870's, several inventors devised iron post survey monuments to mark the survey corners and tried to sell them to the GLO. All received polite replies to the effect that it was a good idea, but funding, freight costs, and burden to the deputies were too great.

On January 4, 1878, in a letter to James M. Gillan, County Surveyor, in Appleton, Wisconsin, Gillan was advised to restore the lost quarter corner between sections 9 and 16 at midpoint between the section corners and on line with a line tree that was originally two and one-half chains east of the now lost quarter corner.

On March 27, 1878, F. Markey, County Surveyor, Chillicothe, Missouri, was advised that under the particular circumstances, he should restore the lost corner of sections 1, 2, 11 and 12, T. 56 N., R. 25 W., Fifth Principal Meridian, at a double proportionate position between the found corners to the north, south, east, and west of the lost corner. So, the single proportion north-south policy was not a hard and fast rule.

The *Act of June 3, 1878,* 20 Stat. 88, allowed timber cutting on mineral lands in nine of the Western States and territories. The timber was to be used only on those lands.

The *Act of June 3, 1878,* 20 Stat. 89, provided for sale of 160-acre tracts of timber lands in Oregon, California, Nevada, and Washington Territory at $2.50 per acre. The act was a mistake and later led to large timber land frauds.

On March 2, 1831, Congress had passed legislation making it a felony to steal timber from public lands, but left it to the local land offices to enforce the law. Timber trespass, or "depredation," as it was called, was becoming a common practice and something had to be done. The Commissioner of the GLO began appointing special agents to catch and prosecute timber trespassers and Congress provided funds for protecting the timber. But Deputy Surveyors were required in many cases to make resurveys to prove that the timber was taken from the public lands. The whole thing eventually led to setting aside of the Forest Reserves, requiring more surveys.

On July 30, 1878, Williamson wrote to a photolithographic company in Washington, D.C., requesting a cost estimate on tracing and restoring the plats on file in the GLO and making litho copies of them. Every time a copy of a plat had to be sent to anyone, a draftsman would place a thin tracing paper over it and trace off all of the lines, dimensions, areas, etc. After repeated tracings, the "original" plat had been literally cut to pieces and many of the figures undiscernible. Apparently the company gave a favorable estimate because for several years thereafter, copying, restorations, and photolithographic copies of the plats were paid for. In the first instance, the GLO plat was a copy of the originals which were retained by the Surveyors General. Quite often the copy was not an exact duplicate of the original; discrepancies did occur. The badly deteriorated copy was copied or restored and beyond doubt, did not always result in an exact or correct duplicate. So it is not unusual to find discrepancies between the original plats and the "Washington copy."

On August 13, 1878, Charles Scott, Deputy Surveyor under contract with the Surveyor General of Dakota, established the Black Hills Baseline in South Dakota. The initial point for this system was the 69th mile post on the Dakota-Wyoming boundary, surveyed by Rollin J. Reeves in 1877. The South Dakota boundary is the Black Hills Meridian. All ranges in the system are numbered east from the boundary and north or south of the baseline. The Black Hills Meridian and Baseline control the surveys in most of western South Dakota, and the Fifth and Sixth Principal Meridians control the remainder.

The following letter was sent in reply to an inquiry of the correct method of subdivision of an elongated section:

Department of the Interior
General Land Office
Washington, D.C.,
January 13, 1879

J. M. McEwen, Esq.
Wausau, Wisconsin
Sir:

In reply to your letter of the 6th instant, requesting information in regard to the proper method of subdividing Section 19, Township 28 North, Range 9 East, 4th P.M. Wisconsin, I have to state as follows:

Upon examination of the field notes, I find that in surveying this section (which contains more than twice the usual quantity of land) the Surveyor established

supplementary corners at every twenty chains between the quarter posts on the north and south boundaries of the section and the range line. The proper method of proceeding will therefor be: —

1st. Run *Straight lines* between the estabished quarter section corners — U.S. Surveys — establishing a corner at the intersection of the said lines, which corner will be common to the four quarter sections.

2nd. Run *Straight lines* from the supplementary corners on the south boundary to the corresponding corners on the north boundary and establish corners at the intersections with the line previously run between the *East* and *West* quarter posts, also at the points equidistant between the supplementary corners and the corners thus established on the east-and-west quarter line.

3rd. Establish quarter-quarter corners for the *east half of the section,* at points equidistant between the section and quarter-section corners and between the quarter corners and the corner common to the four quarter sections and subdivide the Northeast and Southeast quarters by straight lines running between the corners thus established.

4th. On the west boundary of the section the corners common to lots 6 and 7 and 18 and 19 should be established at points equidistant between section and quarter section corners.

As the supplementary corners established on the north and south boundaries of the section at 7.85 and 5.43 chains respectively, east of the range line were disregarded in constructing the plat by which the lands were sold no notice will be taken of them in subdividing.

Very Respectfully,
J. A. Williamson
Commissioner

Fig. 49 is a reasonable facsimile of the original plat of section 19 (approved February 15, 1854) showing the pertinent facts. While the method of subdividing the northwest quarter and southwest quarter of the section is not the procedure that would be used today, it undoubtedly seemed reasonable in 1879. An almost identical reply went to a man in Missouri on May 15, 1879, in regard to subdividing a section similarly elongated except it was against the north boundary of the township. Both letters were contrary to the method used today and contrary to the opinion as expressed in the letter to Barney on March 8, 1875.

In a letter to Orlando H. Brewster, Surveyor General of Louisiana dated January 17, 1879, Williamson rejected payment to a Deputy Surveyor for the retracement of 281 chains of the south boundary of a township. The Deputy had retraced three and one-half miles to find a "starting corner" but had not reestablished the "lost" corners. Williamson said he would have approved payment had the Deputy set those corners.

By the *Act of March 3, 1879,* 20 Stat. 352, Congress amended the deposit survey laws. The entire act follows:

CHAP. 170.—An act to amend section twenty four hundred and three of the Revised Statutes of the United States, in relation to deposits for surveys.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section twenty-four hundred and three of the Revised Statutes of the United States be, and is hereby, amended so as to read as follows:

SEC. 2403. Where settlers make deposits in accordance with the provisions of section twenty-four hundred and one, the amount so deposited shall go in part payment for their land situated in the townships, the surveying of which is paid for out of such deposits; or the certificates issued for such deposits may be assigned by indorsement, and be received in payment for any public lands of the United States entered by settlers under the pre-emption and homestead laws of the United States, and not otherwise.

Approved, March 3, 1879.

Some "deposit survey" frauds had been perpetrated under the old deposit system and the Commissioner had issued stringent rules regarding them, requiring that the Surveyors General have positive proof of actual settlement before accepting deposits and issuing contracts for deposit surveys. Williamson and succeeding Commissioners issued strict orders in that regard to no avail. The deposit survey frauds, usually referred to as the "Benson Syndicate Frauds," began almost immediately on a grand scale.

John A. Benson entered the public land surveys picture as a Deputy Surveyor by a contract dated September 9, 1873, for the survey of the subdivisional lines of T. 26 N., Rs. 1 and 2 E., Mount Diablo Meridian, California. He held other contracts in succeeding years, and it is believed he did reasonably good work until 1879.

After passage of the deposit survey amendment, Benson organized his "syndicate", abetted by clerks in the Surveyor General's office, with the financial backing of a San Francisco bank. Certainly the Surveyor General would have had to be turning his head also. Although much has been written about the Benson Syndicate Frauds the swindle worked basically in the following manner:

Benson hired deputy surveyors, clerks, and draftsmen to work the system. Using bank funds to get operating, he filed applications for deposit surveys in innumerable townships in remote parts of the State.

The "settlers" were nearly all fictitious; although actual persons often appeared, signed the sworn affidavits, and made the deposits, they had no idea where the land was located on which they were filing. Some street bum may have been used and paid for his participation with a bottle of whiskey or wine and sometimes even a few dollars cash. Of course, the deposit certificate would be immediately assigned to Benson; it was almost like a certified check and could be used to pay for public lands anywhere, not just the lands applied for as before the amendment.

Benson gathered his gang of deputies, many of them actual Deputies who had held legitimate contracts before this time, but many were not surveyors at all and some were wholly fictitious. Contracts would then be let to them for the survey of a township or block of townships for which the phony applications and deposits had been made. But, more likely than not, no survey would be actually made in the field. If any surveying was done it would only be a skeleton job—a few township boundaries or parts of them or a few "section lines"

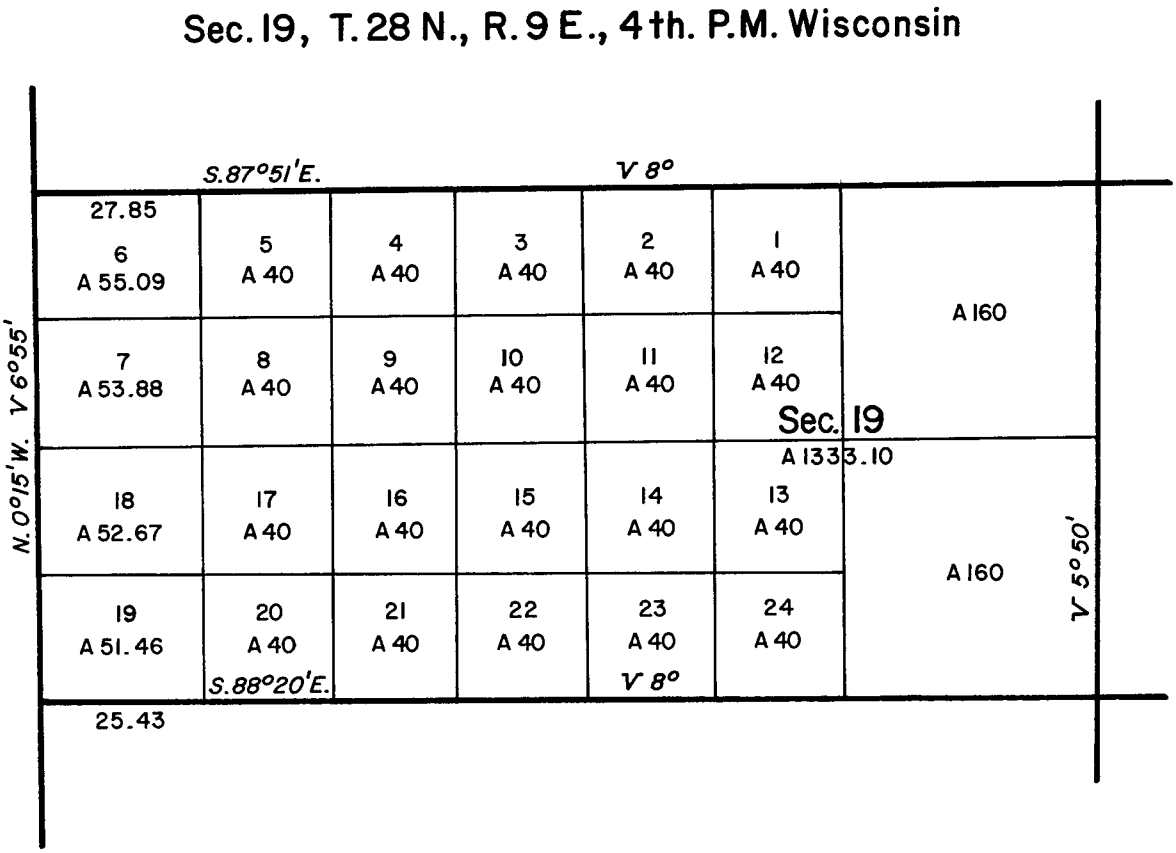


Figure 49. Elongated Section.

surveyed by traversing along accessible trails, ridge tops, along river canyons, and "stubbing in" corners in calculated positions. These "stub jobs" were usually done in areas where actual settlers and miners were located, which gave them the appearance that a survey was being made, however crude and poorly done. But on the whole, no Deputy went to the field at all.

While the Deputy was supposed to be or actually was in the field, the field notes of these surveys were being written up, and plats prepared in a "boiler room" in San Francisco by the support personnel or deputies of the syndicate. If any field work was done, it would be incorporated into the record. The remainder of the topographic calls would be sketched in from any source available, USGS maps and the like. Much of the California coast had been or was being mapped by the U.S. Coast Survey (USCS), and there is no doubt that their triangulation stations and other data were used to full advantage.

The rates per mile for these surveys were always the highest rate allowed by law. Often supplemental contracts were let for the survey of intervening townships and township lines to enable the Deputy to extend the survey lines to a deposit survey township. Although allowed by Congress, the Commissioner did not allow triangulation as a method for extending the lines. The government ended up paying from the regular appropriations for many thousands of miles of fictitious or fraudulent work.

The deposit certificates were sold to timber companies, land speculators, and possibly even to legitimate settlers, perhaps at a small discount, who in turn used them at full face value to pay for public lands which they wanted to acquire. Most of the Redwoods area of northwestern California were purchased with deposit certificates or cash under the *Timber Lands Act of June 3, 1878.*

The Benson Syndicate Frauds extended to several other Western States. No direct evidence exists that Benson operated the swindle in other States, but the *Annual Report of 1887* reported that the syndicate also extended into Nevada, Oregon, Colorado, Arizona, New Mexico, Idaho, Montana, Utah, and Washington. It is probable that after California, Colorado suffered the worst.

The fraudulent surveys scheme operated until about 1885 during the tenure of Commissioner William A. J. Sparks. During this five-year period, most the surveys contracted for were under the deposit system. The annual appropriations for all the surveying districts for surveys was only $300,000 per year. Congress was very tight with the funding and as a result, got what they paid for, but the scheme could not have worked without collusion on the part of trusted government employees, underpaid or otherwise, all the way up to the GLO in Washington.

The *Act of March 3, 1879,* 20 Stat. 394, created a Public Lands Commission to study the public land laws and make recommendations to Congress on legislation to improve the system or to formulate policies. Thomas Donaldson, a former Registrar of the Boise, Idaho, Land Office, was appointed to the Commission. He prepared the first report in 1880; it was revised twice, the last time in 1883. The third revision, current to December 1, 1883, is titled *The Public Domain, Its History, with Statistics,* by Thomas Donaldson. The copy which this writer used for reference material was originally printed in 1884. While "Donaldson" contains many inaccuracies, it is a good reference for most of the history of the public land laws and operations up to the end of 1883.

The *Civil Appropriations Act of March 3, 1879,* 20 Stat. 377, created the U.S. Geological Survey (USGS), a new bureau within the Department of the Interior. Among other duties, the USGS was made responsible for the classification of the public lands and examination of the geologic structure, mineral lands, and other resources; eventually it would execute some of the rectangular surveys of the public lands.

On April 2, 1879, Williamson replied to M. Spear, Deputy County Surveyor in Roscoe, Kansas, in regard to his request for a resurvey of Tps. 6-8 S., Rs. 23-25 W., Sixth Principal Meridian, or 9 townships. Spear was told to investigate thoroughly to see if any corners existed and how the topography fit. If the surveys were indeed fraudulent, the owners could have deposited under the deposit law the estimated cost of resurveying the townships, and Williamson would have appointed a Deputy to execute the work. If not fraudulent, the County Surveyor should do the work, based on the original corners, receiving payment from the settlers. An identical letter was sent on April 7 in regard to a similar request for T. 17 S., R. 9 W. The Surveyor General's office in Kansas had only been closed three years, and none of the surveys could have been more than 25 years old, but resurveys were already being requested.

On April 17, 1879, Commissioner Williamson issued a Circular that said the plats of the rectangular surveys did not become official until accepted by the Commissioner of the GLO. Prior to this time, the plats became official when approved by the Surveyor General. Under this order, the triplicate plat was not officially filed in the local land offices until after official acceptance of the survey in Washington. This acceptance date was usually noted on the margin of the plat but was not evidenced by certification on the face of the plat until July 1, 1925. Both approval and acceptance dates were shown on the plats from 1925 until June 30, 1948; since 1948, only the acceptance date has been shown.

A letter to Raphael Pumpelty, Oswego, New York, dated May 19, 1879, was a portent of things to come. Pumpelty had requested survey of some land (where isn't known, but not in New York) containing standing timber which laid between the original meander line and a lake. The letter said in part:

> ". . . and stating that the tract of land referred to in your former letter is not of recent formation but was omitted by an error in the original survey — which fact is shown by the existence of trees outside the meander line. I have to state that in my opinion the tract is Government land."

Williamson declined to take any steps pending legislation by Congress. This statement on omitted lands outside a meander line was a reversal of Wilson's stand on the same issue at Black Lake in 1870, but no action was taken.

In a letter to E. K. Robinson, Boyne Falls, Michigan, dated September 27, 1879, Acting Commissioner J. M. Armstrong, advised him to proportion the record distances to the original bearing trees, to reestablish the corner point at a quarter corner, because the record didn't agree with the actual position of the trees. This advise was a reversal of the former policy of restoring the corner point at intersection of the record bearings.

On November 1, 1879, Acting Commissioner Armstrong issued a Circular letter on the *Subdivision of Sections and Re-establishment of Lost Corners* (previously referred to). The Circular (see Appendix) was printed for the purpose of replying to requests for opinions on the subjects, which had previously been written out each time. The restoration of lost interior section corners was by the single proportion, north and south method.

In the *1879 Annual Report,* Williamson again requested adopting the use of iron posts to be set at alternate section corners in areas where "durable stones" and bearing trees were not available. (He gave one story to the "inventors" but a different version to Congress.)

On January 20, 1880, Armstrong issued a general Circular for public consumption to the effect that no more island or lake surveys would be made, pending legislation from Congress, which never happened.

On January 23, 1880, Armstrong advised G. C. Kothe, Salina, Kansas, to establish a quarter corner, which fell in a river, at record bearing and distance, East, 1.46 chains from the original witness corner located on the left bank of the river (not at midpoint between section corners, the former policy).

On January 30, 1880, Armstrong advised Thomas A. Bagley, County Surveyor, Medicine Lodge, Kansas, to restore a lost township corner at proportionate distance between found corners to the north and south of the lost corner.

On *February 11, 1880,* 21 Stat. 301, Congress approved a resolution to have printed annually the *American Ephemeris and Nautical Almanac.* This large volume eventually led in 1910 to the condensed version, modified and published for use by the surveyors of the public lands, about as we know it today. The *American Ephemeris* is still published.

On February 19, 1880, Armstrong replied to John M. Morrow, Ellsworth, Kansas, on the subject of off-line closing corners, found to be south of the Third Standard Parallel South. The letter concluded with these words: "Purchasers of lands in sections *adjoining the Standard on the south,* will hold to the Standard notwithstanding the fact that a portion of the closing corners were originally established south of said line."

On March 9, 1880, Thomas H. Holley, County Surveyor, Fulton, Missouri, was advised that he should probably restore a lost township corner by double proportion between found corners to the north, south, east, and west, because it was ten and one-half miles between found corners along the range line.

The *Act of June 16, 1880,* 21 Stat. 287, granted two million acres of land to be selected by the State to Nevada in lieu of the "school land" sections 16 and 36 granted at Statehood. Nevada selected large blocks of these lieu lands in the better agricultural valleys of the State. There are no "school sections" in the townships in Nevada.

The *Annual Instructions,* issued June 26, 1880, required that all Surveyors General establish a meridian station at or near their offices and that all solar compasses and needle compasses used by Deputies had to be checked and adjusted on that station. This practice continued until recent years.

On July 22, 1880, Williamson advised B. F. Lee, Authority, Kansas, that closing corners found as much as three rods off-line, north of the southern boundary of Kansas, would control the section lines in Kansas but the owners would hold to the State boundary. This policy on off-line closing corners has never changed.

On September 3, 1880, Williamson instructed J. B. Bausman, "Examiner of Surveys and Special Agent" (he was a clerk in the GLO), to investigate a case of omitted lands between the record meander line and the actual shore of Lake Benton in section 8, T. 109 N., R. 45 W., Fifth Principal Meridian, Minnesota. The tract had been surveyed by J. Gilbert Bryon, County Surveyor of Lincoln County, and a plat and field notes sent to the Commissioner for approval. Williamson told Bausman to make a thorough investigation of the facts. Bausman reported that the tract was in fact omitted lands and that the County Surveyor had made a proper survey of it. On March 7, 1881, Williamson forwarded the County Surveyor's plat and field notes to Jacob H. Stewart, Surveyor General at St. Paul, instructing him to construct a proper plat of the tract, to approve the plat and Bryon's field notes, and to send the duplicate plat to Washington. Stewart complied and the plat was accepted April 12, 1881, thus the surveys were done and a County Surveyor's work was used to do it.

On September 25, 1880, Stewart was instructed to investigate omitted lands along the Minnesota River in T. 121 N., R. 46 W., Fifth Principal Meridian, and if they were high and dry and "large" in area, he was authorized to have them surveyed.

On or about October 19, 1880, Daniel G. Major, surveyor and astronomer, under contract with Commissioner Williamson, established the initial point of the Ute Meridian and Baseline in the vicinity of Grand Junction, Colorado. This small system was established to survey the Ute Indian Reservation lands. The work was paid for from Indian Service appropriations for the survey of Indian allotments, but actually only a few townships were surveyed on this system. It was dropped in 1881 or 1882, and the Sixth Principal Meridian and New Mexico Principal Meridian surveys were extended over the Ute Reservation instead.

In October, 1880, and on November 27 and December 11, 1880, James L. White, Surveyor, Ocala, Marion County, Florida, wrote to Commissioner Williamson asking advice on the proper procedure to be used to subdivide section 9, T. 15 S., R. 23 E., Tallahassee Meridian. The section had been surveyed originally by Lewis M. Prevost, Jr., Deputy Surveyor, in 1843. The Silver Spring (River) crossed the northern half of section 9 and Prevost had used a traverse and triangulation to cross Silver Spring when surveying the east and west boundaries of the section. White found that the part of section 9 lying north of Silver Spring was actually offset about 4.25 chs. east in relationship to the corners south of Silver Spring, and asked how he should subdivide the section. In his reply of December 3, 1880, Williamson cited the *Act of February 11, 1805,* and advised the straight line intersection method of establishing the center one-quarter corner. Upon receipt of this letter, White then sent to Williamson a sketch of the section showing the distortion. On January 12, 1881, Williamson reversed his opinion, and advised White to establish the center one-quarter corner at midpoint on the east-west center line and then connect the two halves of the north-south center line to it. That procedure would result in a deflection in the north-south center line at the center one-

quarter corner, i.e., a broken north-south center line. Williamson stated that the intent of the Act of February 11, 1805 was to divide a section into four equal parts, as nearly as may be, but that the law did not contemplate such an irregularity as existed in section 9; thus, to comply with the intent of the law, White should subdivide the section with the method described.

The author has seen numerous instances of gross distortion, especially in sections against the north and west boundaries of the townships, where the one-quarter section corners had been "stubbed out" during the original survey and no actual connection made through, from the last one-quarter corners to the section corners on the exterior boundaries. In such cases, the principle outlined by Williamson could have been, or perhaps, should have been applied. When Mansfield proposed the law of 1805, he did not contemplate gross distortions and fictitious closing; therefore, he did not provide for them in the Act. Williamson pointed out what the intent of the law was at the time it was written and passed by Congress.

The omitted-lands problem came up again in early 1881 but in a different form.

In 1834 and 1835, Ambrose Rice, Deputy Surveyor, surveyed fractional T. 9 S., R. 9 E., Michigan Meridian, in Ohio, made fractional by Maumee Bay of Lake Erie and a large marsh. The marsh was meandered and the sections adjoining it were lotted. On the northeast side of the marsh was located a sandy beach area, similar to an outer reef. Rice extended a township line across the marsh to the reef and surveyed three small islands which were part of it between the marsh and open lake. On the original plat, the marsh was labelled "Impassable Marsh covered with Water." The field notes described it as a "flag marsh." The fractional sections abutting the marsh on the south were patented in 1844. In 1852, the State of Ohio filed claim to the marsh under the *Swamp Lands Act.* The claim was denied on the grounds that the marsh was not swamp land under the terms of the act. In early 1881, applications were made for the survey and purchase of the marsh.

On April 2, 1881, Williamson issued *Special Instructions* to John B. Marston, County Surveyor, Toledo, Ohio, for the extension of the rectangular surveys over the marsh, which Marston executed during April and May. This is the first survey in which a steel tape was used to measure the lines. (Steel tapes were being used by mineral surveyors but not by Deputy Surveyors.) The plats were approved in June 1881. Lands within the surveyed marsh (and possibly the sand islands too) were patented in 1882. The successor in title to the fractional lots (south of the marsh, patented in 1844) was Gertrude J. Niles. The successor in title to the lands surveyed by Marston within the marsh was the Cedar Point Club. Niles claimed ownership of the marsh on the grounds of riparian rights and sought to eject the Cedar Point Club. The matter went to court. The Sixth Circuit Court of Appeals upheld Cedar Point Club's title on February 8, 1898 (see *Niles vs. Cedar Point Club,* 85 Fed. Rep. 45). Niles appealed to the U.S. Supreme Court, which upheld the Circuit Court decision on December 4, 1899 (see 175 U.S. 299).

On May 3, 1881, a new *Manual of Surveying Instructions* was issued. Though referred to as the *1881 Manual,* it was not really a manual and was never enacted into law as was the 1855 Manual. The tome is titled *Instructions of the Commissioner of the General Land Office.* In 1880, a meeting was held in San Francisco with attendance by the Surveyors General; today such a meeting is called a cadastral workshop. At this meeting, a commission was appointed to revise the 1855 Manual; they met in Cheyenne, Wyoming, and prepared these instructions. Perhaps Commissioner Williamson wasn't too impressed or felt he didn't have legal authority to issue a new Manual in view of the wording of the *Act of May 30, 1862.* This conclusion is based partly on the wording in the penultimate paragraph of the introductory chapter of this Manual. These intructions made no really basic changes in the 1855 Manual; they deal primarily with housekeeping details, note keeping, contracts forms, citation of the laws, and closing limits. Closing limits are defined and tightened somewhat. Also included is the Circular letter printed on November 1, 1879, which includes the proportion north-south method for restoring a lost section corner. These instructions did not change the 1855 Manual and were not in violation of any statute law, but they were nothing more. They were not widely accepted by the Surveyors General; the consensus was that they were garbage. The 1881 Manual was never enacted into law by Congress (see Appendix).

In July 1881, island surveys were resumed on a limited basis via the deposit system. They have continued to be made ever since.

On June 17, 1881, Noah C. McFarland was appointed Commissioner of the GLO and took charge July 6. He was a very capable man and the opinions emanating from the GLO soon began to reflect that fact.

On August 26, 1881, McFarland issued *Special Instructions* to Richard O. Chaney and William W. Smith, U.S. Surveyors, for the survey of the "Public Land Strip," now the Oklahoma Panhandle. The strip was bounded on the north by the Kansas-Colorado boundary (37° north latitude), bounded south by the Texas boundary (36°30′ north latitude), on the west by the New Mexico boundary (103° west longitude), and on the east by the Indian Territory boundary (100° west longitude). Chaney and Smith were to establish an astronomic station southeast of Las Animas, Colorado, and extend a telegraph line to it for time signals and determine within three seconds the 103° west longitude. From that station, they were to extend a line due south to 37° north latitude, set a monument, continue the line due south to 36°30′ north latitude, and there establish the initial point of the Cimarron Principal Meridian and Baseline. The initial point, at the northwest corner of Texas, was to be monumented with a stone 6 feet long and 12 inches square. The baseline was to be surveyed due east, using a tangent line and offsets therefrom, to 100° west longitude, with quarter corners and section corners thereon. At the end of each two miles, a "Bausman's Patent U.S. Land Monument," an iron post, was to be set, with the other corners to be monumented with stones. The Principal Meridian was to be surveyed back, due north along 103° west longitude, to the south boundary of Colorado, similarly monumented. Double chaining and frequent astronomic observations were required. A Standard Parallel was to be surveyed due east from the meridian, 24 miles north of the baseline. Bausman monuments were to be set at alternate section corners on all township, range, and section lines. This was an elaborate survey and the only initial point ever

established at a precisely predetermined point by latitude and longitude; it was also the last one ever established in the contiguous 48 States.

Chaney and Smith complied with instructions. The field notes indicate they ran the meridian line south between October 19 and November 16, 1881. On the latter date, they established the initial point and surveyed the baseline between November 21 and Christmas Day. The remainder of the surveys followed. All of the townships are numbered north and east from the initial point. The Principal Meridian is part of the east boundary of New Mexico. Due to the later boundary disputes with Texas and a resurvey, the baseline does not exactly follow the Texas boundary.

In a letter to P. T. Curran, Wausau, Wisconsin, dated December 24, 1881, McFarland flatly stated that line trees control the direction of a line but not the proportions along it. He also stated that a lost quarter corner should be restored at midpoint between section corners.

In a reply to James E. Rankin, Elk Rapids, Michigan, dated December 29, 1881, McFarland stated that meander lines along the navigable Great Lakes did not mark the boundary—the water did. He also stated that small, inconsiderable areas between the meander line and water's edge went to the riparian owner; everyone knew that meander lines were run in a manner that would leave such small strips.

In the *1881 Annual Report,* McFarland asked for repeal of the deposit survey systems, explaining how the deposit frauds worked. He asked for $10,000 to purchase iron post survey monuments. Both McFarland and the Secretary of the Interior asked for examiners of surveys to be direct employees of the Commissioner instead of most examinations being made under the Surveyors General. The words used are the following:

> "It is an absurdity to suppose that truthful and honest returns of examinations in every paticular will be made by deputy surveyors, upon whom surveyors general are more than oridinarily dependent for examiners, when it is considered that the examining deputy will at some time, if not already under obligations, have this own work examined by the very deputy whose work he has, if honest, condemned. The temptation of overlooking defects, either in the survey of lines or the marking of the same, has proven too great to be resisted by them. It is safe to say that not one per cent of the number of examinations are satisfactory to this office in the results obtained."

The Secretary also requested that patents be issued to individual Indians for lands within a reservation which they had improved and occupied.

In a letter to H. L. Humphrey of the House of Representatives, dated January 19, 1882, McFarland approved the idea of including the words "and resurveys" in the appropriations bill. The wording was used in the *Appropriations Act of July 7, 1884,* 23 Stat. 194, and generally thereafter.

In a reply to J. H. Davenport, County Surveyor, Cherokee, Iowa, dated March 4, 1882, McFarland stated that as a general rule, a lost section corner should be restored between the found corners to the north and south of it, but in this (unspecified) situation the lost corner should be restored by double proportion. This was the first real break in the north-south proportion policy of the *1881 Manual.*

On May 23, 1882, in reply to J. D. Lonsdale, Dale City, Iowa, McFarland discussed magnetic variation and then the proper method of restoring the lost corner of sections 27, 28, 33, and 34, T. 79 N., R. 30 W., Fifth Principal Meridian, concluding with these words:

> "The lost corner in question, should in the opinion of this office, be established, first, on the north and south line, between nearest corners, proportionate measurement; and if the difference in such location should exceed one chain (the legal allowance) then to correct the position of the point thus found by measurement of the east and west lines intersecting at the point sought to be established."

So the "closing limits" of a section were being used to determine whether a corner should be single or double proportioned. This closing limit concept was carried into the location of quarter section corners as well when their location was in doubt.

The surveys in Kansas, Nebraska, Dakotas, and eastern Colorado had progressed very rapidly. Many were, no doubt, executed by the "buggy wheel" method of chaining. In those open prairies, there is more than ample evidence that the original surveys where possible were surveyed by loading down a buckboard wagon with stones or stakes. A cloth was tied to a spoke of a wheel. One man drove the team, another kept line with a compass, and a third counted the revolutions of the flagged wheel. When the requisite number of revolutions was counted, to measure a half mile, the counter threw out a stone or stake. The more honest surveyors actually halted the wagon and set the monument "as per instructions." Obviously, the line so run would not be straight. The distances to topographic calls were also determined in the same way. If the east-west section lines were run, they were either stubbed out or run in the above described manner. Apparently, the stones used were a soft sandstone or conglomerate from which the marks soon weathered away, making them difficult if not impossible to identify if other stones were in the area. Or the stones just melted from the action of rain, ice, and snow into an unidentifiable pile of sandy rubble.

Most of the settlers and the local surveyors honored these corners where they found them in accordance with the law; some did not. Many letters came into the GLO from settlers complaining that a neighbor and often some surveyor had moved a corner or corners to straighten up the section lines. The moved corner was usually a quarter corner on an east-west line. The Commissioner would invariably reply that the original position was correct according to law, that to correct the situation it should be returned to the original position, and that since he had no authority over private lands, the complainant should submit the matter to the local courts for resolution.

But the "floating" corner was a different problem. Inquiries were made in this tone: "I ran the section line between the section corners and found this crumbled rock lying on the ground, two chains east and one chain north of midpoint — What should I do?" The stock reply was that if the rock was identified as the original, and it had not been moved by

"designing persons," then it had to stand in place. But if it was more than one chain out of position (i.e., more than one chain out of midpoint or more than one chain off-line), and could not be positively identified as being in the original position, then the quarter corner should be treated as lost and be restored at midpoint and on line. This, of course, was the answer on regular lines, not those against the north and west boundaries of the township, in which case appropriate modifications were made. The whole rationale of the one-chain criteria was the Manual closing limits of a section.

The repeated requests for funds to purchase iron post monuments were made to correct the described problem. But so far, the only place they had been used was the Public Land Strip (Cimarron Meridian surveys).

In a letter dated June 2, 1882, C. B. Magruder, County Surveyor, Rockledge, Florida, was advised to establish a one-sixteenth corner on a section line at proportionate position between a quarter corner and meander corner. This method (principle) was probably followed until about the 1930's when a hiatus in the policy took place.

On September 6, 1882, *Special Instructions,* were issued to Jacob R. Meyers, County Surveyor, West Branch, Michigan, for the extension of the public land surveys over approximately 100 acres of omitted lands between the original and actual meander line of "Peach Lake" in section 15, T. 22 N., R. 2 E., Michigan. The land was from 5 to 200 feet in elevation above the lake level. The survey was made and approved. Patent was issued to Lots 7, 8, 9, and 10 (the omitted land) to W. R. Meyers. The owner of Lot 2 (adjoining the original meander line) sued for possession of the land patented to Meyers. The local court ruled in 1883 in favor of the owner of Lot 2 and ejected Meyers. The outcome of the case is unknown. The original plat and omitted lands survey are shown in Figs. 50 and 51.

The survey of nonexistent lakes began in 1882. Evidence was produced to the satisfaction of the Commissioner that a tract of land in sections 22 and 23, T. 40 N., R. 4 W., Wisconsin, which had been meandered and shown on the original plat as being a lake, was in fact high, dry land and no lake had ever existed where shown. The Commissioner had plats constructed, protracting the section line across the lake and the section subdivision lines, completing the survey. The original plat of this survey was sent to Wisconsin authorities on November 11, 1882. Pertinent portions of the original survey and completion (protractions) are shown in sketches (see Figs. 52 and 53).

On December 9, 1882, P. T. Curran, Deputy County Surveyor, Wausau, Wisconsin, was advised to restore the lost corner of sections 3, 4, 9, and 10, T. 30 N., R. 6 E., by double proportionate methods. No mention is made of single proportion north and south, nor the one-chain test.

On January 16, 1883, the Secretary of the Interior ruled that island surveys could no longer be made under the deposit survey system. Those surveys, when made, had to be paid for from the regular appropriations for public land surveys, a special examination had to be made to determine that the island had been in existence since before statehood or the original survey, and adjacent land owners had to be notified 30 days prior to the survey that a survey was going to be made of it. Those are still the basic rules today.

The *Appropriations Act of March 3, 1883,* 22 Stat. 603, provided $15,000 for the resurvey of poorly or fraudulently surveyed townships in Kansas.

On March 19, 1883, McFarland issued a Circular to all Surveyors General that in the future, all Supplemental Diagrams (plats) had to be made on the regular township-sized paper. Up until this Circular, supplemental plats had been made any size, from a few inches square up to the uniform township plat size.

On March 13, 1883 the first full Circular was issued by the GLO, titled *Restoration of Lost and Obliterated Corners.* These instructions are published in 1 LD 339 or 671. By this Circular, the single proportion north-south method of restoring a lost interior section was forever put to rest. Double proportioning, based on the law, was adopted and still remains. The subdivision of sections was not included; that part remained in the 1879 Circular. The *Restoration of Lost and Obliterated Corners Circular* was reissued in identical form in 1885 and on September 25, 1891. It was sent to all the Surveyors General on May 7, 1883, with instructions that it superseded the *1881 Manual,* especially p. 40 (see Appendix).

In June 1883, the Department of the Interior began publishing the more important Land Decisions, relating to the public lands administration and surveys. These volumes are numbered consecutively and are referred to as the "LD's." Reference is by volume and page, such as 1 LD 339, 2 LD 115, etc. For several years previous to this, the more important LD's were printed in the Annual Reports.

In the *Annual Instructions to the Surveyors General* (sent out in June 1883), McFarland directed that in the future all calls of topography entered in the field notes would be given along the true line, not the random line as was the practice in many districts. Tangent lines could not be run for more than 12 miles and offsets to the true line had to be carefully made. McFarland prohibited the use of open sight or needle compasses in the survey of Standard Parallels and other "principal" lines (presumably township lines). Bearing trees marked south of the Standard Parallel at Standard Corners must be marked to refer to the sections north of the standard, not south of it as was the former practice. He again reminded them that the *Special Instructions* for every survey had to accompany the contract when sent to him for approval. These *Annual Instructions* were almost a manual in themselves.

On July 31, 1883, McFarland issued *Special Instructions* to Henry C. F. Hackbush, Deputy Surveyor, Leavenworth, Kansas, for the resurvey of Tps. 6 through T. 10 S., Rs. 23 and 24 W., Sixth Principal Meridian. Part of those instructions reads as follows:

> "According to the best evidence obtainable it appears that the returns of the original subdivisional survey of said townships were fraudulent, and that, in fact, no subdivisional lines were run and marked in the field by the U.S., hence the survey to be made by you although termed a *resurvey* will, in fact, be a survey *de novo,* and you will disregard any corners which you may find in the interior of said townships."

The instructions directed Hackbush to dependently restore all lost corners on the exterior boundaries of these ten townships in accordance with the Manual and Circular of March 13, 1883, then survey the interior section lines as though it was an original survey. Those ten townships con-

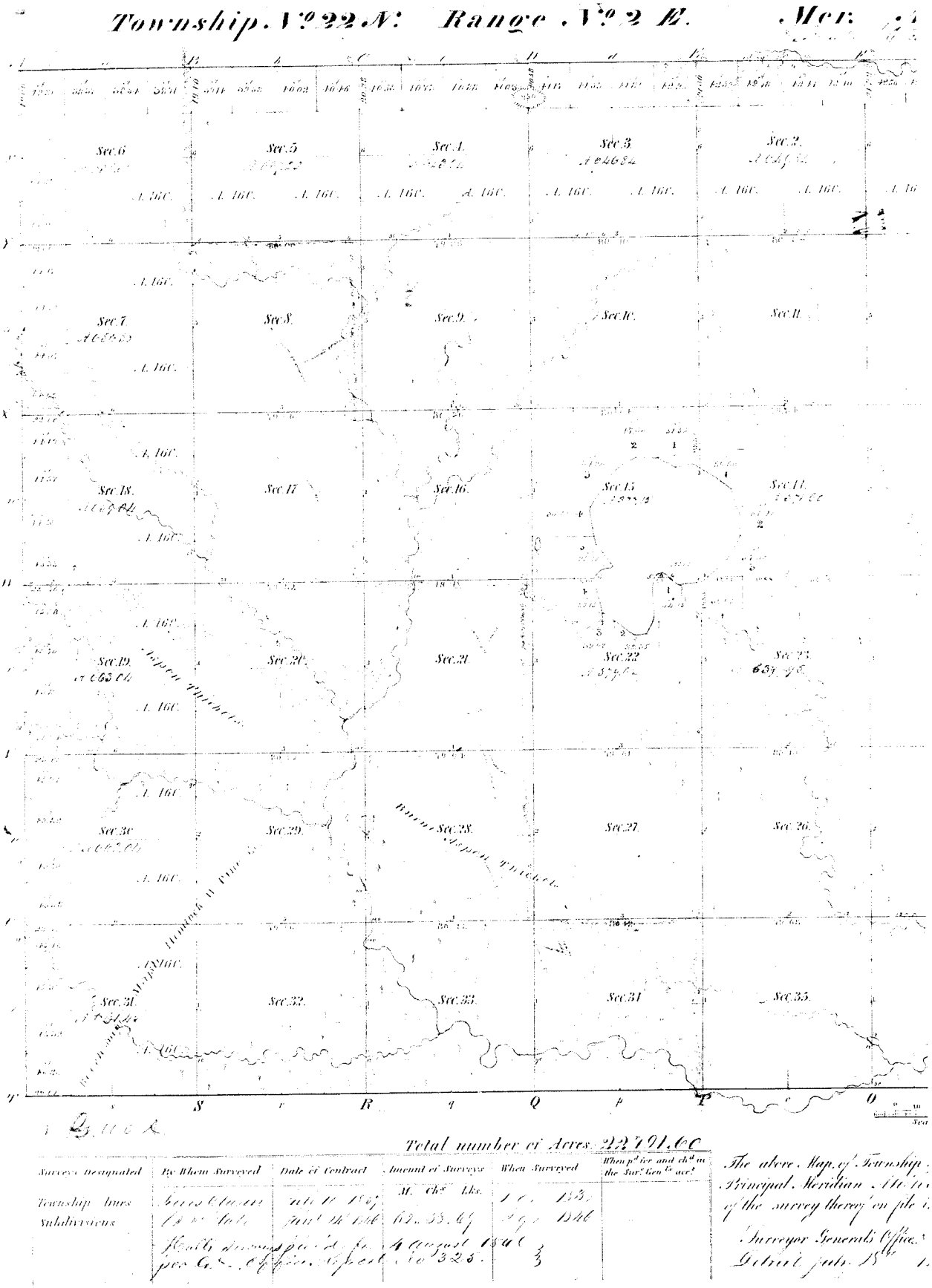
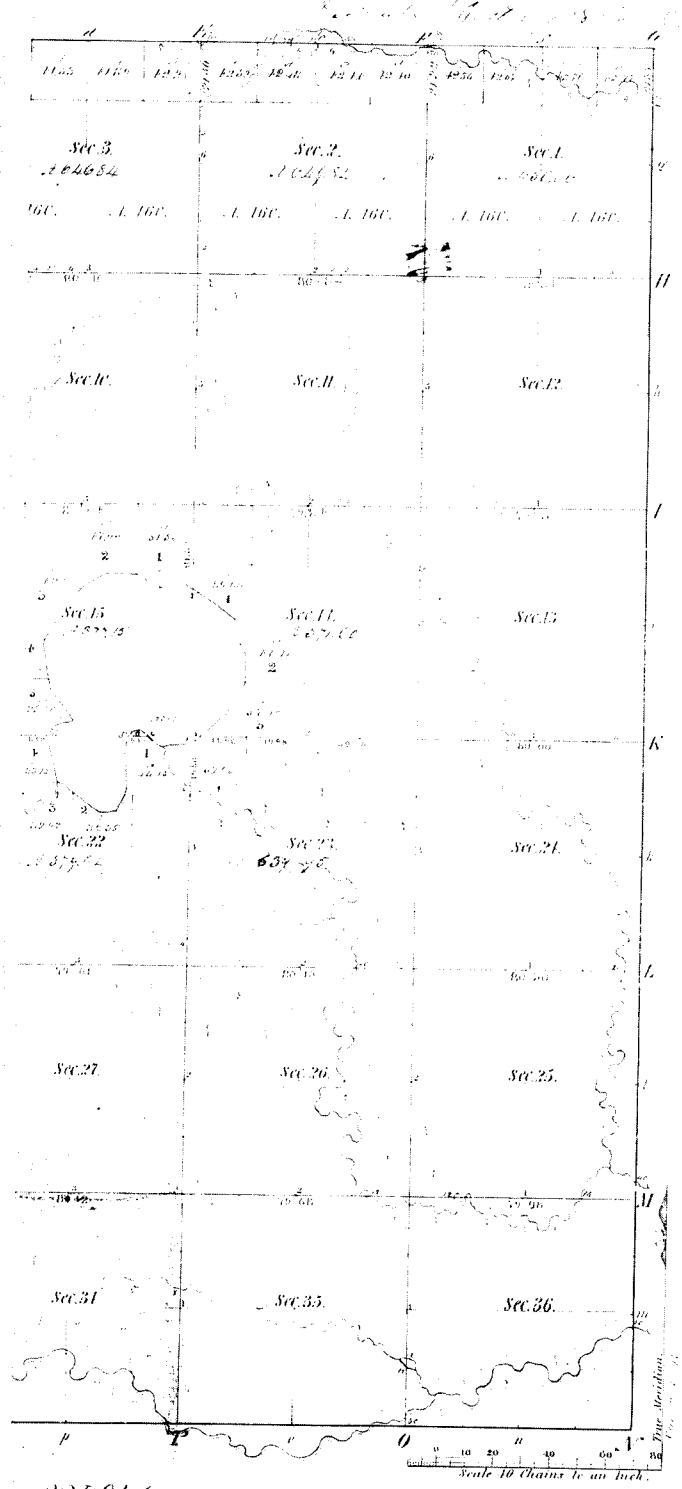


Figure 50. T.22N., R.2E., Michigan. Plat Approved July 28, 1846.

No. 2 E. Mer: Mich.



Meanders

Posts	Courses	Ch.s Lk.s	Posts	Courses	Ch.s Lk.s	Posts	Courses	Ch.s Lk.s

...s. 22791.60

	When p.d for and ch.d in the Sur.r Gen.l's acc.t
3	
46	

The above Map of Township No. 22 North of Range No. 2 East of the Principal Meridian Michigan is strictly conformable to the field notes of the survey thereof on file in this Office, which have been examined and approved.

Surveyor General's Office.
Detroit July 18th 1846

Lucius Lyon, Sur.r Gen.l

PLAT
OF
SEC. 15, T. 22 N. R. 2 E. MICH. MER.
Michigan.

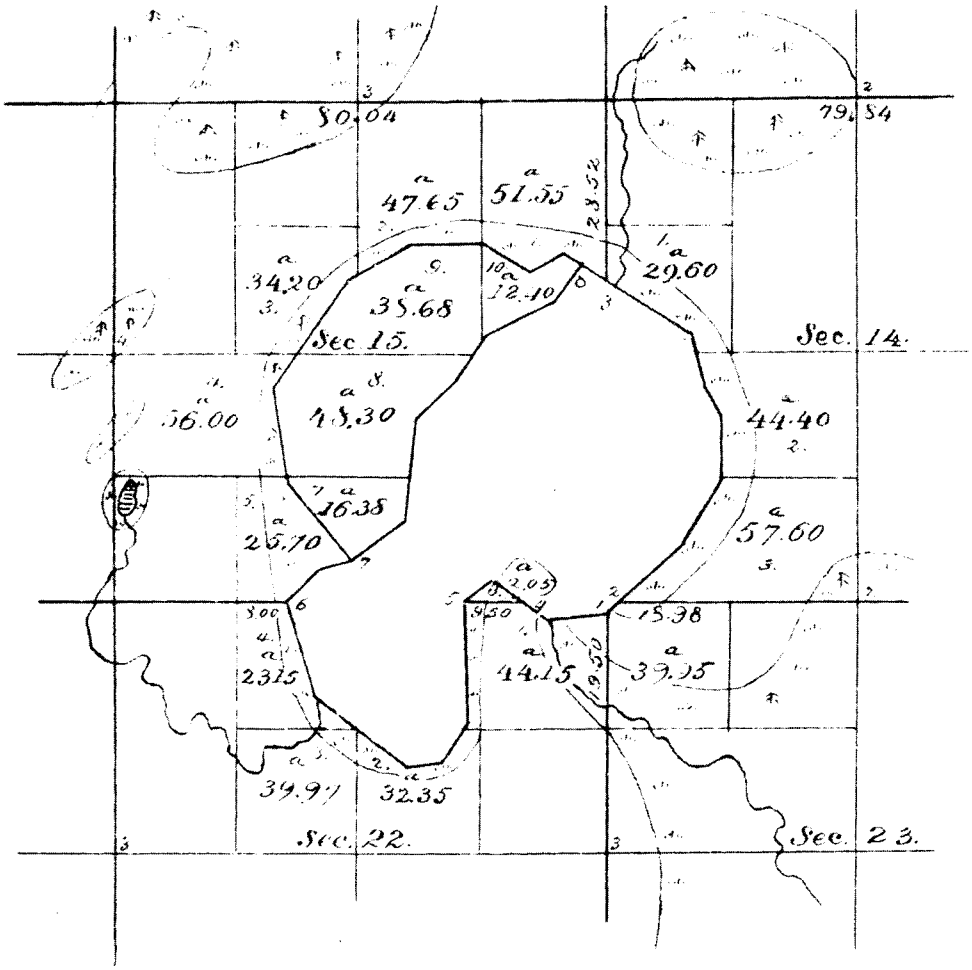


Figure 51. T.22N., R.2E., Michigan. Survey of Omitted Lands — 1883.

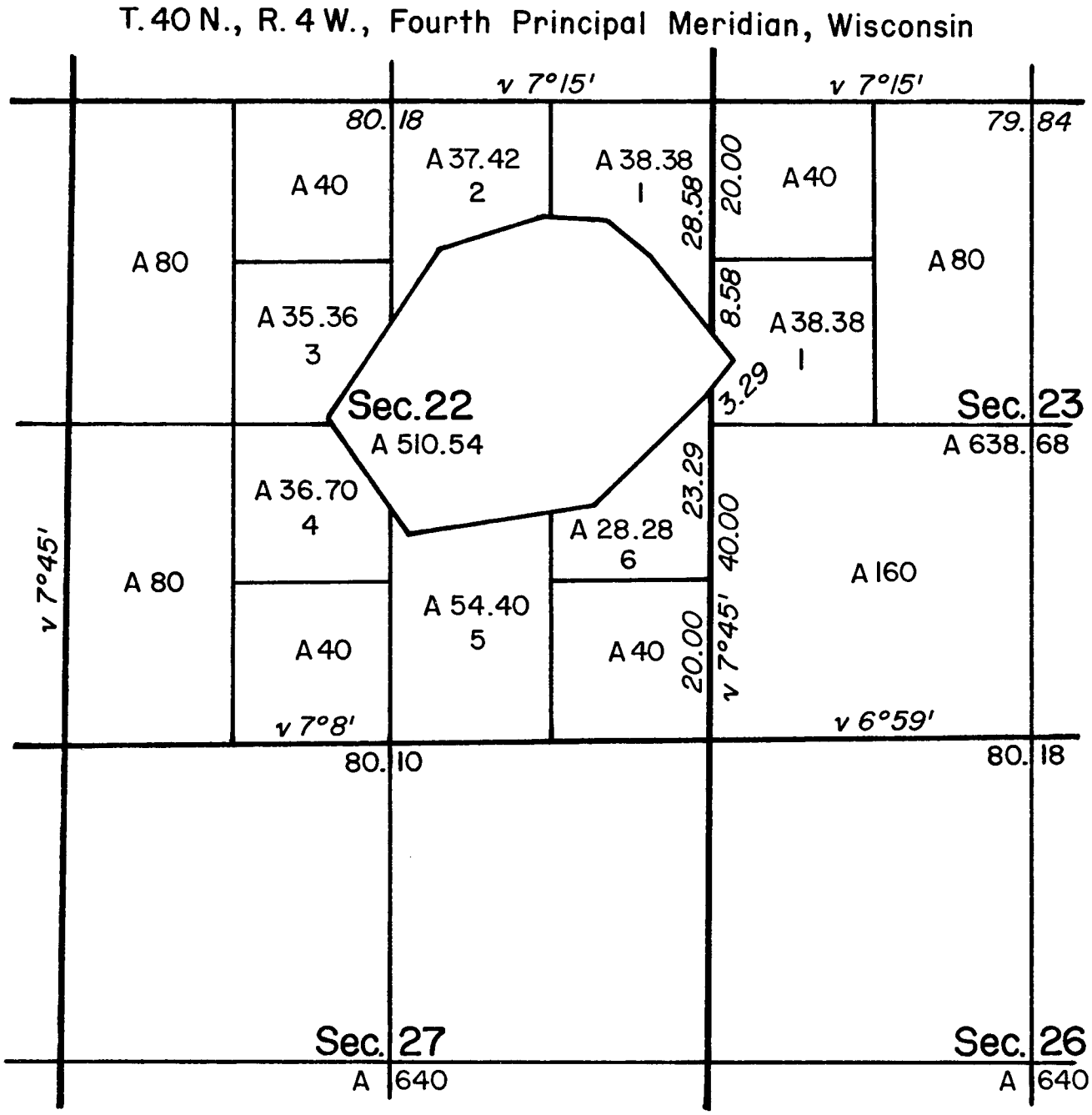
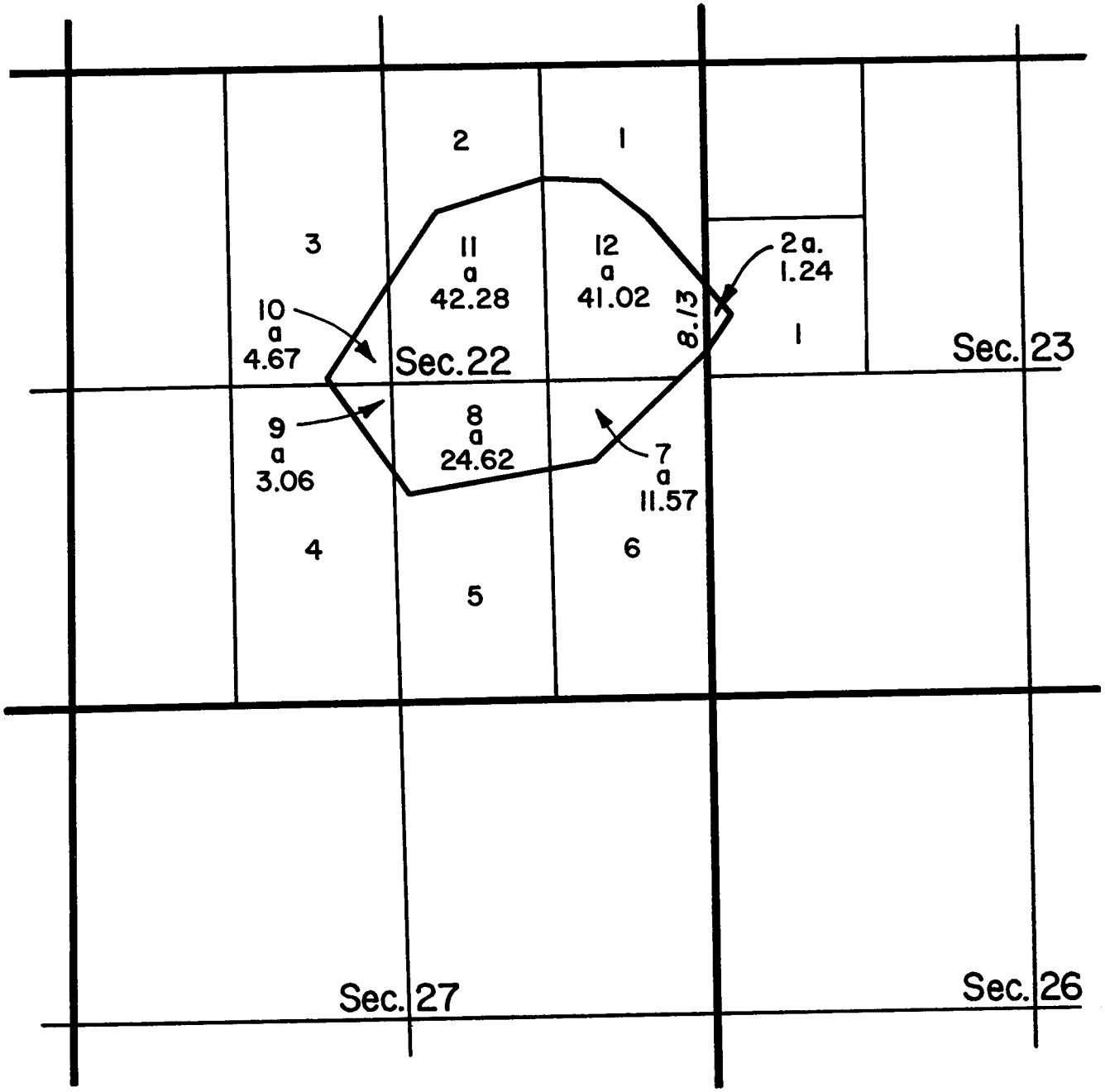


Figure 52. Portion of Original Plat. Approved Feb. 14, 1859.

T.40 N., R.4 W., Fourth Principal Meridian, Wisconsin



tained settlers on patented lands, so anyone can visualize the complaints that could have arisen, but no evidence was found that they did.

On September 6, 1883, McFarland rejected applications for survey and entry on large areas of omitted lands bordering meandered lakes in Florida. He said they were large in area, high and dry, but "under present circumstances" he would not permit the survey of them.

At 2 a.m., Wednesday, September 12, 1883, the Surveyor General's office in Olympia, Washington, burst into flame and burned; none of the plats, field notes and records were saved. The fire department deduced that the cause was a smoldering cigar butt thrown into a waste basket or trash can, which finally burst into flame and destroyed the building. The warning to Tilton about fire protection when he took office in 1854 had not included cigar butts! All the field notes and plats were replaced over the next few years from the Washington, D.C., copies. The only records irretrievably lost were internal records and the field notes of surveys just brought in from the field and in the process of being copied and platted, which had to be done over. As a result, the Washington field notes are all in legal sized books.

On December 13, 1883, in reply to Surveyor General Malachi Martin of Florida, McFarland refused to consider a survey of a reported hiatus between Tps. 19 S., Rs. 21 and 22 E. Martin reported two separate township lines were monumented on the ground. McFarland said the plats and field notes called for only one line and therefore there could be no hiatus. The naivete with regard to hiatuses would last another 15 years.

In the *1883 Annual Report,* McFarland asked for a general authority to execute resurveys and recommended establishing a civil government in Alaska. He also asked that fire extinguishers be supplied to all Surveyors General and that their offices be equipped with fireproof vaults.

The *Act of March 13, 1884,* 23 Stat. 4, established the standard time of the 75th Meridian as the standard time to be used in Washington, D.C. The railroads had already gone to a standard time system and this action recognized the standard time by the government; in a few years it prevailed throughout the country. This system was a real help to the surveyors in timing their observations and regulating their clocks.

On April 30, 1884, *Special Instructions* were issued to Henry Hackbush for the resurvey of seven townships and parts of two other townships in Kansas. Unlike the previous contract, Hackbush was to dependently resurvey these townships, accept all found corners, and restore lost corners in accordance with the *Circular of March 13, 1883.* Nearly identical instructions went to William Tweeddale, Topeka, Kansas on May 9, 1884, who was to restore all township boundaries and dependently resurvey the subdivisional lines in 16 townships. If he found no corners at all within a township, he was to subdivide that township as though it were an original survey. Tweeddale interpreted that provision very liberally and actually did original surveys within townships that really did have original corners in them. The residents complained, an examiner was sent out who found Tweeddale's work improper in many places, and the corrections of the work dragged on for several years.

The *Act of May 17, 1884,* 23 Stat. 24, established a civil government in the District of Alaska and a Land Office at Sitka. No provision was made for surveys, but U.S. Marshal Munson C. Hillyer was made ex officio Surveyor General with his office at Sitka. The mining laws were also extended to Alaska in pursurance with this act.

The following Circular letter was sent to all Surveyors General on May 31, 1884:

CIRCULAR

Department of the Interior
General Land Office
Washington D.C., May 31, 1884

Sir:

This office has received information that it is the practice of Deputy Surveyors to furnish, for a compensation, copies of their plats and notes to settlers and others, who apply for them in advance of their approval by the Surveyor General and acceptance by this office.

The practice is *objectionable* and you are hereby directed to notify all Deputy Surveyors in your district that in the future they must not furnish plats or field notes to any parties whatever, prior to the final acceptance of their surveys by this office.

Approved
H.M. Teller
31 May 1884 Secretary

Very Respectfully
N. C. McFarland
Commissioner

As far as is known, that Circular has never been rescinded. No cadastral engineer could for any reason give to anyone any information regarding a survey being made, which irritated many local and County Surveyors who wanted information, and the request was refused. Over the years, there was a relaxation of this regulation and the office would furnish a limited amount of information, always stamped "Unofficial Records." Since passage of the *Freedom of Information Act* in 1973, more relaxation of this Circular has been made.

The *Act of July 5, 1884,* 23 Stat. 103, placed all of the abandoned military reservations under the Secretary of the Interior and provided for the survey and disposal of those lands. Surveying abandoned military reservations would become a heavy workload for the surveyors in ensuing years. The *Act of February 24, 1871,* 16 Stat. 430, had provided for the survey of certain military reservations in the West; with the 1884 act, all surveys were to be handled by the GLO.

The *Civil Appropriations Act of July 7, 1884,* 23 Stat. 194, provided $5,000 for the purchase of iron posts to be used to monument survey corners on nontimbered lands; $50,000 was provided for examinations of surveys and $300,000 for surveys, not to exceed $9, $7 and $5 in ordinary country, and $13, $11 and $7, in heavily timbered and brushy country; $75,000 was appropriated for timber protection and $10,000 for resurveys.

In the *Annual Instructions* dated July 25, 1884, McFarland made some significant changes:

(1) The $50,000 for examinations would be expended by the Commissioner only.
(2) All resurveys would be made under contract with the Commissioner.
(3) The iron posts would be distributed as the Commissioner saw fit, but would be used at all mineral monuments established in the future.
(4) Both banks of all non-navigable streams, three chains, or

greater in right angle width would be meandered. Those already meandered on only one bank would have the areas of lots abutting them calculated on the basis of a uniform width.

(5) Slope chaining would be adopted in steep terrain, with the slope angle determined by the vertical arc of the surveying instrument, and reduced to horizontal with the tables provided (sets of tables were sent).

(6) The angle and elevation of all slopes over 3° would be given in the field notes.

(7) All improvements and lines of occupation of non-reservation Indians would be noted and entered in the field notes.

(8) No deputy could be given a contract for both the subdivisions and the exterior boundaries of a given township. If he did the exteriors, he could not have a contract for the interiors and vice-versa.

On March 26, 1885, William A. J. Sparks, an attorney, was appointed Commissioner of the GLO; he resigned November 17, 1887.

In his *Annual Instructions* of September 15, 1885, Sparks directed that in the future, all survey contracts would be examined; any found faulty would be rejected until corrected in every respect. The $15,000 appropriation for resurveys would be used only with his express permission. Retracements of old lines to effect a closure would not be paid for because that work was a necessary part of any contract. The result was that many retracements were just a paper job and were never done. When a survey was to be made, an invitation for bids had to be advertised and the contract let to the lowest competent bidder.

In the *1885 Annual Report,* Commissioner Sparks reported that an average of six examiners had been on duty in the field in the previous three years. Many faulty and incomplete surveys were found. To prevent further fraudulent work in the field and acceptance of fictitious surveys by the government, Sparks directed the suspension of all examinations of the plats and field notes in his office on surveys already contracted for and supposedly executed until after the surveys were examined in the field. Some of the surveys were later cancelled and some that had been suspended, were never officially cancelled or reinstated. In any case, the examination program did not completely eliminate fictitious or fraudulent surveys, though they were reduced. The Surveyor General of Washington reported on bad surveys found in his district and suggested that all surveyors should be government employees paid at a regular salary. This Annual Report contains a lengthy report on the fraudulent surveys, how the frauds worked, and reports on land frauds.

The *Appropriations Act of 1886* provided only $50,000 for surveys in all the districts, except Nevada, which received $30,000. Appropriations in 1887 were also $50,000. The country was in a depression and the fraudulent survey scandals induced Congress to cut appropriations to the bone. Most States did no original work at all except on Indian reservations. Some resurveys of the fraudulent work were done, but they weren't really resurveys. When a township was found to be fraudulent, the work was done over as an original survey. The rationale was that a survey not done in fact, was not a survey at all. The result was many hiatuses and overlaps.

The *1886 Annual Report* contains long lists of fraudulent, cancelled, and suspended townships. With no work being done, the Surveyor General of Louisiana sent a lengthy report on the bad surveys and ensuing problems in that State. The Surveyor General of Colorado suggested that the USGS (i.e., government employees) should be used to execute the rectangular surveys at the same time they did the topographic mapping, a convincing argument.

The *Act of February 8, 1887,* 24 Stat. 388, is known as the "General Allotment Act of 1887" or "Dawes Act." It provided for patenting of allotments to Indians either living on or off a reservation. In all probability, most of the Indian allotment patents were made under the provisions of this act.

The survey of most of the Indian reservation boundaries had been made by surveyors under contract with the Surveyors General, beginning with Ludlow's survey of the Greenville Treaty boundary in 1797.

The *Act of April 8, 1864,* had placed the survey of Indian lands under the GLO. Each Indian treaty, Presidential Proclamation, Executive Order, or resolution pertaining to the lands of specific Indian tribes, might have contained some provision for the survey and the division of those lands, and now patent to individual Indians. For example, an Executive Order issued by President Grover Cleveland on May 1, 1886 reads as follows:

> "It is hereby ordered that all that portion of country in Washington Territory, withdrawn from sale and settlement, and set apart for the permanent use and occupancy of Chief Moses and his people, and such other friendly Indians as might elect to settle thereon, with his consent and that of the Secretary of the Interior, by Executive Orders dated April 19, 1879 and March 8, 1880, respectively, and not restored to the public domain by Executive Order, dated February 23, 1883, be, and the same is, hereby, restored to the public domain, subject to the limitations, as to disposition, imposed by the act of Congress, approved July 4, 1884, (23 Stat. pages 79 and 80) ratifying and confirming the agreement entered into July 7, 1883, between the Secretary of the Interior, and the Commissioner of Indian Affairs, and Chief Moses and other Indians of the Columbia and Colville Reservations, in Washington Territory.
>
> And it is hereby further ordered that the tracts of land in Washington Territory, surveyed for and alloted to Sar-sarp-kin, and other Indians, in accordance with the provisions of said act of July 4, 1884, which allotments were approved by the Acting Secretary of the Interior, April 12, 1886, be and the same are hereby set apart for the exclusive use and occupation of said Indians; the field notes of said allotments being as follows:"

The field notes of 20 or more allotments were then given. This Executive Order is the sole known source of the field notes of these allotments; most of which were for rectangular tracts, about 160 acres in area, lying in all directions and in no way conforming to the rectangular surveys. It isn't known who surveyed the allotments nor when, but they were shown on the rectangular survey plats and the sections around them were lotted in fractional lottings when the rectangular surveys were extended through the area.

There are innumerable instances of individual Indian allotments surveyed in this manner. Most were surveyed by the GLO, but many were surveyed by land surveyors under the direction of the Commissioner of Indian Affairs.

Most of the Indian reservations in the West were surveyed into townships and sections, following the 1864 act. Many of those were subdivided into 20-acre or 40-acre allotments by subdividing the sections containing agricultural lands or at least lands that were thought fit to be farmed. Those subdivision of section surveys did not follow the present legal method of subdividing a section. Most sections were subdivided by establishing the north and south one-sixteenth section corners on the east and west boundaries of the section at midpoint between the quarter corners and section corners. The sixteenth section corners were called "⅛ corners." The sixty-fourth and one-sixteenth corners on the north and south boundaries of the section (called "⅛ and 1/32" corners) were established in a similar manner, i.e., at equidistant positions. The section would then be subdivided by running a true line from the north sixteenth corner on one section line to the north sixteenth corner on the opposite section line, establishing the "⅛ and 1/32" corners at equidistant positions. The same process was used on the east and west centerline between quarter corners and on the south sixteenth section line. The 20-acre allotments were numbered 1 to 32, with number 1 in the northeast corner and 32 in the southeast corner of the section. This procedure has previously been referred to as the Three Mile Method (see Fig. 47).

Sometimes the centerlines of the sections would be surveyed properly and then the quarter sections subdivided in the manner described. Unless the section was a perfect square, with all quarter section corners exactly at midpoint and on a line between section corners, this procedure would not result in a legal subdivision of the section.

Remember that these surveys usually resulted in a technically correct procedure. Boundary lines based on these subdivisions and monuments are just as binding on all parties as are other monuments of an officially approved survey; however, exceptions might be made. For example, assume a section was subdivided into allotments, but for some reason the whole northeast quarter was patented as the "NE ¼ of section 10" (ignoring the allotments 1-4 and 13-16) and the remainder of the section was patented by allotment numbers. Later, the "NE ¼ NE ¼ of section 10", is reacquired by the government. Would the three allotment corners within the northeast quarter control the reconveyance? They would not because they were not used in the original patent nor in describing the reconveyance. But the allotment corners on the exteriors of the whole northeast quarter would control the boundaries of that quarter section and its legal subdivisions. Of course, much would depend upon the method, order, description, and chain of title within and around the section. No general rule could be advanced; each section must be dealt with on an individual basis. In fact many allotments were surveyed by the Indian Service (later the BIA) and the BLM has no record of them. Much of the *Dawes Act* is now codified in *25 U.S.C. 331,* et seq.

On June 2, 1887, Sparks issued a new Circular on the proper method of subdivision of sections, which was a slight expansion of the *Circular of November 1, 1879,* and eliminated the improper restoration of lost corners given in the latter Circular.

On August 9, 1887, Deputy Mineral Surveyor George W. Garside, a Deputy Surveyor in Nevada who went to Juneau because of the depression and lack of work, surveyed the Aurora Lode, Mineral Survey No. 41, near Juneau, Alaska. This survey was approved by Barton Atkins, ex officio Surveyor General of Alaska, on September 9, 1887, and was the first official survey approved in Alaska.

On October 12, 1887, *Special Instructions* were issued to Henry Hackbush for the survey and subdivisions of the Ottowa and Modoc Indian Reservations in the Indian Territory. The Ottawa Reservation was surveyed into allotments by the Three Mile Method. The Modoc Reservation was subdivided into 24-acre allotments, each 20 chains east and west by 12 chains north and south.

No appropriation was made in 1886 for the Surveyor General of Nebraska for the fiscal year 1886–1887. The office was closed the end of June 1886 and the records stored in Lincoln until legislation was passed by the State for their safekeeping.

On March 27, 1888, Strother M. Stockslager, an attorney, was appointed Commissioner of the GLO.

On February 6, 1889, in a letter to Calhoun Fluker, Surveyor General of Louisiana, Stockslager directed that the distances to bearing trees should be measured to the centers of the trees, the first mention of this requirement, which was soon incorporated into the *1890 Manual* (then in preparation). Prior to this time most of the surveyors used their own judgment or habits in measuring to bearing trees from a corner. Some just guessed the distance, another might measure to the face of the blaze or to a chaining notch cut in the tree between the upper and lower parts of the blaze or at the bottom of the lower blaze. Some measured horizontal distance, others the slope distance; there were no consistent rules. The *1890 Manual* would also require that Arabic numbers be used. Some surveyors did not have timber scribes which were constructed for making circular scribing and therefore used Roman numerals in scribing trees.

The *Act of February 22, 1889,* 25 Stat. 676, divided the Dakota Territory into North and South Dakota and enabled those two territories and the Montana and Washington Territories to become States. North and South Dakota were admitted to the Union on November 2, 1889, Montana on November 8, and Washington on November 11, 1889, all with their present boundaries. In just ten days, the country had gained four new States.

By the *Act of March 1, 1889,* 25 Stat. 735, the Muscogee and Creek Indians in the Indian Territory ceded over three million acres to the United States. By the *Appropriations Act of March 2, 1889,* 25 Stat. 1004, the Seminole Indians ceded over two million acres. By Presidential Proclamation on March 23, 1889, those lands were declared open to settlement effective 12 o'clock noon, April 22, 1889. Two land offices were opened in preparation, one at Guthrie, the other at King Fisher Stage Station. People lined up for miles. On the opening gun at noon on April 22 thousands rushed to stake and lay claim to a quarter section of land, town lots, etc. This was the first and largest of several Oklahoma Land Rushes, lands that had been all previously surveyed.

By the *Act of March 2, 1889,* 25 Stat. 854, Congress withdrew all of the public lands (except in Missouri and a few other exceptions) from further private entry.

By the end of 1889, the Commissioner of the GLO was practically running the "Surveying Service," telling the Surveyors General what to do and when. By early 1890, a diagram showing the surveys to be executed had to be included with every set of *Special Instructions* issued.

On September 16, 1889, Lewis A. Groff, a former judge, was appointed Commissioner of the GLO.

On January 1, 1890, the *Manual of Surveying Instructions, 1890,* was officially issued. The new Manual updated and revised the 1881 issue and required the use of a solar instrument on all major survey lines. The *Act of October 1, 1890,* 26 Stat. 650, made the new Manual part of every contract by law. This Manual is quite an improvement over the *1881 Manual* but contained some insignificant errata. The lists of errata were sent to the Surveyors General, along with a copy of a corrected Manual on October 2, 1890.

The *Act of April 10, 1890,* 26 Stat. 53, authorized the appointment of a Surveyor General in both North and South Dakota. Erastus S. Williams was appointed Surveyor General of North Dakota and opened his office in Bismark on July 16, 1890. The Dakota office in Huron, under Boetius H. Sullivan, became the office of Surveyor General of South Dakota.

The *Act of May 2, 1890,* 26 Stat. 81, created the territory of Oklahoma, which included the Public Land Strip (Cimarron Meridian surveys) but not the Indian Territory. An unusual feature of this act was that it reserved a roadway, four rods wide, along every section line in the territory. The public lands in the territory were also opened to entry. Another item of interest is that the Registrar and Receivers in some of the Oklahoma land offices issued patents for diagonal quarter sections. Instead of the "east half" or "west half" of a quarter, they were issued for the "diagonal NE ½ of the NE ¼ of section ____, containing 80 acres." The southwest boundary of such patent would run from the north quarter corner to the east quarter corner of the section. It is unknown why the patents were issued in that manner.

The *Act of July 3, 1890,* 26 Stat. 215, admitted the State of Idaho to the Union.

On *July 10, 1890,* 26 Stat. 222, the State of Wyoming was admitted. Colorado and Wyoming are the only two States whose boundaries are entirely described by lines of longitude and parallels of latitude, the same number of degrees in each. Colorado contains 104,247 square miles, whereas Wyoming contains 97,914 square miles, which shows the effect of convergency of meridians. The two States are the only ones which are laid out similar to the original plan put forth by Thomas Jefferson.

The *Appropriations Act of July 11, 1890,* 26 Stat. 228, at 261-262, provided funds for Surveyors General in 16 States and territories, which were Arizona, California, Colorado, North Dakota, South Dakota, Minnesota, Florida, Idaho, Louisiana, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

The *Act of August 30, 1890,* 26 Stat. 391, made a reservation of right-of-way for ditches and canals on all lands west of the One Hundredth Meridian. All patents for public lands west of that meridian issued subsequent to this act contain a reservation for ditches and canals, to provide for irrigation.

The *Act of September 25, 1890,* 26 Stat. 467, directed the Secretary of the Interior to have surveyed the Seventh Standard Parallel North of the Fifth Principal Meridian, which was the State boundary between North and South Dakota. Thus, a line of the regular rectangular survey system again became a State boundary and was surveyed in 1891 and 1892 by Charles H. Bates. The line was monumented with quarried stones, 7 feet long, 10 inches square, set halfway into the ground.

The *Act of October 1, 1890,* 26 Stat. 650, set aside and established Forest Reserves in the State of California. These first reserves were placed under the authority of the Secretary of the Interior as were the reserves to follow, the beginning of what would become the National Forests.

The *Act of March 3, 1891,* 26 Stat. 854, provided for the survey of Small Holding Claims in New Mexico and Arizona, which did not follow the rectangular system and were surveyed as numbered metes and bounds tracts, somewhat similar to any other private claim.

The *Act of March 3, 1891,* 26 Stat. 1095, repealed the old timber culture laws and amended the *Desert Land Act of March 3, 1877.* It required irrigation before patent could be issued on desert homesteads and also repealed the preemption laws, stopped the sale of public lands at public sale (except military reservations and other lands of a special nature), provided for Trustee Townsites in Alaska, provided for Trade and Manufacturing sites in Alaska, withdrew the coal lands and other lands containing precious metals (except mining claims), and native lands in Alaska from entry. Sec. 18 to 21 of the act grants rights-of-way for ditches, canals, and reservoirs on the public lands. Plats of these rights-of-way had to be filed with the land office, showing the locations. These plats are frequently incorrect and do cause some problems when the sections are resurveyed. Sec. 24 of the act provides that the President may set aside Forest Reserves by Presidential Proclamation.

The first Forest Reserve set aside by President Benjamin Harrison was in Wyoming by proclamatin dated *March 30, 1891,* 26 Stat. 1565. It adjoins Yellowstone National Park. Harrison subsequently reserved over 13 million acres of forest lands by proclamation in 1891 and 1892, all in the States and territories west of the Mississippi River. All of the Forest Reserves were under the Secretary of the Interior and in turn the GLO.

Later administrations reserved many more millions of acres. President Grover Cleveland withdrew nearly 27 million acres, McKinley seven million, and President Theodore Roosevelt withdrew over 18 million acres for forests.

On March 31, 1891, Thomas H. Carter was appointed Commissioner of the GLO.

Between October 26 and November 7, 1891, Charles W. Garside, Deputy Surveyor, surveyed a Trade and Manufacturing Site claimed by the Alaska Oil and Guano Company on Kenasnow Island (now Killisnoo Island) south of Angoon, Alaska. This claim was designated "U.S. Survey No. 5," and was the first of the Alaska Special Surveys now commonly referred to as "U.S. Surveys." It was approved by Orville T. Porter, ex officio Surveyor General of Alaska in November 1892 and was accepted April 23, 1893.

Between April 11 and June 2, 1892, George W. Garside, Deputy Surveyor, surveyed the Juneau Townsite, designated

"U.S. Survey No. 7." That special survey was also approved by Porter in November 1892 but was accepted on February 14, 1893. Therefore, U.S. Survey No. 5 was the first U.S. survey executed on the ground, but the Juneau Townsite was the first of these special surveys to become officially accepted by the Commissioner of the GLO. These metes and bounds surveys of isolated tracts, designated as "U.S. Surveys," in a serial numbering system, are used only in Alaska.

On October 7, 1892, Acting Commissioner William M. Stone, in a letter to the Surveyor General of Minnesota, rejected applications for the survey of omitted lands bordering Cedar Island Lake or Ely Lake in T. 57 N., R. 17 W., Fourth Principal Meridian. The original survey had been made by Henry S. Howe in 1876 and the plat approved August 7, 1876. The meanders of the lake were grossly in error or fraudulent. The omitted lands contained about 1,000 acres, high above the actual shore of the lake (which was not relicted). Stone cited *Hardin vs. Jordan* and *John P. Hoel,* 13 L.D. 511, 588 (a relicted lake case) as basis for his rejection of the application, made by G. A. Burns and others.

Burns appealed Stone's decision to the Secretary of the Interior who reversed the Commissioner's decision on January 19, 1895; *G. A. Burns,* et al, 20 L.D. 28. On October 31, 1895, Commissioner Silas W. Lamoreaux ordered the Surveyor General to have the survey made. That order was appealed by the upland owners on the basis of riparian rights. Their appeal was denied *October 29, 1896,* 23 L.D. 430. A contract was given to Thomas H. Croswell for the survey. The upland owners got an injunction halting the survey. The matter went through the courts and the decision of the Secretary in favor of Burns was eventually upheld. The survey was finally made by Edward L. Faison, Examiner of Surveys, in 1903 and 1904. The plat was approved by Eli S. Warner, Surveyor General of Minnesota, on June 29, 1905, nearly 13 years after the case first began. The plats of this survey are shown in Figs. 54 and 55.

On November 18, 1892, William M. Stone became Commissioner. Five months later, on March 28, 1893, Silas M. Lamoreaux was appointed Commissioner of the GLO.

The *1892 Annual Report* lists thousands of Indian allotment patents. The USGS selection of sites for reservoirs and irrigation ditches was far advanced. A Surveyor General was urgently needed in Alaska. Steel tapes, 66 feet (one chain) in length, were being used on the public land surveys.

On April 27, 1893, a *Circular* was issued which flatly prohibited any deputy from being an examiner of surveys. If money was allocated to a Surveyor General for examinations, the work had to be executed by a special examiner, the Surveyor General, or a clerk from his office.

In the *1893 Annual Report,* the Surveyor General of California strongly warned against resurveys of townships in which the lands were already patented. The first Annual Report of the ex officio Surveyor General of Alaska, Orville T. Porter, was also printed; most of the work in Alaska was mining claim surveys.

The 1894 *Manual of Surveying Instructions* was officially issued on June 30, 1894. The most notable revision in the procedures made in this manual was the elimination of the magnetic needle in the execution of the rectangular land surveys. The 1894 Manual was made part of every contract by the *Act of August 15, 1894,* 28 Stat. 285.

The *Act of July 16, 1894,* 28 Stat. 107, enabled Utah to become a State; it was granted sections 2, 16, 32, 36 in every township for schools and was admitted to the Union on January 4, 1896.

The *Act of August 9, 1894,* 28 Stat. 275, provided for the resurvey of Grant and Hooker counties in the State of Nebraska; $16,000 was appropriated on August 18, 1894, to pay for the work. The enabling act states in part:

> "Provided, That nothing herein contained shall be so construed as to impair the present bona fide claim of any actual occupant of any said lands to the lands so occupied."

These were the first townships surveyed in the manner which is today called an "Independent Resurvey." The work involved 171 miles of standard parallels, 405 miles of township lines, 2,490 miles of section lines and the exterior boundaries of all lands patented. Each owner was requested to point out to the surveyor the corners of his lands, as he knew them to be. The only requirement was that the tract when resurveyed had to be rectangular and could not contain more area than the lands he had patented. If two or more claims conflicted, the owners were asked to resolve their differences. If they couldn't agree, the claims were surveyed and shown in conflict. Each owner's tract was given a number beginning with Tract 37, then Tract 38, and so on. The same number was used only once in a township, nearly identical to the method used in the Donation Land Claim surveys in Oregon during the 1850's. The corners of each tract were monumented, then the township, range and section lines were surveyed, just like an original survey. Closing corners were set at the intersection of any tract boundary and a section line with lottings of the fractional sections against the tracts. The Commissioner was extremely proud of this procedure for it stopped complaints.

The Independent Resurveys of Grant and Hooker counties were completed in 1899. The plat of one township is shown in Fig. 56.

In the *1894 Annual Report,* request was made by both the Secretary of the Interior and Commissioner Lamoreaux that a bill be passed approving the execution of surveys to be made by the USGS or Civil Service employees.

The request was granted by the *Indian Appropriations Act of March 2, 1895,* 28 Stat. 876, in which $200,000 was appropriated for surveys in the Indian Territory by the USGS. These surveys were made in the Seminole, Creek, Choctaw, and Chickasaw lands, along with a topographic survey, starting in April 1895. At first they tried doing topographic work and rectangular surveys simultaneously, but this didn't work out very well. The following year they had separate operations and things went smoothly. Iron post monuments were set at each township corner, with stone monuments at all other corners. These surveys were completed in June 1898 with great success. Plats and field notes were prepared and approved by the Director of the Geological Survey and accepted by the Commissioner about the same as a survey by a Surveyor General would be. There was never a Surveyor General for Oklahoma; all the surveys there were done under the Commissioner.

On January 30, 1895, *Special Instructions* were issued to Josiah Gideon for the survey of a hiatus between Tps. 13 S.,

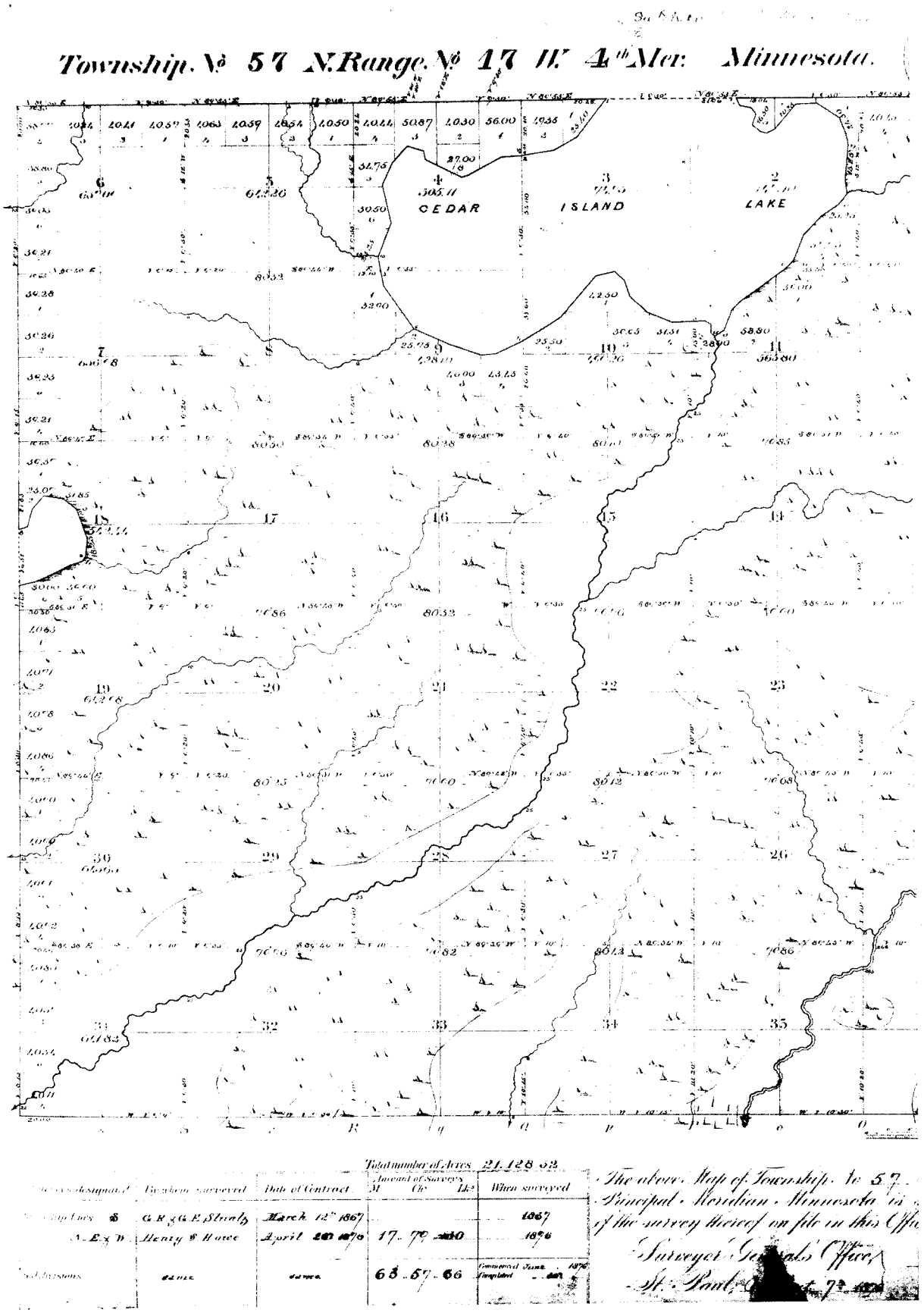
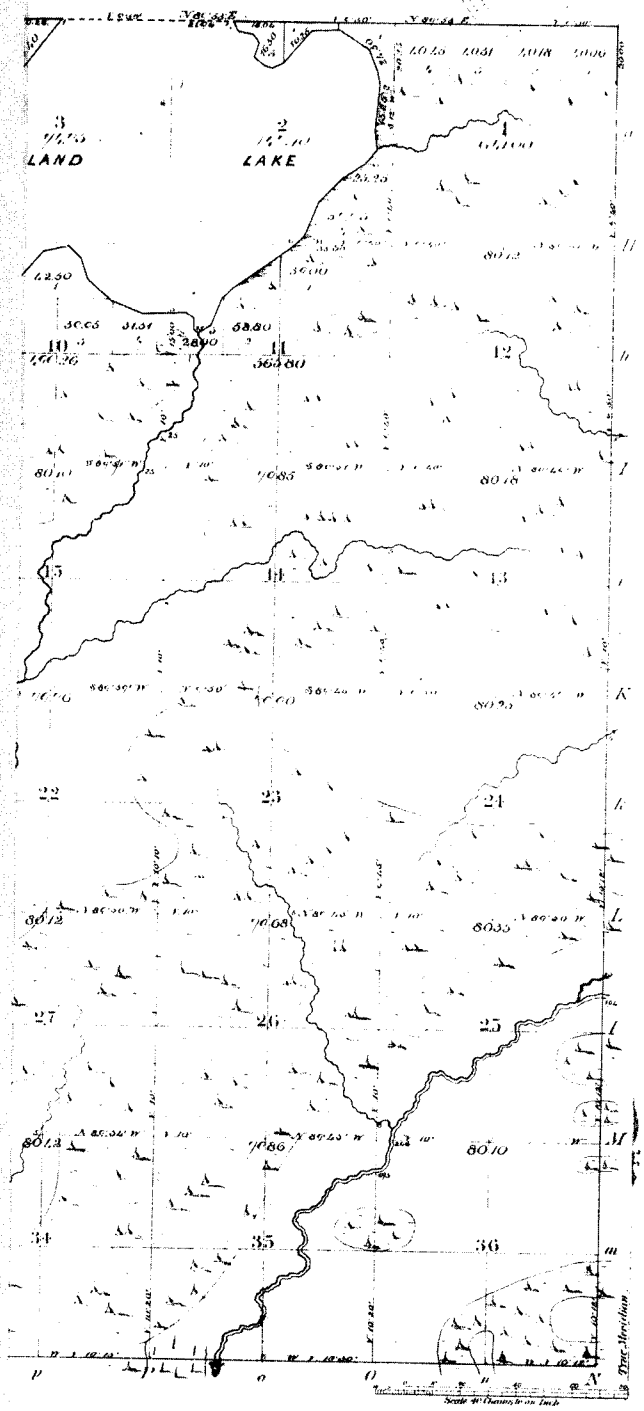


Figure 54. T.57N., R.17W., Minnesota. Cedar Island Lake — Original Plat.

4th Mer: Minnesota.



Meanders

CLEAR ISLAND LAKE

Sec Lines

Sec. 3

S 35½° W	25.00	
S 65° W	15.00	
S 87° W	15.00	

Sec. 4

S 86° W	20.00	
S 65° W	7.00	
S 45° W	6.20	
S 67½° W	21.00	
S 40° W	4.00	
S 75° W	7.50	
S 55° W	10.00	
S 35° W	12.00	
S 15° E	18.00	
S 30° W	17.50	
S 60° E	6.10	

Sec. 5

S 10° E	7.50	
S 50° E	20.00	
S 60° E	20.00	
S 72° E	10.00	
N 85° E	8.00	
N 65° E	15.45	

Sec. 10

N 57° E	20.00	
N 42° E	27.00	
N 75° E	6.00	
S 47° E	6.20	
S 17½° E	8.80	
S 40° E	12.00	
S 68½° E	12.00	
N 88° E	8.70	

Sec. 11

N 88° E	6.25	
S 60° E	2.50	
South	4.00	
S 18° E	2.00	
N 58½° E	5.00	
N 25° E	10.00	
N 44½° E	5.00	
N 55° E	27.00	

Sec. 3

N 44½° E	5.00	
N 22° E	15.00	
N 45° E	12.00	
N 56½° E	10.00	
N 38° E	6.00	
N 72° E	7.00	
N 42° E	17.00	
N 15° W	5.00	
N 22½° W	8.00	
N 58° W	15.00	
S 87½° W	10.00	
S 51° W	15.00	
S 66½° W	3.00	
N 75° W	2.50	
N 52° W	4.00	
N 19½° E	5.00	

LAKE

Sec. 18

N 72° E	4.00	
N 41° E	7.00	
N 24½° E	8.00	
S 61½° E	10.00	
S 47½° E	8.00	
S 20½° E	10.00	
S 4° W	8.00	
S 44° W	2.00	
S 70° W	5.00	
S 65° W	10.00	
S 60° W	5.00	
S 77° W	2.00	

Miscellaneous Lines

Total	8	40	50

The above Map of Township 56 N of Range 15 W of the 4th Principal Meridian Minnesota is strictly conformable to the field notes of the survey thereof on file in this Office which have been examined & approved.

Surveyor Generals Office
St. Paul, Oct. 7th 1872

J. M. Baker
Sur. Genl.

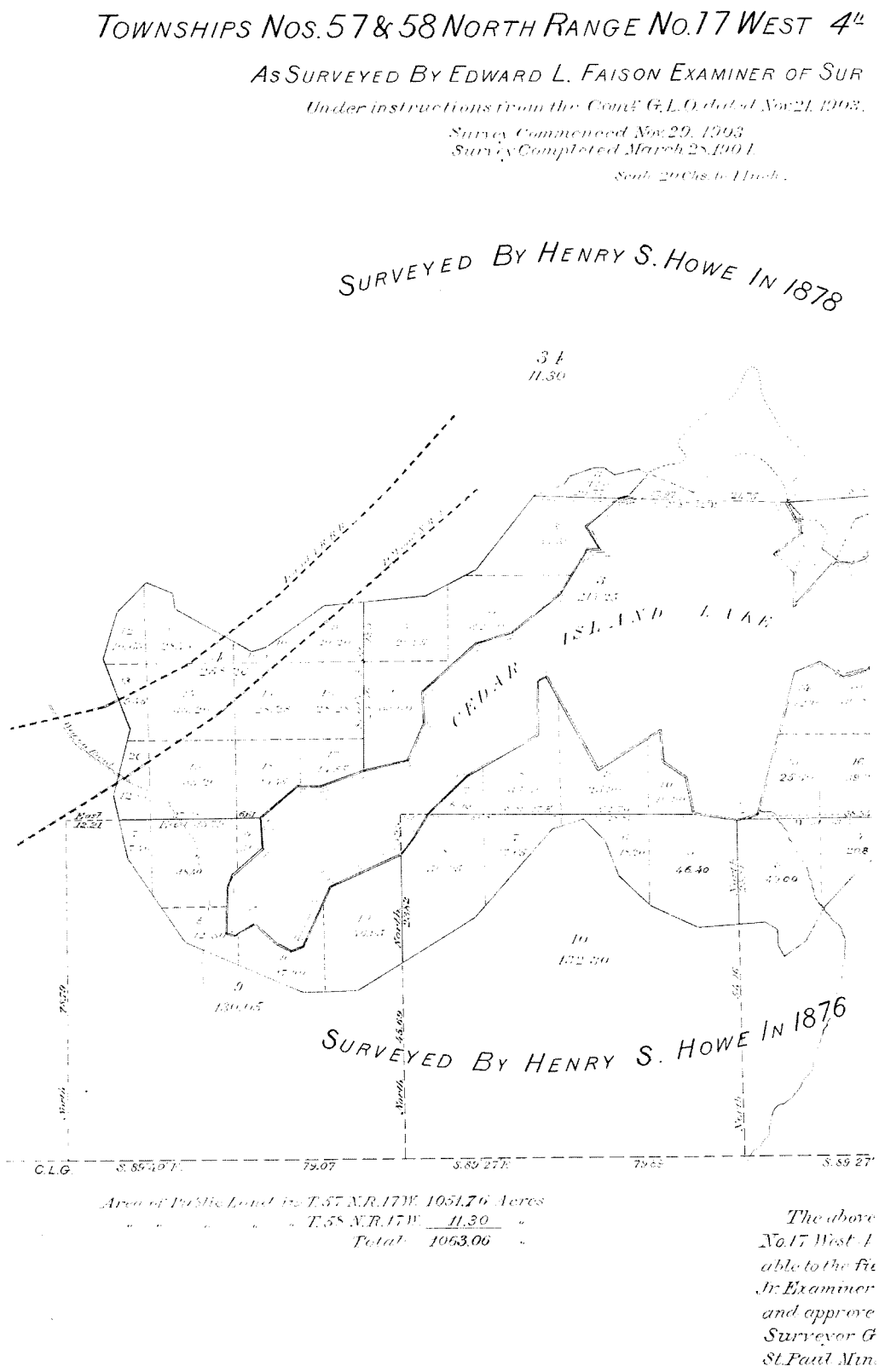


Figure 55. Cedar Island Lake — Omitted Lands Survey.

...H RANGE NO. 17 WEST 4th MER. MINNESOTA.

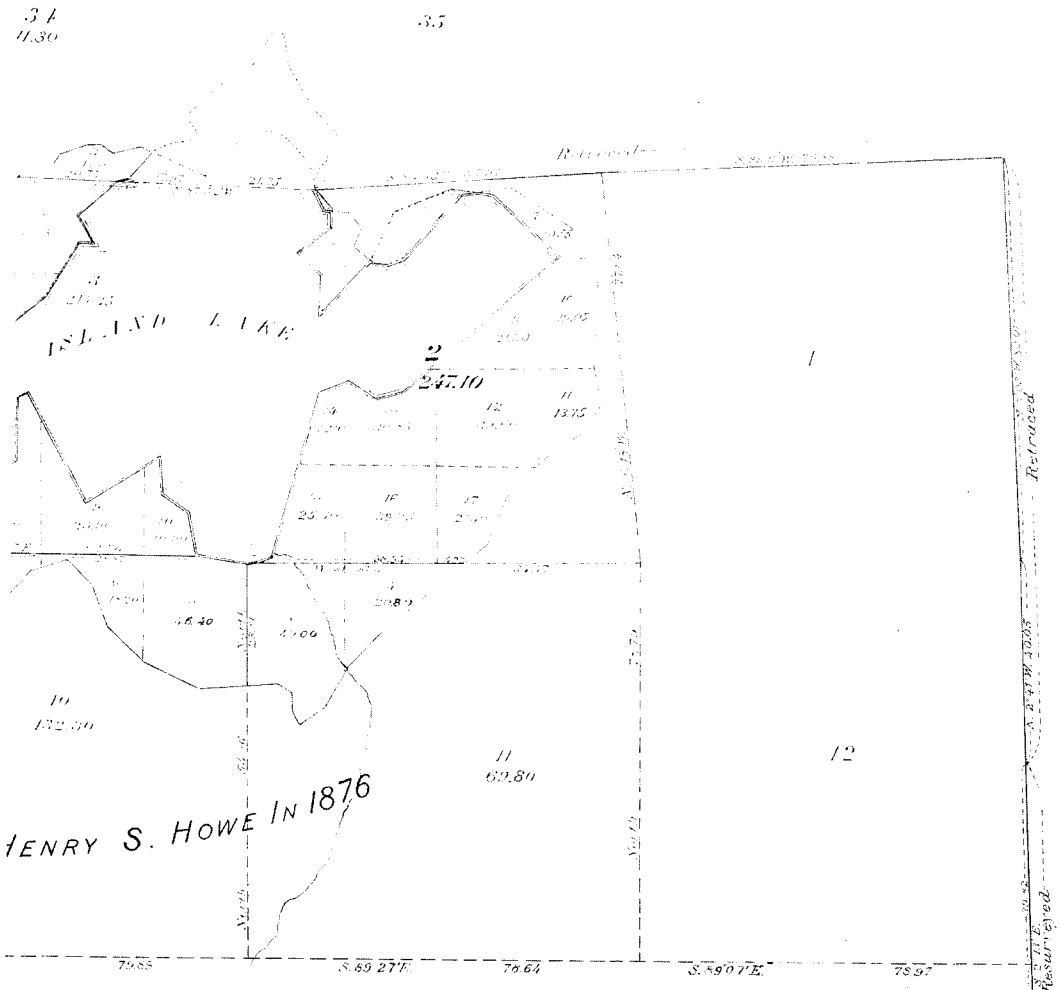
...D L. FAISON EXAMINER OF SURVEYS.

...in the Comr. G.L.O. dated Nov. 21, 1903.

...ommenced Nov. 29, 1903
...ompleted March 28, 1904.

Scale 20 Chs. to 1 Inch.

HENRY S. HOWE IN 1878



HENRY S. HOWE IN 1876

The above Map of part of Townships Nos. 57 and 58 North Range No. 17 West 4th Principal Meridian Minnesota is strictly conformable to the field notes of the survey thereof made by Edward L. Faison Jr. Examiner of Surveys on file in this Office which have been examined and approved.

Surveyor General's Office
St. Paul Minn. June 29th 1905

U.S. Surveyor General.

Posted Aug. 17/05 E.S.

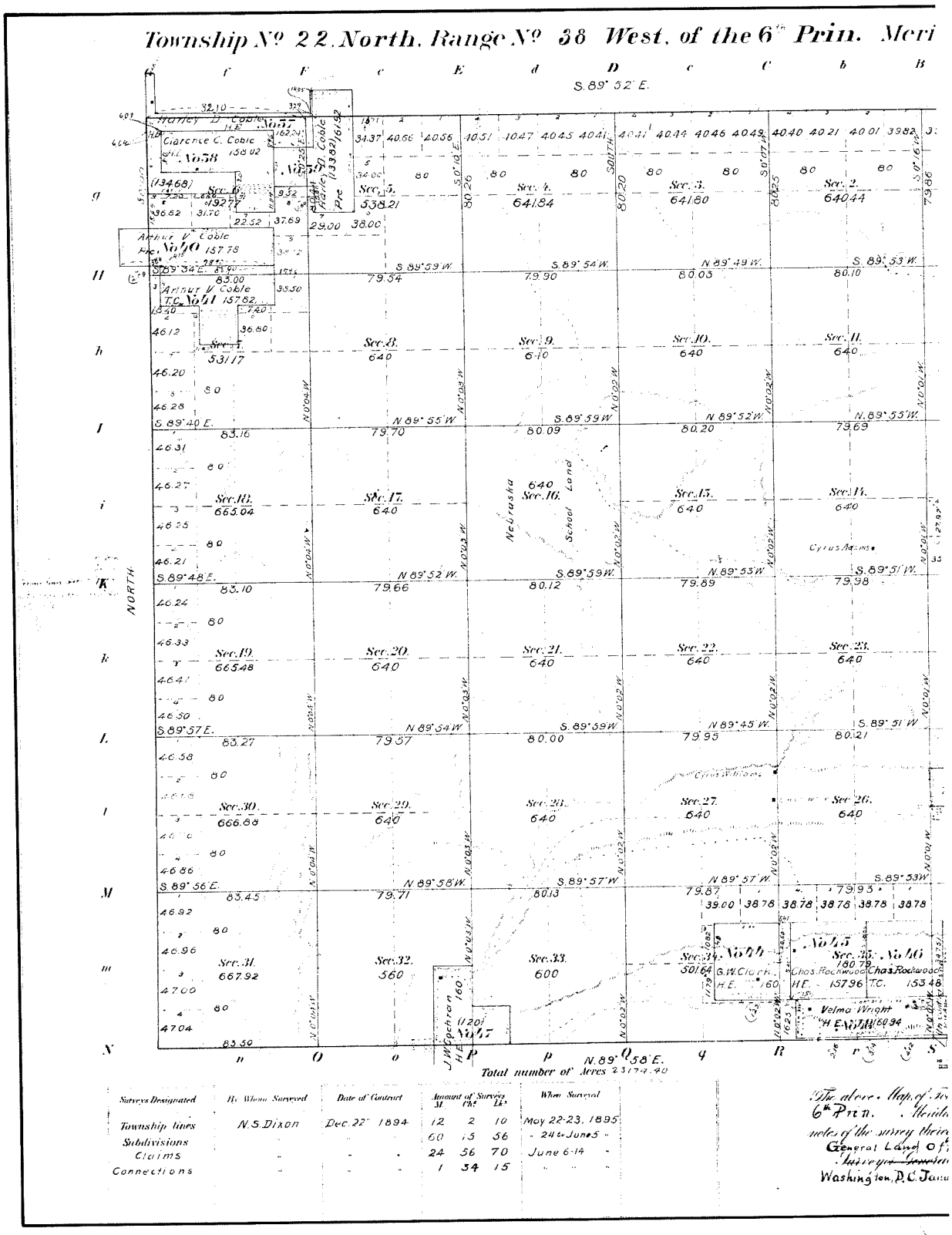
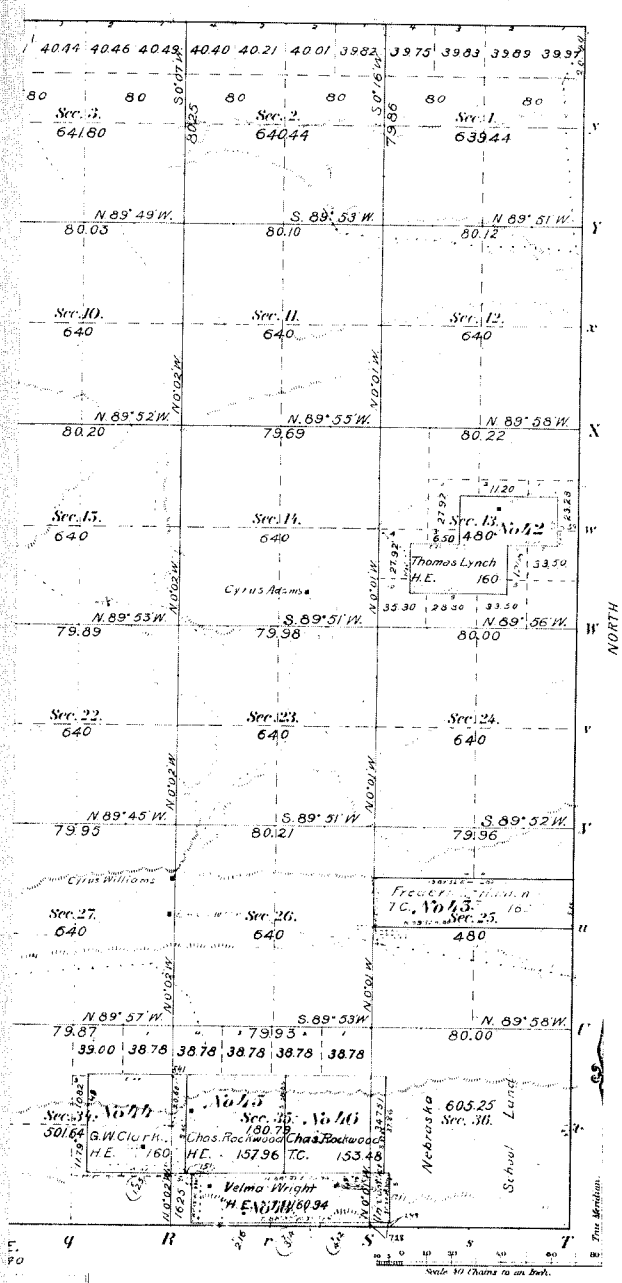


Figure 56. Grant and Hooker Counties, Nebraska. Independent Resurvey.

Report 483, Feb. 10, 1897.

st. of the 6th Prin. Meridian

Recd. with letter from N. S. Dixon, D.S., dated July 11, 1896.
76036
1896.



Meanders of

Posts	Courses	Ch.s Lk.s	Posts	Courses	Ch.s Lk.s	Posts	Courses	Ch.s Lk.s

The above Map of Township No. 22 N. of Range No. 38 W. 6th Prin. Meridian Nebraska is strictly conformable to the field notes of the survey thereof on file in this Office which have been examined and approved.

General Land Office
~~Surveyor General's Office~~
Washington, D.C. January 11, 1897.

Commissioner and Ex officio Sur.r Gen.l

THE NORRIS PETERS CO. LITHO., WASHINGTON, D. C.

Posted March 22, 1897
C. S. M.

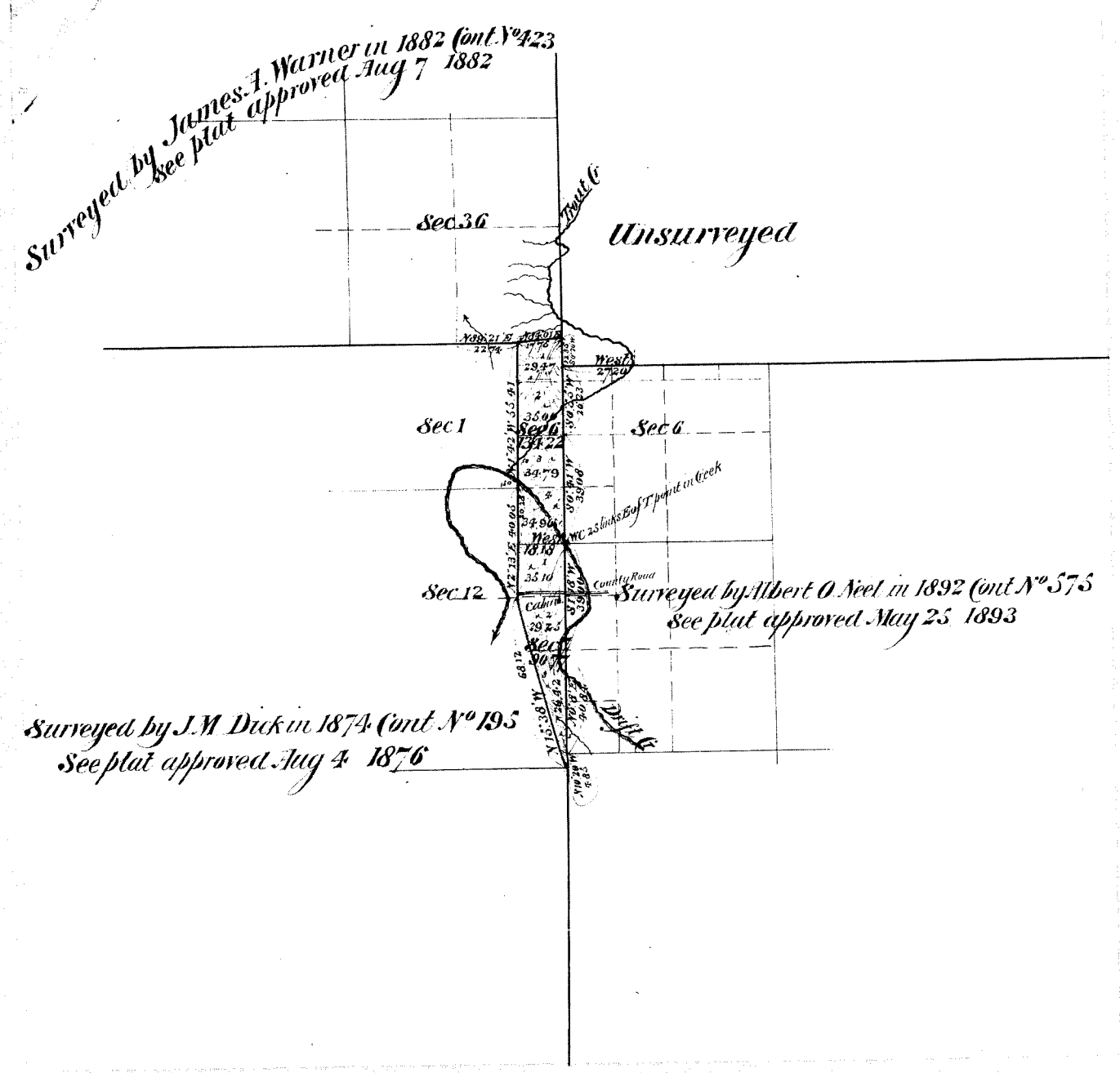


Figure 57. Hiatus T.13S., R.10½W., Willamette Meridian, Oregon. Approved July 14, 1899.

29S-38E FLORIDA

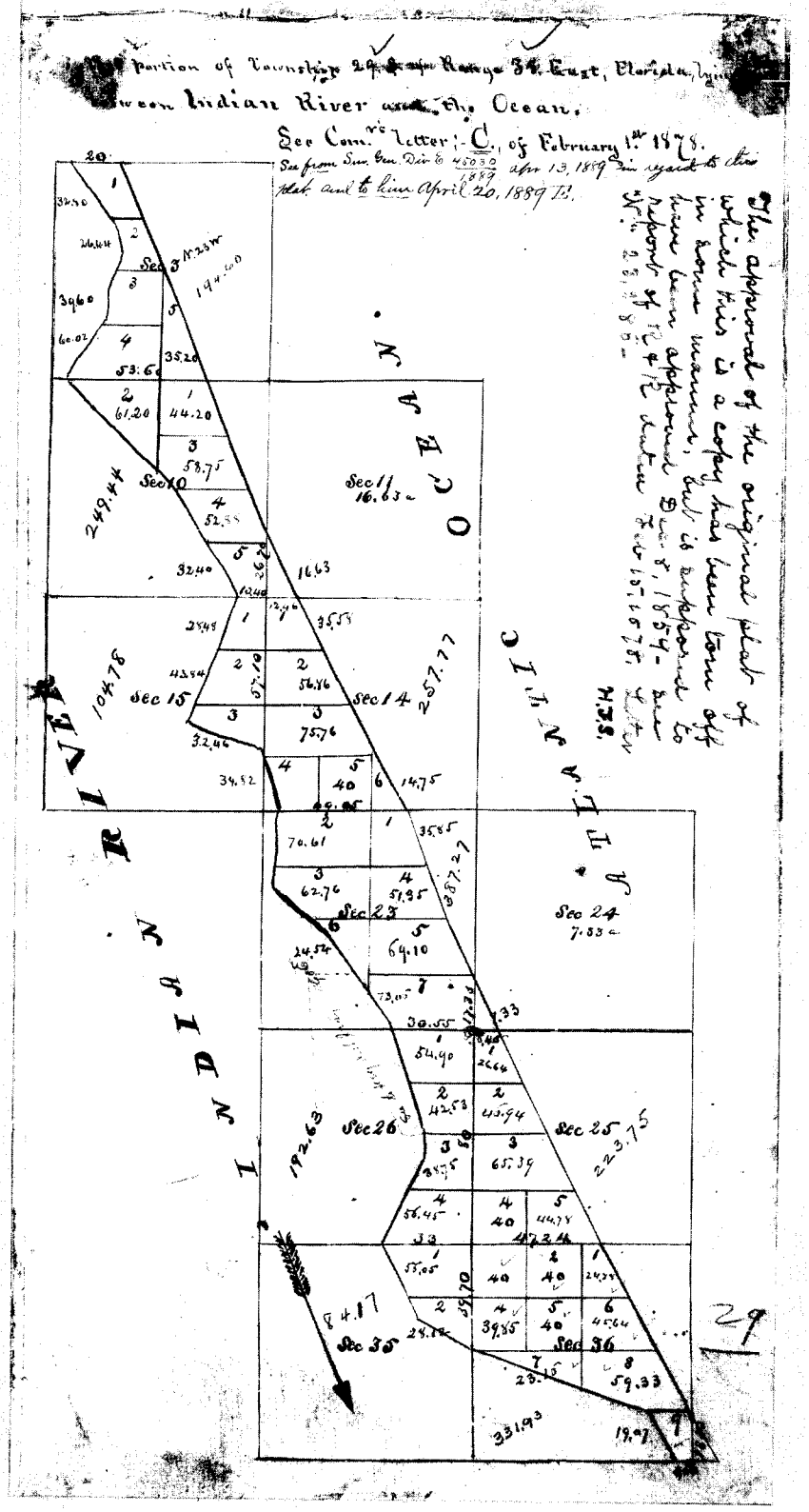


Figure 58. T.29S., R.38E., Tallahassee Meridian, Florida. Original Plat — December 8, 1859.

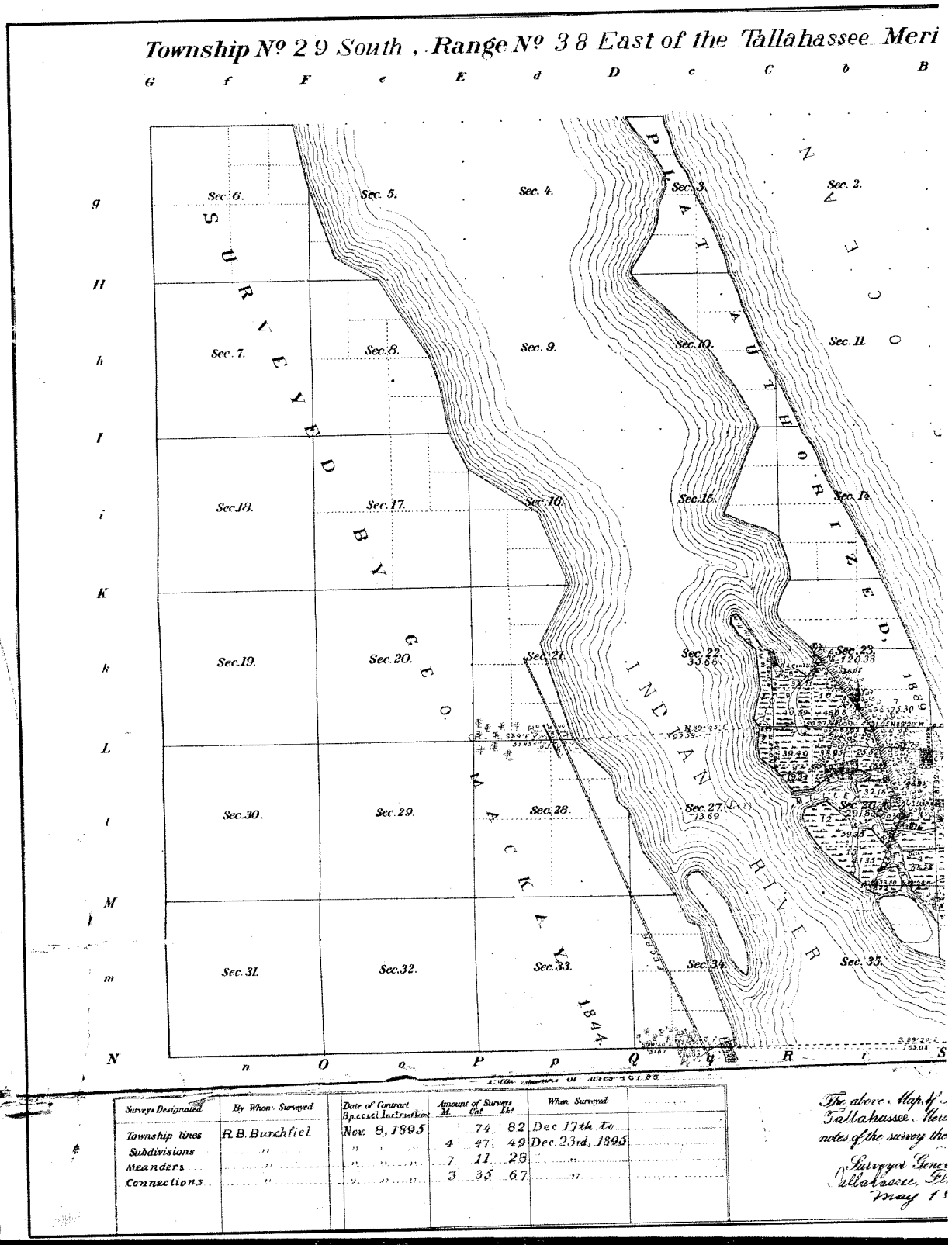
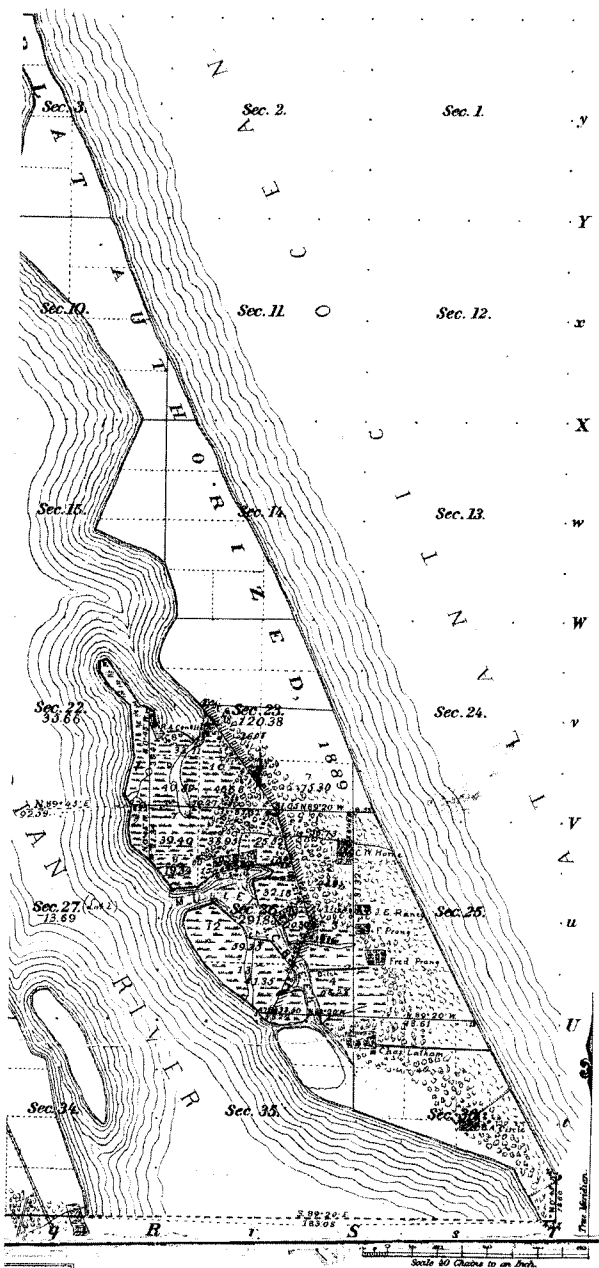


Figure 59. T.29S., R.38S., Florida Survey of Omitted Lands — 1896.

Report No. 207, June 1, 1896

of the Tallahassee Meridian, Florida.

RECEIVED WITH
GEN'L'S. LETTER
MAY 18 1896



Meanders of Indian River, Atlantic Ocean &c

Posts	Courses	Ch.s Lk.s	Posts	Courses	Ch.s Lk.s	Posts	Courses	Ch.s Lk.s
	In Sec 22							
1	N 31° W	3.80						
	N 3° E	8.60						
	N 15°30' E	8.70						
	N 4°30' W	21.00						
2	N 46°15' W	11.60						
	N 29°15' W	8.00						
	N 9° W	2.10						
	N 84°30' E	3.00						
	S 35°30' E	18.00						
	S 30° E	5.00						
	S 72° E	4.04						
	In Sec 23							
2	S 75° E	1.70						
	S 19°45' E	5.00						
	S 37°30' E	5.40						
2	N 79° E	5.80						
	S 55°15' E	7.50						
	N 43°15' E	11.17						
3	N 35°45' W	8.05						
	In Sec 27							
1	S 6°15' W	10.30						
	S 14° E	6.00						
2	S 52° E	8.55						
	In Sec 26							
4	S 37° E	13.60						
	N 85° E	10.00						
	N 66° E	8.50						
	N 76°15' E	9.00						
	N 79°30' E	9.00						
	S 68° E	6.40						
	S 22° W	2.80						
	S 76° W	7.70						
	S 15° E	7.70						
	S 38°15' E	7.00						
	S 50° E	1.70						
	S 21°45' E	6.60						
4	S 49°45' E	4.85						
	S 24°55' W	5.23						
	N 34° W	3.00						
	N 42°30' W	9.60						
	N 79°30' W	9.00						
	N 23° W	6.00						
	N 27°30' W	7.20						
	N 75°45' W	8.00						
	S 70° W	11.00						
	S 19° W	5.00						
	S 15°30' E	6.00						
	S 26° E	4.60						
	S 36° E	5.40						
	S 40° E	14.00						
	S 56°30' E	9.00						
5	S 46°30' E	7.88						
6	N 24°55' E	38.77						
7	N 17°50' W	48.54						
	In Sec 23							
8	N 35°45' W	50.47						
9								
	In Sec 36							
9	N 27°55' W	71.43						
10								

The above Map of Township No. 29 South of Range No. 38 East of the Tallahassee Meridian, Florida, showing the land between Indian River and Lake 7 of Sec 23 & Lake 2, 3 & 4 of Sec 26 is strictly conformable to the field notes of the survey thereof on file in this Office, which have been examined and approved.

Surveyor General's Office,
Tallahassee, Florida.
May 18, 1896.

W. H. Milton Jr.
Sur. Gen.l

Entered on Tracklook Aug. 4, 1896

Rs. 10 and 11 W., Willamette Meridian, in Oregon. Two separate range lines were monumented by surveys executed in 1874 and 1892. This is the first known hiatus actually surveyed, though several had been reported over the years with all being rejected. Gideon had some problems with this survey, designated T. 13 S., R. 10½ W. He finally completed it in March 1899 and the survey was approved July 14. The plat is shown in Fig. 57. Many hiatus surveys have been made since then.

On June 3, 1895, the Supreme Court rendered the final decision in the case of *Horne vs. Smith,* 159 U.S. 40. That case involved omitted lands along the Indian River in sections 23 and 26, T. 29 S., R. 38 E., in Florida.

On January 17, 1888, Commissioner Stockslager rejected the application by Charles A. and Robert T. Smith for the survey of a large body of land lying between the original meander line and the actual bank of the Indian River. The Commissioner thought they might be "accretions" or "swamp and overflowed" lands, and in either case would not be patentable to the Smiths, and on those grounds rejected their application. The Smiths actually occupied the land.

The "riparian" owner of the fractional lots in sections 23 and 26 was Charles W. Horne, who sued in an action of ejectment to kick the Smiths out and the case ended up in the Supreme Court. In the cited decision, the Court upheld the Smiths' claim that it was omitted land belonging to the government. The omitted area was 700 acres, while the fractional lots owned by Horne contained about 170 acres. Thus, a private suit proved government ownership.

On September 5, 1895, E. F. Best, Acting Commissioner, directed Surveyor General of Florida, William H. Milton, to have the lands surveyed. The survey was made by R. B. Burchfiel in December 1895, approved May 18, 1896, and accepted by the Commissioner on May 26, 1896. The original plat and omitted lands survey plat are shown in Figs. 58 and 59. This case solidified the government's stand on omitted lands and many have been executed over the past 80 years.

The *Act of February 20, 1896,* 29 Stat. 11, opened certain Forest Reserves in Colorado to mining claim entry. Subsequent acts of Congress have opened nearly all the forest lands to valid mining claims.

The Indian Department *Appropriations Act of June 10, 1896,* 29 Stat. 321, appropriated $200,000 for continuation of the rectangular surveys in the Indian Territory of Oklahoma. The act also provided for prosecution and fine of any person convicted of destroying or defacing survey monuments or trees marking a survey. The provision for a $250 fine for destroying survey corners and bearing trees were enacted into statutory law in 1909.

The *Civil Appropriations Act of June 11, 1896,* 29 Stat. 413, 435, stipulated that the USGS was to establish at least two bench marks in each township west of the One Hundred and Third Meridian and that they should be established near the township corners if practicable and monumented with iron posts or stones.

On October 16, 1896, the first full Circular titled *Restoration of Lost or Obliterated Corners and Subdivision of Sections* was issued. It combined all previous circulars covering the same subjects and has been reissued periodically ever since in that format.

The *Act of February 11, 1897,* 29 Stat. 526, permitted the patenting of oil lands under the placer claim provisions of the mining law.

Binger Hermann from Oregon was appointed Commissioner of the GLO on March 25, 1897. On May 26, 1897, Hermann issued a Circular letter to all Surveyors General. In the future, plats would be made of all township exteriors, standard parallels, and guide meridians when surveyed. The old practice was to show them along with the township subdivisions when those were surveyed.

The *Civil Appropriations Act of June 4, 1897,* 30 Stat. 11, 34-36, is also known as the *Forest Reserve Act of 1897.* It is long and complex; among other items, it provided for the survey of the Forest Reserve boundaries, township and subdivisional lines by the USGS, and the protection of the reserves by the Secretary of the Interior.

The surveyors employed by the USGS were government employees under the Civil Service system, established in 1883 (22 Stat. 403). The GLO had gained a bad reputation for surveying due to the Benson Syndicate Scandals and the timber land frauds. It was thought that government employees could and would do an honest job of surveying the valuable timber lands in the Forest Reserves. The law required them to make the rectangular surveys in compliance with the existing laws and regulations, i.e., the *Manual of Surveying Instructions.* The plats and field notes were approved by the Commissioner of the GLO. It might be said that these rectangular surveys in the Forest Reserves were the origin of the direct system of surveying. In 1898, in the Black Hills Reserve, surveys were being made by Frank M. Johnson, A. L. Coleman, M. P. McCoy, William H. Thorn, and J. Scott Harrison, all employees of the USGS. Frank M. Johnson became the first Supervisor of Surveys when the direct system began in 1910. In 1900, Johnson was a Special Examiner of Surveys in Colorado. The rectangular surveys of the townships were generally well executed. However, the survey of the Forest Reserve boundaries were usually monumented with three-inch iron posts. In some places (California), the USGS surveyors did not execute the boundary work correctly, ignored the original surveys, or followed some other incorrect procedure. In those cases, the surveys were never approved or accepted by the GLO. Monuments may exist on the ground but have no legal force or effect except as they indicate the position of the original approved surveys.

The survey of townships adjacent to the boundaries of the Forest Reserves by the USGS continued until 1899. After that, they surveyed only the boundaries of the reserves, continuing until 1905.

Under the protection provisions of the *Forest Reserve Act,* Binger Hermann reorganized "Division P" of the GLO into a Division of Forestry; it became "Division "R" on March 1, 1901. Five years later in 1903, the Division of Forestry employed 326 Forest Rangers, 41 Forest Supervisors, and 6 Forest Superintendents; the most notable was Gifford Pinchot, Special Forest Agent. These men managed and protected the forest reserves and watersheds and supervised timber sales. All were government employees, appointed in accordance with the *Act of July 7, 1898,* 30 Stat. 673.

On June 29, 1897, a Circular letter to the Surveyors General directed them that in the future, bearing trees at all quarter-section corners would be marked with the section number

included, such as ¼ S 16 BT, not just ¼ S BT as in the old practice.

The *Act of July 24, 1897,* 30 Stat. 215, provided for the appointment of a Surveyor General in the District of Alaska; William L. Distin was appointed and established his office at Sitka, November 5, 1897. Distin moved the office to Juneau in the fall of 1906 where it remained until abolished.

The *Act of April 29, 1898,* 30 Stat. 367, is known as the "Arkansas Compromise Act." Arkansas relinquished her claim to all of the remaining unclaimed swamp lands in that State.

The *Act of May 14, 1898,* 30 Stat. 409, extended the homestead law to Alaska but restricted the claims to 80 rods along navigable waters, with a shore space of 80 rods between claims; granted right-of-way to railroads; defined navigable waters and tidelands; and provided for 80-acre trade and manufacturing sites.

The following item was reported by the Surveyor General of North Dakota in his *1898 Annual Report:*

> "August 8, 1898, at 7.30 p.m., fire broke out in the Northern Pacific Railway Company's freight house, and, owing to the character of the building and the wind prevailing at the time, the fire was beyond control in a very few minutes, and spread rapidly to the main business portion of the city. This office was situated on the third floor of the First National Bank building, and it was impossible to save but a small portion of the records."

Williams then went on to list the few records saved. Once again the Washington copies were called on to replace the burned records at considerable expense.

The *Civil Appropriations Act of March 3, 1899,* 30 Stat. 1074, restricted the USGS surveys in the Forest Reserves to the survey of the boundaries of those reserves. The survey of all regular township and section line surveys within the reserves was returned to the GLO. The act also provided for metes and bounds Homestead Entry Surveys (HES) in the Black Hills Reserve in South Dakota on lands classified as agricultural, a departure from the rectangular system. Actually, settlers had been taking up homesteads in the Black Hills under the *Placer Mining Law.*

By this act, the rectangular system of surveys was extended to the District of Alaska; none were made until 1905.

The *Act of June 6, 1900,* 31 Stat. 327, extended the mining laws of the United States to Alaska.

On January 1, 1902, the *Manual of Surveying Instructions, 1902,* was officially issued and was made part of all surveying contracts by the *Act of April 26, 1902,* 32 Stat. 120.

The *Act of June 17, 1902,* 32 Stat. 388, provided for the reclamation and irrigation of arid lands in the West. Under this act and amendments which followed, the Bureau of Reclamation was established in the Department of the Interior; eventually, it would execute some rectangular surveys and resurveys on lands under their authority. The first employees of the Reclamation Service were men from the hydrographic branch of the Geological Survey.

The *Act of July 1, 1902,* 32 Stat. 728 and *January 10, 1903,* 32 Stat. 767, authorized the resurvey of 25 townships in San Diego County, California, and 84 townships in Wyoming without requiring a petition by the settlers. Up to this time the Congress had provided funds for resurveys in most of the appropriations acts. These resurveys were usually at the request of settlers who couldn't find the corners. Congress was generally moving toward the necessary legislation allowing resurveys. The resurveys provided for, when executed, were done almost as original surveys and caused much contention.

On January 26, 1903, Binger Hermann was removed from office and William A. Richards was appointed Commissioner of the GLO. Hermann was involved in timber land frauds in the West and it was alleged that he burned 43 letter books of correspondence before he left office; he was later elected Congressman from Oregon. On February 13, 1905, Hermann, Senator Mitchell from Oregon, and several other men were indicated on charges of land frauds involving 150,000 acres of timber lands in the Blue Mountain Forest Reserve in Oregon.

The *Act of March 3, 1903,* 32 Stat. 1028, enlarged homesteads in Alaska to 320 acres to be surveyed in a rectangular form if no rectangular system surveys existed near the homestead. There were no rectangular surveys at that time in Alaska.

The *Act of February 1, 1905,* 33 Stat. 628, transferred the Forest Reserves to the Department of Agriculture and established the bureau known as the Forest Service within that department. Thus, the GLO was the origin of the USGS, Bureau of Reclamation, and the Forest Service.

The *Act of April 16, 1906,* 34 Stat. 116, provided for Reclamation Townsites on lands administered by that Bureau.

On April 17, 1905, Alfred B. Lewis, Deputy Surveyor, under Contract No. 3 with the Surveyor General of Alaska, William L. Distin, set a stone monument on the north side of Stuck Mountain for the initial point of the Copper River Meridian. The point was near the Military Trail and telegraph lines which later became the Richardson Highway. Lewis then surveyed some 72 miles of the Copper River Meridian, 18 miles of the baseline, and the exterior boundaries of several townships. These surveys were approved by Distin on January 28, 1908, and the rectangular surveys were underway in Alaska. The first township subdivided in Alaska was T. 3 N., R. 1 W., Copper River Meridian, around the community of Copper Center in the Copper River Valley. That survey was made by Thomas A. Haigh, Deputy Surveyor, in 1910. The returns were approved by Distin on April 11, 1912. These surveys were hard to contract for at the low prices allowed by law.

At 5:16 a.m., April 18, 1906, the great San Francisco earthquake hit that city, with a subsequent fire that burned for days. The Surveyor General's office and all his records, plats, maps, etc. were destroyed. The rectangular plats and field notes were once again replaced over several years from the Washington copies. Many of the mineral survey records were, however, destroyed forever. There were thousands of claims and most of their records were recovered through the claimants and land offices but, California still suffers many difficulties with mining claims because of the loss. The San Francisco fire was the last of the series, beginning with Symmes in Ohio. The GLO (and BLM) have never provided safe, fireproof storage for these vital records where the reliability of an original document versus a copy is so important. Ironically, many of the "Washington copies" are now

housed in a flammable wooden structure in Denver, Colorado.

The *Act of April 28, 1904,* 33 Stat. 545, declared the corners of mineral surveys the best evidence of the true position of a mining claim. In other words, the mineral survey corners assumed the same legal status as the rectangular survey corners, they were unchangeable, and the Surveyor General had to honor them.

The *Act of May 17, 1906,* 34 Stat. 267, enabled Oklahoma, Arizona and New Mexico to become States. Oklahoma formed a government and was admitted to the Union on November 16, 1907.

The *Act of June 11, 1906,* 34 Stat. 233, provided for Homestead Entry Surveys on agricultural lands within most of the Forest Reserves. The previous act had applied only to the Black Hills. Under this act the lands classified by the Forest Service as best suited for agriculture were surveyed by metes and bounds. These surveys were made by Forest Service surveyors under instructions from the Surveyors General and were approved by and filed in the GLO in about the same manner as any other survey. Homesteads in the Black Hills Reserve were denied riparian rights under an unusual provision, Sec. 3 of the act. This act was repealed *October 23, 1962,* 76 Stat. 1157.

On January 28, 1907, Richard A. Ballinger was appointed Commissioner of the GLO.

The *Act of March 2, 1907,* 34 Stat. 1232, directed the Surveyor General of Alaska to furnish survey numbers to the land offices at Nome and Fairbanks. The numbers were those used in the official surveys known as the "U.S. Surveys" of metes and bounds claims in that State.

On January 14, 1908, Fred Dennett was appointed Commissioner of the GLO and took charge in March. Ballinger became Secretary of the Interior.

The *Civil Appropriations Act of May 27, 1908,* 35 Stat. 317, provided $25,000 for the purchase of iron posts to be used to monument the corners of the public land surveys. Iron posts have been the standard monument ever since. The act also abolished the offices of Surveyor General in Minnesota, North Dakota, and Florida. Rates of up to $25 per mile were allowed in the land surveys at that time.

The *Act of March 3, 1909,* 35 Stat. 845, is the "Resurvey Law." It provides by statute for the necessary resurveys of the public lands and is codified in 43 U.S.C. 772. Resurveys had been made for many years but this act authorized them whenever and wherever they were necessary to mark the boundaries of the remaining public lands.

The *Civil Appropriations Act of March 4, 1909,* 35 Stat. 945, abolished the Office of Surveyor General in Louisiana.

The *Act of June 20, 1910,* 36 Stat. 557, again enabled Arizona and New Mexico to become States. New Mexico was admitted January 6, 1912, and Arizona on February 14, 1912. Both States received sections 2, 16, 32, and 36 in each township for school lands. The 48 contiguous States were completed.

The *Civil Appropriations Act of June 25, 1910,* 36 Stat. 703, provided that, "The surveys and resurveys to be made by such competent surveyors as the Secretary of the Interior may select, at such compensation not exceeding two hundred dollars per month as he may prescribe . . ." It was the end of the contract system of surveys begun by Rufus Putnam in 1797. The system had surveyed millions of acres of public lands by good, bad and indifferent surveyors. Most of the easy surveying had been done, so not even the Deputy Surveyors themselves were sorry to see the contract method go.

CHAPTER IV

THE DIRECT SYSTEM
TO END
OF THE GENERAL LAND OFFICE

THE PERIOD 1910 — 1946

As organized at the beginning of the direct system of surveying and resurveying the public lands, the GLO consisted of six units:

(1) Washington Headquarters Office (GLO and divisions therein)
(2) Offices of the Surveyors General
(3) District Land Offices
(4) Field Service
(5) Surveying Service
(6) Logging Service

The Commissioner of the GLO, the Assistant Commissioner, the Surveyors General, and the Registrar and Receivers of the district land offices were appointed by the President.

Surveyors General and their offices were located at Juneau, Alaska; Phoenix, Arizona; San Francisco, California; Denver, Colorado; Boise, Idaho; Helena, Montana; Reno, Nevada; Santa Fe, New Mexico; Portland, Oregon; Huron, South Dakota; Salt Lake City, Utah; Olympia, Washington; and Cheyenne, Wyoming.

Division "E" in the Washington Headquarters office had general supervision of all cadastral surveys on public lands, regardless of who managed those lands. All instructions for surveys issued in the field were examined and approved in Division"E."

The *Civil Appropriations Act of March 4, 1911,* 36 Stat. 1363, permitted the Secretary of the Interior to appoint two Supervisors of Surveys. Frank M. Johnson and Arthur D. Kidder had already been appointed to those positions.

The Field Surveying Service was organized with Johnson as Supervisor of Surveys; his office was located in Denver, Colorado. Kidder later became Associate Supervisor of Surveys in Washington, D.C. Ten surveying districts were established with an Assistant Supervisor in charge of each district, except the Eastern States District, which was under the Associate Supervisor. The Districts and their numbers were:

District 1 — Montana,
District 2 — Colorado and Wyoming
District 3 — South Dakota and Nebraska
District 4 — New Mexico
District 5 — Arizona and California
District 6 — Utah and Nevada
District 7 — Washington and Idaho
District 8 — Oregon
District 9 — Alaska
District 10 — Eastern States, at Washington, D.C. (not numbered until 1918)

Under this organization, the technical direction of the actual field work was controlled by the Supervisor of Surveys, through the Associate and Assistant Supervisors. The major office work was done under the Surveyors General, who were under the Chief Clerk in Washington. They issued the *Special Instructions,* prepared the plats and approved the field returns prepared by the field surveyors; but the plats did not become official until accepted by the Commissioner. The Surveyors General remained custodians of the survey records and also received and disbursed monies deposited by settlers for surveys and resurveys. This splitting of the responsibilities for the surveys was unsatisfactory at best, but continued for 15 years until the offices of Surveyor General were abolished in 1925.

The first cadre of surveyors was made up primarily of men who had been field examiners of the contract surveys and from the known reliable Deputy Surveyors who had proven themselves when executing their contracts. The titles given them were either "U.S. Surveyor" or "U.S. Transitman." They were selected very strictly on the basis of ability. All were government employees, paid a monthly salary, and provided with food and lodging (tents) when in the field. All instruments and equipment were furnished by the government, although like most surveyors, they had and used personally owned equipment as well.

The Surveyors General grouped the proposed field work together by type and classification; i.e., railroad, coal, and forest lands, settler's application (deposit) surveys, and resurveys. If the proposed work program was approved by Division "E," the Surveyor General prepared *Special Instructions* under a Group Number. A "group" might be a few miles of a special type of survey, but most often was for the survey or resurvey of a township or group of townships. The township was the usual unit used. The *Special Instructions* were approved in either Division "E," or if more expedient, by a Supervisor. The work would then be assigned to a U.S. Surveyor or U.S. Transitman for execution in the field. Assignment instructions were issued by the appropriate Assistant Supervisor of Surveys. The surveyor assigned would hire his field assistants, gather his camp and surveying equipment and head for the field.

At first, some of the Examiners of Surveys remained on that duty until all of the outstanding contracts were completed, examined, and approved. These men then became U.S. Surveyors or Assistant Supervisors. In the early years of the direct system, while the organization was being perfected, the field surveyors were placed in the field and moved around by the Supervisor of Surveys. A set amount of time was allowed for preparing field returns and in effect the field surveyors were per-diem employees, furloughed between jobs. The system was gradually refined and later the surveyors were assigned to a district and worked within that state or states as the responsibility of the Assistant Supervisors increased. Surveyors could not transfer from one district to another without the approval of the Supervisor of Surveys.

Annual Instructions were issued on July 20, 1910, outlining in detail the procedures to be used in hiring surveyors, procurement, and use of equipment, duties of responsible persons, and other details of expending the appropriation for surveying. The surveyors *Weekly Progress Report* was installed and is still used in only slightly modified form. The *Standard Field Tables* and *The Ephemeris* (of the sun and selected stars) were issued in 1910 and are still being supplied to all BLM surveyors.

The changeover to the direct system was apparently a rather smooth operation and had been in the planning and preparation stage for more than a year. Much of its early success was due to the superb organizational ability of the Supervisor of Surveys, Frank M. Johnson, and his selection of able Assistant Supervisors.

After field work was completed on a group, the surveyor

submitted sketches and plats of the work to the Surveyor General. Field notes were usually handwritten, one mile per page, on loose sheets and turned in with the other materials. The notes would then be typed by an office typist. Those surveyors who had access to a typewriter and knew how to use it could type their notes directly. In a few years, when typewriters became available, the surveyors had to type up all the final field notes themselves. As more complicated resurveys and special surveys became numerous, this was a practical necessity. The first survey approved and accepted under the direct system was Group No. 1, Colorado, T. 14 S., R. 100 W., Sixth Principal Meridian, executed by A. C. Horton, Jr., U.S. Surveyor, and Jay P. Hester, Transitman, under *Special Instructions* issued on July 14, 1910. The returns were submitted to Division "E" on September 30, 1910, but were not immediately accepted because of a few deficiencies in the field notes and plat. Perhaps that is not too surprising, considering that an extremely rough and mountainous township had been surveyed, the field notes written, and plat drafted in just two and one half months. It is doubtful that any double party, complete with the most modern equipment, could match that feat today. The surveyors were out to prove that the direct system was more economical than contracting and succeeded despite the fact that most of easier, more accessible work had been already surveyed. And in fact the direct system was more economical in cost per mile of line surveyed and produced higher quality work than the contract system was doing in 1900-1910.

Fairbanks Meridian

The *Appropriations Act of June 25, 1910,* provided $100,000 for public land surveys in Alaska. Prior to that date, an irregular arrangement was made between Secretary of the Interior Richard A. Ballinger and George O. Smith, Director of the Geological Survey, without consulting the Commissioner of the GLO, Fred Dennett. Smith detailed a large party to Alaska under the supervision of R. H. Sargent, Topographer. Smith formulated a system of "plans" for the surveys and sent them to Sargent on June 29, 1910, which called for metes and bounds surveys at the direction of settlers or speculators, laying off of township boundaries from irregular triangulation networks without measurement on the ground and to "correct" or alter previously established and accepted surveys. Most of the work was a matter of platting and protraction, rather than running and monumenting the lines.

Commissioner Dennett and Division "E" disapproved these plans. They were not in compliance with the requirements of the *1902 Manual* and hence would be in violation of the *Act of April 26, 1902*. But Sargent was in Alaska and executed much of what work was accomplished during the 1910 field season. The initial point of the Fairbanks Meridian was established and some of the meridian and baseline surveyed. The $100,000 appropriation for surveys was largely consumed. The GLO insisted on the right to audit and disburse funds and this caused conflict with the USGS, who withdrew from the enterprise, since they could not exercise complete control of the work and funds.

Sargent's field returns were forwarded to Division "E" on May 15, 1911, in an incomplete and fragmentary condition. When examined they contained about 95 miles of line which were finally acceptable. These miles included the establishment of the Fairbanks Meridian and Baseline, the exterior boundaries of several townships, and the survey of five sections of land.

The establishment of the initial point of the Fairbanks Meridian was made by S. G. Lund, under the supervision of R. H. Sargent. The point was monumented with a concrete post and brass tablet. The surveys were approved June 7, 1913.

These surveys were made by calculations from an unchecked triangulation net, with "forced" closures. The survey corners established were monumented with wood posts of spruce, birch, and aspen, instead of iron posts or stones. These were later replaced by U.S. Surveyors with permanent monuments. On the basis of the lines finally acceptable, the average cost of these surveys exceeded $360 per mile. As far as can be determined, this was the last adventure of the USGS into the execution of the rectangular system of surveying.

Seward Meridian

On May 15, 1911, John P. Walker and G. G. McDaniel, U.S. Surveyors, established the initial point of the Seward Meridian and Baseline, near Seward, Alaska, tied into the existing Coast and Geodetic Survey (USC & GS) triangulation net. Walker and McDaniel surveyed many miles of townships boundaries and subdivided several townships on the Kenai Peninsula in 1911. The work was approved June 11, 1914, by Charles E. Davidson, the second Surveyor General of Alaska. The Seward Meridian Surveys were extended into the Anchorage and Matanuska Valley areas in 1912 by using computations for position based on the Coast and Geodetic Survey (USC & GS) triangulation network, instead of extending the rectangular survey lines directly over the mountains. The *Act of July 31, 1876,* permitted that procedure and it worked well with the proper application.

The *Act of August 24, 1912,* 37 Stat. 512, made Alaska a territory of the United States and established a civil government for the territory.

On June 5, 1913, Clay Tallman was appointed Commissioner of the GLO.

The *Act of March 12, 1914,* 38 Stat. 305, authorized the President to have the Alaska Railroad built and provided for townsites along that railway. Anchorage was one of the first townsites surveyed under the act.

The *Act of July 17, 1914,* 38 Stat. 509, amended the public land laws to provide for agricultural entry on lands containing phosphate, nitrate, potash, oil and gas, with those elements reserved to the United States. The law did not apply to lands containing metallic minerals; those elements came under the 1872 Mining Act. Since 1914, nearly all homestead, cash entry, and small tract patents contain a clause reserving the minerals to the government. These mineral reserves can cause problems for the present-day surveyor when the surface has been patented, and he is called on to resurvey the section lines to identify the subsurface mineral deposits.

The *Act of March 4, 1915,* 38 Stat. 1214, granted sections 16 and 36 in every township in Alaska to the territory for support of schools when the lands were surveyed. In addition, section 33 in each township in the Tanana Valley between parallels 64° and 65° north latitude and between 145° and

152° west longitude was granted. The four sections (1, 6, 31, and 36) around the corner of Tps. 1 N., Rs. 1 and 2 W., and Tps. 1 S., Rs. 1 and 2 W., Fairbanks Meridian were granted for a college.

By the *Act of June 9, 1916,* 39 Stat. 218, the unsold lands granted to the Oregon and California Railroad (pursuant to the *Act of June 25, 1866*) were revested to the United States. These lands soon required surveys and resurveys to identify their boundaries and these have continued to the present time.

The *Act of July 8, 1916,* 39 Stat. 352, reduced the size of homesteads in Alaska to 160 acres.

The *Act of August 25, 1916,* 39 Stat. 535, established the National Park Service within the Department of the Interior. The boundaries of the national parks have been surveyed by the surveyors of the GLO and BLM.

In 1917, the organization and supervisors of the Field Surveying Service was reported as: Supervisor of Surveys — Frank M. Johnson, and Associate Supervisor of Surveys — Arthur D. Kidder.

District	Assistant Supervisor of Surveys
No.1—Montana	J. Scott Harrison
No. 2—Colorado and Wyoming	Herman Jaeckel
No. 3—Nebraska and South Dakota	N. B. Sweitzer
No. 4—New Mexico	Alonzo E. Compton
No. 5—California and Arizona	A. C. Horton, Jr.
No. 6—Utah and Nevada	George D. D. Kirkpatrick
No. 7—Idaho	Frank S. Spofford
No. 8—Oregon and Washington	Ernest P. Rands
No. 9—Alaska	John P. Walker
Eastern States	Charles L. Dubois, Chief Division of Surveys, GLO

In January 1918, the Eastern States office was designated as District No. 10.

The *Act of September 21, 1918,* 40 Stat. 965, provided for resurveys or retracements in townships which were more than 50 percent in private ownership. Resurveys could be made on application of three-fourths of the land owners or a court of competent jurisdiction and deposit of the estimated cost of executing the resurveys. This act is now codified in *43 U.S.C. 773.*

On June 16, 1919, advance sheets of the first six chapters of the 1930 *Manual of Surveying Instructions* were officially issued. Congress had appropriated funds for revision of the 1902 Manual in previous years, following the resurvey law of 1909. A board was appointed to make the necessary revisions. Of the first six chapters, Chapter IV, Corner Monuments; Chapter V, Restoration of Lost Corners; and Chapter VI, Resurveys; were probably the most important. They directed the Cadastral Engineers in the proper marking of iron post monuments and in the execution of resurveys, things not covered by any of the previous manuals.

The *Civil Appropriations Act of July 19, 1919,* 41 Stat. 163, provided funds for one Supervisor of Surveys and ten assistant supervisors and also provided funds for the resurvey of State boundaries where required to close the public land surveys against them. This same provision for State boundary resurveys was included in the appropriations acts in 1920, 1921, and 1922.

The *Act of February 25, 1920,* 41 Stat. 437, is known as the "Mineral Leasing Law." It provides for the leasing of nonmetallic minerals on the public domain, including coal (except in Alaska), phosphate, oil, oil shale, and sodium. The leasing act also applies to the minerals on lands in which the minerals were reserved in the patents. Surveys for leases on unsurveyed lands are at the expense of the applicant.

Sec. 7 of the *Act of May 21, 1920,* 41 Stat. 607 and 613, provides that one government agency may provide goods or services to another government agency on a reimbursable basis. This section of the act is referred to as the "Economy Act," it is under this provision that the BLM executes surveys or resurveys on lands under the jurisdiction of another government agency, such as the Bureau of Indian Affairs or National Park Service.

The *Act of June 5, 1920,* 41 Stat. 1059, abolished the 80-rod shore space between homesteads fronting on navigable waters in Alaska.

On March 22, 1921, William Spry was appointed Commissioner of the GLO.

The *Act of March 20, 1922,* 42 Stat. 465, is the "Forest Exchange Act." It provides for land exchanges between the Forest Service and private owners of surveyed, non-mineral lands. As written, it implies exchanges of legal subdivisions and/or aliquot parts of surveyed sections. Forest Exchange Surveys, similar to Homestead Entry Surveys, have been made by surveyors employed by the Forest Service, under *Special Instructions* issued by the BLM. The field notes and plats were examined and accepted by the BLM. As of 1980, the surveys of odd-shaped tracts, made for exchange purposes, are made by BLM surveyors at the request of the Forest Service on a reimbursable basis.

The Interior *Appropriations Act of May 24, 1922,* 42 Stat. 552, did not provide funds for a Surveyor General in South Dakota; apparently that office was abolished.

The *Act of June 15, 1922,* 42 Stat. 650, directed that small holding claims, up to 160 acres in area in New Mexico, would be shown on all township plats. If confirmed, the claims would then be surveyed and segregated on the plats.

The Interior *Appropriations Act of March 3, 1925,* 43 Stat. 1141, abolished the offices of the Surveyors General, effective July 1, 1925. The surveying duties previously assigned to the Surveyors General were assigned to the Field Surveying Service under the direction of the Supervisor of Surveys.

Under the reorganization following July 1, 1925, the Assistant Supervisors were titled "District Cadastral Engineers." The former Chief Clerks in the Surveyor Generals' offices were titled "Office Cadastral Engineers." The ten Surveying Districts remained as before, but at least one Public Survey Office was maintained in each State. These offices maintained the field notes and plats and other public contact duties formerly performed by the Surveyor General. The Division of Surveys in the GLO (Division E) was placed under the general supervision of the Supervisor of Surveys, who approved the plats which were then accepted by the Commissioner. Both approval and acceptance dates were shown on the face of the survey plats.

The *Act of April 13, 1926,* 44 Stat. 243, allowed departure from the rectangular form for surveying homesteads in Alaska. Previously, homesteads were surveyed in a rectangular form with exterior boundaries lying in cardinal directions. Under this act they could lie in any direction and in different shapes but were to be compact and as nearly rectangular in form as practicable.

The *Act of March 3, 1927,* 44 Stat. 1365, provided for five-acre homesites or headquarters sites in Alaska on nonmineral lands, not withdrawn from entry. The act was amended in some provisions by the *Act of May 26, 1934,* 48 Stat. 809. These homesites and headquarters sites were all surveyed under the numbered U.S. Survey method of metes and bounds surveys.

The *Act of December 28, 1928,* 45 Stat. 1069, is sometimes known as the "Color of Title Act" and provides for survey and patent of lands claimed under color of title, the nearest thing to "adverse possession" of public lands.

On May 9, 1929, Charles C. Moore was appointed Commissioner of the GLO.

On July 1, 1930, Surveying District No. 3, Nebraska and South Dakota, was consolidated and combined with District No. 2, Colorado and Wyoming. Thereafter, District No. 2 was composed of the four States.

The 1930 *Manual of Surveying Instructions* was officially issued on June 14, 1930; 20 years in preparation, it was a vast improvement over the 1902 Manual. It incorporated the first six chapters issued in 1919 and introduced chapters on instruments and methods, modern corner monumentation, restoration of lost and obliterated corners, resurveys, special surveys, and included the instructions for executing mineral surveys. The cover was blue, as is the cover of the 1947 and 1973 *Manuals*. Since 1930 the *Manual of Surveying Instructions* has been referred to by the public land surveyors as the "Blue Bible."

One item should be mentioned here, Section 377 of the 1930 and 1947 Manuals, which reads:

> "377. Lost meander corners, originally established on a line projected across the meanderable body of water and marked upon both sides will be relocated by single proportionate measurement, after the section or quarter-section corners upon the opposite sides of the missing meander corner have been duly identified or relocated."

That section was interpreted to mean that original meander corners were not used to determine the proportionate position of a lost quarter corner or section corner, nor to proportion a one-sixteenth corner; the meander corner controlled the direction of the line but not the proportions along it. That procedure was wrong but the people who wrote the Manual did not correct the wrong interpretation, which lasted until about 1966.

On May 20, 1933, Fred W. Johnson was appointed Commissioner of the GLO and Johnson was destined to be the last man to hold the position. He served until 1946 when the GLO was abolished.

The *Act of June 28, 1934,* 48 Stat. 1269, is known as the "Taylor Grazing Act." Under this act, the Secretary of the Interior was authorized to withdraw up to 80 million acres of public domain and establish grazing districts, except in Alaska. The lands were to be classified for their best use, etc. The Grazing Act halted agricultural homesteading (in effect) in the Western Public Land States. Under this act, the Grazing Service in the Department of the Interior was established. The need for original surveys under the rectangular system was greatly reduced in the contiguous States.

On May 1, 1937, Surveying District No. 1, Montana, was added to District No. 7, Idaho and Washington. For the next three years, District No. 7 included all three States.

The *Act of June 1, 1938,* 52 Stat. 609, as amended July 14, 1945, and June 8, 1954, is known as the "Small Tract Act." Under this act, small tracts up to five acres in area were sold or leased. The act provides that the lands must be surveyed, which was interpreted in various ways. In some cases, if a rectangular survey plat existed, even if surveyed 50 or more years previously, the lands were surveyed and 5-acre aliquot parts of a section were sold or leased. All too frequently, the old surveys were nearly obliterated and/or greatly distorted. Buyers tried to locate their lands according to the plat and build homes or cabins. Later a properly executed dependent resurvey and subdivision of section survey would reveal that these improvements were on someone else's land and even in the wrong section. As these conflicts arose, the need for dependent resurveys of the lands being sold as small tracts was evident. Later many dependent resurveys were made by the Cadastral Engineers because of this act. No particular problems occurred in Alaska because that territory was largely unsurveyed; the small tracts there were surveyed by metes and bounds as Lots in a U.S. Survey.

Effective January 1, 1941, the Surveying Districts were reorganized and numbered as follows:

District	State
1	Colorado, Wyoming, Nebraska, South Dakota
2	New Mexico
3	California and Arizona
4	Utah and Nevada
5	Idaho and Montana
6	Oregon and Washington
7	Alaska
8	Eastern States

Each District was supervised by a District Cadastral Engineer.

The Surveying Service was again reorganized into Regions, effective January 1, 1946, as follows:

Region	State
1	Colorado, Wyoming, Montana, Nebraska, and South Dakota
2	New Mexico, Arizona, and Southern California (the San Bernardino Meridian)
3	Utah, Nevada, and Idaho
4	Oregon, Washington, Northern California (Humboldt and Mount Diablo Meridians)
5	Alaska

The surveys in each Region were under the general supervision of a Regional Cadastral Engineer. The Cadastral Engineers worked out of the Public Survey offices under an Office Cadastral Engineer.

The *Act of July 16, 1946,* 60 Stat. 1100, known as Reorganization Plan No. 3 or the "Organic Act," consolidated the

GLO, the Grazing Service, the Oregon and California Administration, Alaska Fire Control, and others into one new bureau to be called the Bureau of Land Management (BLM). The GLO was abolished and the duties of the Commissioner were assigned to the Director of the BLM. The change had little, if any, immediate effect on the public land surveys.

On April 4, 1971, Harold H. Waller, the last surviving Deputy Surveyor under the contract system, died in Seattle, Washington. He was born September 19, 1889. Waller had continued executing public land surveys over the years. The last was U.S. Survey No. 4941, a Soldier's Additional Homestead Claim in Alaska, which he surveyed between September 10, 1967, and August 7, 1969.

During the past 30 years, changes have occurred. The surveying service has declined into more of a service instead of the planned program that existed under the GLO. The esprit de corps that existed among the surveyors following the beginning of the direct system has nearly disappeared. In 1910, Frank M. Johnson and the men under him were out to prove that the direct system could do better surveys at a lower cost. Johnson ran a tight, close-knit organization of hard-working, dedicated men. But, like Rufus Putnam and Edward Tiffin, they have all passed into history. And that is sad.

CHAPTER V

SURVEYORS GENERAL OF THE PUBLIC LANDS STATES

The following pages contain a list of the Surveyors General of the Public Lands States in which the rectangular surveys were executed. The first Surveyor General, Rufus Putnam, was appointed Surveyor General of the lands northwest of the Ohio River, on November 5, 1796, and established his office in Marietta, Ohio.

The early records of the appointments of Surveyors General are vague and somewhat conflicting. Beginning in 1828, the records were kept in a "Bond Book" which indicates the date on which a given Surveyor General was commissioned, date of his bond, and other information pertaining to his tenure in office. Occasionally the man commissioned would decline the appointment or serve for only a temporary period. In the period 1796 to 1828, the list shows the date on which a Surveyor General was appointed or took office as determined from correspondence or reports. After 1828, the date given is the date of his commission as shown in the Bond Books. Under the "Remarks" heading is other pertinent information and dates thought to be of interest.

Several Offices of Surveyors General were responsible for the surveys in more than one state (or territory) such as, Ohio, Indiana, and Michigan; Wisconsin and Iowa, etc. Therefore, there is duplication in the lists among the affected states.

CAUTION: This list of Surveyors General is for informative purposes only. The dates given, spelling of names, etc., has not been positively verified and may contain factual errors. The information has been taken from the most reliable sources available without extensive individual research which, for the purpose intended, is not warranted. A considerable lapse often occurred between the date a Surveyor General was commissioned and the date he actually took charge of a particular office.

COMMISSIONERS OF THE GENERAL LAND OFFICE

Name	Date of Commission
Edward Tiffin	May 7, 1812
Josiah Meigs	October 11, 1814
John McLean	September 11, 1822
George Graham	June 26, 1823
Elijah Hayward	September 30, 1830
Ethan A. Brown	July 24, 1835
James Whitcomb	October 21, 1836
Elisha M. Huntington	July 3, 1841
Thomas H. Blake	May 19, 1842
James Shields	April 16, 1845
Richard M. Young	January 6, 1847
Justin Butterfield	July 1, 1849
John Wilson	September 16, 1852
Thomas A. Hendricks	August 8, 1855
Samuel A. Smith	October 13, 1859
Joseph S. Wilson	February 23, 1860
James H. Edmunds	March 16, 1861
Joseph S. Wilson	September 1, 1866
Willis Drummond	February 4, 1871
Samuel S. Burdett	July 1, 1874
James A. Williamson	June 24, 1876
Noah C. McFarland	June 17, 1881
William A. J. Sparks	March 26, 1885
S. M. Stockslager	March 27, 1888
Lewis A. Groff	September 16, 1889
Thomas H. Carter	March 31, 1891
William H. Stone	November 18, 1892
Silas W. Lamoreaux	March 28, 1893
Binger Hermann	March 25, 1897
William A. Richards	January 26, 1903
Richard A. Ballinger	January 28, 1907
Fred Dennett	January 14, 1908
Clay Tallman	June 5, 1913
William Spry	March 22, 1921
Charles C. Moore	May 9, 1929
Fred W. Johnson	May 20, 1933

OFFICE OF SURVEYOR GENERAL OF ALASKA

Name	Appointment or Date of Commission	Remarks
Munson C. Hillyer	July 5, 1884	U.S. Marshal and Ex officio Surveyor General Office opened at Sitka, Alaska
Barton Aikins	July 21, 1885	Ex officio
Orville T. Porter	June 21, 1889	Ex officio Effective October 1, 1889
Louis L. Williams	February 20, 1894	Ex officio
James M. Shoup	June 26, 1897	
Gilbert B. Pray	July 27, 1897	Temporary and declined
William L. Distin	August 7, 1897	Surveyor General Opened November 5, 1897 Office moved to Juneau, October 1, 1906
Charles E. Davidson	July 23, 1913	Entered office October 18, 1913 Drowned August 8, 1919
Robert J. Sommers	September 25, 1919	Resigned July 18, 1921
Karl Theile	July 22, 1921	Entered office August 25, 1921

Office abolished by Act of March 3, 1925, 43 Stat. 1141. Equipment and records transferred to Field Surveying Service, July 1, 1925.

OFFICE OF SURVEYOR GENERAL OF ALABAMA

Name	Appointment or Date of Commission	Remarks
Isaac Briggs	April 1, 1803	Surveyor, South of Tennessee Opened at Washington, Mississippi
Seth Pease	Early in 1807	
Thomas Freeman	September 10, 1810	
John Coffee	March 17, 1817	Surveyor General of Alabama at Huntsville Moved to Florence, Alabama in 1823 Died July 7, 1833
James W. Weakley	July 20, 1833	Office closed October 29, 1849

Records were transferred to Secretary of State of Alabama June 8, 1850. Subsequent surveys were under the direction of the Commissioner, General Land Office.

OFFICE OF SURVEYOR GENERAL OF ARIZONA

Name	Appointment or Date of Commission	Remarks
Levi Bashford	May 4, 1863	Office opened January 25, 1864 at Tucson, Arizona Closed July 4, 1864
John A. Clark	Assumed duties July 1864	Arizona under Surveyor General of New Mexico at Santa Fe
Lauren Upson	Effective March 2, 1867	Arizona under Surveyor General of California at San Francisco
Sherman Day	July 22, 1868	Surveyor General of California
John Wasson	July 14, 1870	Surveyor General of Arizona Opened office in Tucson on November 5, 1870
Joseph W. Robbins	July 15, 1882	Died November 14, 1883
Royal A. Johnson	January 11, 1884	Suspended November 6, 1885
John Hise	November 6, 1885	Removed June 17, 1889
Royal A. Johnson	June 17, 1889	Resigned March 4, 1893
Levi H. Manning	April 17, 1893	Resigned January 10, 1896
George T. Roskruge	March 11, 1896	Removed July 17, 1897
George Christ	July 22, 1897	Took office August 6, 1897 Moved to Phoenix, Arizona, March 1, 1902
Hugh H. Price	August 3, 1901	Removed September 9, 1903
Frank S. Ingalls	September 9, 1903	
Frank P. Trott	January 26, 1916	
Charles M. Donohoe	January 24, 1924	Took office February 11, 1924

Office abolished by Act of March 3, 1925, 43 Stat. 1141. Equipment and records transferred to Field Surveying Service, July 1, 1925.

OFFICE OF SURVEYOR GENERAL OF ARKANSAS

Name	Appointment or Date of Commission	Remarks
Silas Bent	March 1806	Principal Deputy of Missouri Territory at St. Louis, Missouri
William Rector	August 20, 1813	Principal Deputy Became Surveyor General of Illinois and Missouri by Act of April 29, 1816
William Clark	October 1824	Acting Surveyor General at St. Louis
William McRee	May 17, 1825	Surveyor General of Illinois and Missouri at St. Louis
James S. Conway	June 30, 1832	Opened office of Surveyor General of Arkansas at Little Rock
Edward Cross	April 30, 1836	
Richard D. C. Collins	August 6, 1838	Declined office October 8, 1838
David Fulton	November 7, 1838	
William Pelham	April 7, 1841	
Lorenzo Gibson	May 8, 1849	
George Milbourne	April 7, 1853	
Henry M. Rector	March 7, 1855	Resigned February 7, 1859

Office closed March 12, 1859. Records transferred to State of Arkansas about 1861. Subsequent surveys made under the Commissioner of the General Land Office.

OFFICE OF SURVEYOR GENERAL OF CALIFORNIA

Name	Appointment or Date of Commission	Remarks
Samuel D. King	March 12, 1851	Office created by Act of March 3, 1851 Office opened in San Francisco, California, on June 19, 1851
John C. Hays	March 19, 1853	
James W. Mandeville	July 13, 1857	
Edward F. Beale	April 15, 1861	
Lauren Upson	February 25, 1864	
Sherman Day	July 22, 1868	
James R. Hardenbergh	January 20, 1871	
James T. Stratton	December 20, 1873	
Henry G. Rollins	January 15, 1876	Resigned
John W. Ames	September 27, 1877	Died April 6, 1878
Theodore Wagner	May 25, 1878	
William H. Brown	June 2, 1882	Resigned November 7, 1885
Richard P. Hammond Jr.	November 20, 1885	
William H. Pratt	March 4, 1890	
William S. Green	March 24, 1894	
James M. Gleaves	February 19, 1898	Died November 27, 1901
William S. Graham	January 9, 1902	
Edward H. Archer	February 11, 1910	
Frank H. Gould	January 27, 1914	Died January 26, 1918
Louis H. Mooser	February 19, 1918	Resigned September 23, 1921
John Plover	October 3, 1921	

Office abolished by Act of March 3, 1925, 43 Stat. 1141. Equipment and records transferred to Field Surveying Service July 1, 1925.

OFFICE OFFICE OF SURVEYOR GENERAL OF COLORADO

Name	Appointment or Date of Commission	Remarks
Francis M. Case	April 5, 1861	Office opened in Denver, Colorado June 17, 1861
John Pierce	March 16, 1863	
William H. Lessig	March 20, 1867	
Thomas B. Searight	February 13, 1874	
William L. Campbell	January 26, 1877	Suspended November 6, 1879
Albert Johnson	November 6, 1879	Suspended April 3, 1883
Norman H. Meldrum	April 3, 1883	Suspended November 6, 1885
James A. Dawson	November 6, 1885	Died January 16, 1887
Oney Carstarphen	January 24, 1887	
Enery C. Humphrey	February 28, 1890	Removed June 15, 1893
Thomas D. Robinson	June 15, 1893	
Richard LeBert	December 22, 1897	Resigned January 7, 1899
Charles C. Goodale	January 9, 1899	
John F. Vivian	March 3, 1903	
William G. Lewis	July 15, 1905	
Timothy O'Connor	May 24, 1910	Entered office June 7, 1910
John B. McGauran	June 19, 1914	Entered office July 8, 1914 Removed September 16, 1921
William H. Clark	October 8, 1921	

Office abolished by Act of March 3, 1925, 43 Stat. 1141. Equipment and records transferred to Field Surveying Service July 1, 1925.

OFFICE OF SURVEYOR GENERAL OF FLORIDA

Name	Appointment or Date of Commission	Remarks
Robert A. Butler	July 9, 1824	Office opened at Tallahassee, Florida
Valentine Y. Conway	March 17, 1842	Ordered moved October 6, 1843 to St. Augustine, Florida
Robert A. Butler	August 11, 1845	
Benjamin A. Putnam	April 11, 1849	
John Westcott	April 29, 1853	
Francis L. Dancy	May 13, 1858	Resigned March 4, 1861
M. L. Stearns	April 17, 1869	Opened in Tallahassee, Florida Resigned March 18, 1873
Joshua W. Gilbert	March 18, 1873	Suspended May 11, 1875
LeRoy D. Ball	May 11, 1875	
Malachi Martin	March 1, 1881	Died (Date unknown)
William H. Hicks	November 21, 1884	
James F. McClellan	April 27, 1885	Resigned October 21, 1885
William D. Bloxham	November 14, 1885	Removed October 28, 1889
John C. Slocum	October 28, 1889	
William H. Milton Jr.	April 12, 1894	
Richard L. Scarlett	October 29, 1897	
Edmund C. Weeks	March 5, 1902	
Charles H. Parlin	May 4, 1906	Closed June 30, 1908

Records transferred to State of Florida on August 24, 1908.

OFFICE OF SURVEYOR GENERAL OF IDAHO

Name	Appointment or Date of Commission	Remarks
LaFayette Cartee	August 13, 1866	Opened November 7, 1866, in Boise City, Idaho
Edward Ruger	April 21, 1869	Resigned February 28, 1870
LaFayette Cartee	March 21, 1870	
William P. Chandler	May 28, 1878	Suspended November 6, 1885
Joseph C. Straughan	November 6, 1885	
Willis H. Pettit	July 9, 1890	Removed June 28, 1893
Joseph C. Straughan	June 28, 1893	
Joseph Perrault	October 2, 1897	Entered office November 1, 1897
Ernest G. Eagleson	June 30, 1902	Resigned November 16, 1907
Darwin A. Utter	February 10, 1908	Entered office March 1, 1908
Edward Hedden	August 29, 1916	Entered office September 30, 1916
Virgil W. Samms	May 4, 1921	Entered office June 1, 1921

Office abolished by Act of March 3, 1925, 43 Stat. 1141. Equipment and records transferred to Field Surveying Service, July 1, 1925.

OFFICE OF SURVEYOR GENERAL OF ILLINOIS

Name	Appointment or Date of Commission	Remarks
Jared Mansfield	November 3, 1803	Office at Cincinnati, Ohio Illinois Territory created by Act of February 3, 1809
Josiah Meigs	November 24, 1812	
Edward Tiffin	November 1814	Office moved to Chillicothe, Ohio, in November 1814
William Rector	Effective April 29, 1816	Office of Surveyor General of Illinois and Missouri created by Act of April 29, 1816. Located at St. Louis, Missouri
William Clark	October 1824	Acting Surveyor General
William McRee	April 1825	Took office May 17, 1825, in St. Louis
Elias T. Langham	May 30, 1832	
Daniel Dunklin	May 11, 1836	Resigned
William Milburn	March 13, 1839	
Silas Reed	April 27, 1841	
J. C. Brown	September 13, 1841	
Silas Reed	March 17, 1842	
Frederick R. Conway	May 12, 1845	
Merriwether Lewis Clark	June 14, 1849	
Don Alonzo Spaulding	February 10, 1853	Resigned
John Loughborough	April 22, 1853	
William Cuddy	April 3, 1861	Closed office October 31, 1863

Records transferred to State of Illinois in July 1869. Subsequent surveys made under the Commissioner of the General Land Office.

OFFICE OF SURVEYOR GENERAL OF INDIANA

Name	Appointment or Date of Commission	Remarks
Rufus Putnam	November 5, 1796	Surveyor General of Northwest Territory opened office in Marietta, Ohio. Indiana Territory created by Act of May 7, 1800
Jared Mansfield	November 3, 1803	Moved to Cincinnati, Ohio, in May, 1905
Josiah Meigs	November 24, 1812	
Edward Tiffin	November 1814	Moved office to Chillicothe, Ohio
William Lytle	July 3, 1829	Moved office to Cincinnati, Ohio Died March 18, 1831
Micajah T. Williams	April 13, 1831	
Robert T. Lytle	April 23, 1835	
Ezekial S. Haines	June 6, 1938	
William Johnston	June 11, 1842	
Lucius Lyon	June 23, 1845	Office moved to Detroit, Michigan, in June 1845

Records transferred to State of Indiana in 1850. Subsequent surveys executed under Surveyor General in Detroit and under the Commissioner of the General Land Office.

OFFICE OF SURVEYOR GENERAL OF IOWA

Name	Appointment or Date of Commission	Remarks
Albert G. Ellis	June 28, 1838	Opened office for Wisconsin and Iowa at Dubuque, Iowa, February 1839
George W. Jones	February 4, 1840	
James Wilson	April 24, 1841	
George W. Jones	May 9, 1845	
Caleb H. Booth	January 12, 1849	
George B. Sargent	March 24, 1851	
Warner Lewis	April 23, 1853	
Thomas J. Townsend	May 6, 1861	
Henry A. Wiltse	January 29, 1863	Office at Dubuque closed June 30, 1866

Subsequent surveys in Iowa were executed under the Surveyor General of Nebraska until about 1886. Survey records were transferred to the State of Iowa in March 1868.

OFFICE OF SURVEYOR GENERAL OF KANSAS

Name	Appointment or Date of Commission	Remarks
John Calhoun	August 1, 1854	Opened at Fort Leavenworth, Kansas, September 15, 1854
Ward B. Burnett	July 21, 1858	Moved to Nebraska City, Nebraska, in May 1858
Mark W. Delahay	April 29, 1861	Moved to Leavenworth, Kansas, in September 1861
Daniel W. Wilder	October 10, 1863	At Leavenworth, Kansas
Hirano S. Sleeper	March 16, 1865	
C. W. Babcock	April 21, 1869	At Lawrence, Kansas

Office was closed June 30, 1876, and the records transferred to the State of Kansas. Subsequent resurveys made under the Commissioner of the General Land Office.

NOTE: The Kansas-Nebraska Office was opened at Fort Leavenworth, Kansas, on September 15, 1854; moved to Wyandotte, Kansas, in September 1855; moved to Lecompton, Kansas in October 1856; moved to Nebraska City, Nebraska, in May 1858; and moved to Leavenworth, Kansas, in September 1861. The Act of July 28, 1866, 14 Stat. 344, created the Office of Surveyor General of Nebraska and Iowa. The Kansas (only) office remained in Leavenworth until moved to Lawrence, Kansas, in 1869 until closed in 1876.

OFFICE OF SURVEYOR GENERAL OF LOUISIANA

Name	Appointment or Date of Commission	Remarks
Isaac Briggs	With Act of March 26, 1804	2 Stat. 283 created Orleans Territory Briggs was Surveyor South of Tennessee with office at Washington, Mississippi
Seth Pease	Early in 1807	At Washington, Mississippi
Thomas Freeman	September 10, 1810	
Levin Wailes	January 22, 1822	
George Davis	June 1, 1824	
James P. Turner	April 24, 1828	
Joseph Dunbar	December 23, 1829	
Hore Browse Triste	June 15, 1831	Act of March 3, 1831 Office of Surveyor General of Louisiana established at Donaldsonville, Louisiana
Henry T. Williams	February 21, 1834	Donaldsonville, Louisiana
Francis D. Newcomb	June 23, 1841	
Pierre T. Landry	May 10, 1845	
Robert W. Boyd	May 9, 1849	
J. Charlton Beattie	April 7, 1853	Declined
William J. McCulloh	June 2, 1853	Resigned February 6, 1861 Office closed
John Lynch	June 3, 1869	Opened at New Orleans, Louisiana
Everett W. Foster	February 27, 1871	Suspended October 25, 1873
Maximilian F. Bonzano	November 28, 1873	
Orlando H. Brewster	July 21, 1874	Resigned November 4, 1876
Orlando H. Brewster	January 23, 1877	
Jaques A. Gla	November 2, 1881	Suspended March 5, 1883

James Lewis	March 5, 1883	Suspended November 12, 1885 Resigned February 26, 1886
Benjamin T. Ledbetter	November 12, 1885	Temporary appointment Commissioned June 23, 1886 Died December 7, 1886
Calhoun Fluker	February 28, 1887	
Charles B. Wilson	March 26, 1890	Removed September 5, 1893
Charles H. Dickinson	September 15, 1893	Died December 13, 1898
James Lewis	January 19, 1899	Civil Appropriations Act of March 4, 1909, abolished office. Office closed July 1, 1909

Records transferred to State of Louisiana in 1910.

OFFICE OF SURVEYOR GENERAL OF MICHIGAN

Name	Appointment or Date of Commission	Remarks
Jared Mansfield	November 3, 1803	At Marietta, Ohio Michigan Territory created January 11, 1805
Josiah Meigs	November 24, 1812	Office moved to Cincinnati, Ohio, May 1805
Edward Tiffin	November 1814	Office moved to Chillicothe, Ohio
William Lytle	July 3, 1829	Office moved to Cincinnati, Ohio Died March 18, 1831
Micajah T. Williams	April 13, 1831	
Robert T. Lytle	April 23, 1835	
Ezekiel S. Haines	June 6, 1838	
William Johnston	June 11, 1842	Moved to Detroit, Michigan in June 1845
Lucius Lyon	June 23, 1845	
Charles Noble	January 14, 1850	
Leander Chapman	April 1, 1853	Detroit Office closed May 11, 1857 Surveyor General moved to St. Paul, Minnesota

Records transferred to State of Michigan between May 1857 and May 1858. Subsequent surveys and resurveys made under the Commissioner of the General Land Office.

OFFICE OF SURVEYOR GENERAL OF MINNESOTA

Name	Appointment or Date of Commission	Remarks
Charles L. Emerson	March 24, 1857	Opened in St. Paul, Minnesota May 23, 1857
William D. Washburn	March 28, 1861	
Levi Nutting	April 26, 1865	
Chester D. Davison	April 21, 1869	
Charles T. Brown	February 2, 1871	Resigned
Dana E. King	October 3, 1873	
James H. Baker	May 1, 1875	
Jacob H. Stewart	April 3, 1879	
Martin S. Chandler	April 2, 1883	Resigned November 13, 1886
John F. Norrish	February 28, 1887	
James Compton	March 20, 1891	Removed November 4, 1895
Patrick H. Kirwan	November 4, 1895	
Eli S. Warner	January 18, 1900	

Warner was the last Surveyor General listed. The office was closed and records transferred to the State of Minnesota on February 4, 1908.

OFFICE OF SURVEYOR GENERAL OF MISSISSIPPI

Name	Appointment or Date of Commission	Remarks
Isaac Briggs	April 1, 1803	Surveyor, South of Tennessee Opened at Washington, Mississippi
Seth Pease	Early in 1807	
Thomas Freeman	September 10, 1810	
Levin Wailes	January 10, 1822	
George Davis	June 1, 1824	
James P. Turner	February 28, 1828	
Joseph Dunbar	February 20, 1830	
Gideon Fitz	February 19, 1831	Office moved to and opened in Jackson, Mississippi, August 1, 1833
R. M. Williamson	July 1, 1834	Opened August 16, 1834 Appointment rejected by Senate Closed in 1835 and remained Closed until 1836
Henry S. Foote	May 31, 1836	Reopened at Jackson, Mississippi Resigned April 20, 1838
Volney E. Howard	May 15, 1838	
Benjamin A. Ludlow	April 19, 1841	
Alexander Downing	May 9, 1843	
Charles A. Bradford	March 24, 1845	

Office closed and records transferred to State of Mississippi in October 1849. Subsequent surveys and resurveys made under the Commissioner of the General Land Office.

OFFICE OF SURVEYOR GENERAL OF MISSOURI

Name	Appointment or Date of Commission	Remarks
Silas Bent	March 1806	Principal Deputy Office opened in St. Louis, Missouri
William Rector	August 20, 1813	Principal Deputy Became Surveyor General by Act of April 29, 1816
William Clark	October 1824	Acting Surveyor General
William McRee	April 1825	Surveyor General of Illinois and Missouri at St. Louis
Elias T. Langham	May 30, 1832	
Daniel Dunklin	May 11, 1836	Resigned
William Milburn	March 13, 1839	
Silas Reed	April 27, 1841	
Joseph C. Brown	September 13, 1841	
Silas Reed	March 17, 1842	
Frederick R. Conway	May 12, 1845	
Merriwether Lewis Clark	June 14, 1849	
Don Alonzo Spaulding	February 10, 1853	Resigned
John Loughborough	April 22, 1853	
William Cuddy	April 3, 1861	Closed October 31, 1863

Records transferred to State of Missouri in August 1874. Subsequent surveys made under the Commissioner of the General Land Office.

OFFICE OF SURVEYOR GENERAL OF MONTANA

Name	Appointment or Date of Commission	Remarks
Soloman Meredith	April 18, 1867	Opened in Helena, Montana
Henry D. Washburn	April 17, 1869	Died January 26, 1871
John E. Blaine	February 27, 1871	Resigned December 18, 1873
Andrew J. Smith	December 23, 1873	Suspended August 14, 1877
Roswell H. Mason	September 7, 1877	Resigned October 18, 1881
John S. Harris	October 29, 1881	
Benjamin H. Greene	October 2, 1885	Removed September 2, 1889
George O. Eaton	September 2, 1889	
John S. M. Neill	May 28, 1894	Removed June 22, 1897
Edward W. Beattie	June 28, 1897	
John Frank Cone	June 27, 1906	
Jerome G. Locke	June 15, 1911	Resigned May 1914
Henry Gerharz	June 24, 1914	Resigned December 27, 1919
Gilman Bullard	January 14, 1920	

Office abolished by Act of March 3, 1925, 43 Stat. 1141. Equipment and records transferred to Field Surveying Service, July 1, 1925.

OFFICE OF SURVEYOR GENERAL OF NEBRASKA

Name	Appointment or Date of Commission	Remarks
John Calhoun	August 1, 1854	Opened at Fort Leavenworth, Kansas, September 15, 1854
Ward B. Burnett	July 21, 1858	Moved to Nebraska City, Nebraska, in May 1858
Mark W. Delahay	April 29, 1861	Moved to Leavenworth Kansas, in September 1861
Daniel W. Wilder	October 10, 1863	
Hirano S. Sleeper	March 16, 1865	
Phineas W. Hitchcock	April 1, 1867	Surveyor General of Nebraska and Iowa Opened at Plattsmouth, Nebraska, in May 1867
Robert R. Livingston	April 17, 1869	Plattsmouth, Nebraska
E. E. Cunningham	April 20, 1871	
John R. Clark	July 2, 1875	
George S. Smith	April 14, 1879	
David V. Stephensen	March 7, 1883	Resigned May 2, 1885
Jonathan F. Gardner	June 11, 1885	

The Nebraska-Iowa office of Surveyor General was apparently closed June 30, 1886, due to lack of appropriations to maintain the office. The records were transferred to the State of Nebraska in September 1886.

NOTE: The Kansas-Nebraska Office was opened at Fort Leavenworth, Kansas, on September 15, 1854; moved to Wyandotte, Kansas, in September 1855; moved to Lecompton, Kansas, in October 1856; moved to Nebraska City, Nebraska in May 1858; and moved to Leavenworth, Kansas, in September 1861. The Act of July 28, 1866, 14 Stat. 344, created the Office of Surveyor General of Nebraska and Iowa, which was opened in Plattsmouth, Nebraska, in May 1867 where it remained until closed in 1886.

OFFICE OF SURVEYOR GENERAL OF NEVADA

Name	Appointment or Date of Commission	Remarks
John W. North	March 28, 1861	Opened in Carson City, Nevada, June 22, 1861 Closed — Act of March 14, 1862
Edward F. Beale	From March 1862	Nevada under Surveyor General of California with office in San Francisco
Lauren Upson	February 25, 1864	San Francisco, California
William B. Thornburgh	October 20, 1866	Reopened in Carson City, Nevada, November 27, 1866
Anson P. K. Safford	April 1, 1867	Moved to Virginia City, Nevada
Edmund S. Davis	April 28, 1869	Moved to Reno, Nevada January 20, 1882
Christopher C. Powning	March 7,1883	Suspended November 12, 1886
Charles W. Irish	November 12, 1886	Removed April 1, 1890
George F. Turrittin	April 15, 1890	
Clayton Belknap	August 8, 1894	
Matthew Kyle	July 21, 1898	Resigned August 10, 1914
John B. O'Sullivan	September 9, 1914	Resigned July 5, 1921
Joseph E. Gelder	July 19, 1921	

Office abolished by Act of March 3, 1925, 43 Stat. 1141. Equipment and records transferred to Field Surveying Service July 1, 1925.

OFFICE OF SURVEYOR GENERAL OF NEW MEXICO

Name	Appointment or Date of Commission	Remarks
William Pelham	August 1, 1854	Office opened in Santa Fe, New Mexico, December 28, 1854
Alexander P. Wilbar	June 21, 1860	
John A. Clark	July 26, 1861	
Benjamin C. Cutler	July 29, 1868	Died October 18, 1869
T. Rush Spencer	April 15, 1869	Died June 21, 1872
James K. Proudfit	July 23, 1872	Resigned January 27, 1876
Henry M. Atkinson	February 10, 1876	
Clarence Pullen	July 9, 1884	Suspended June 1, 1885
George W. Julian	June 1, 1885	Removed August 3, 1889
Edward F. Hobart	August 3, 1889	Removed June 28, 1893
Charles F. Easley	June 28, 1893	Resigned August 3, 1897
Quinby Vance	July 26, 1897	
Morgan O. Llewellyn	January 29, 1902	Resigned December 12, 1907
John W. March	January 13, 1908	Resigned March 12, 1914
Lucius Dills	March 20, 1914	
Manuel A. Sanchez	April 7, 1922	

Office abolished by Act of March 3, 1925, 43 Stat. 1141. Equipment and records transferred to Field Surveying Service July 1, 1925.

OFFICE OF SURVEYOR GENERAL OF NORTH DAKOTA

Name	Appointment or Date of Commission	Remarks
George D. Hill	March 28, 1861	Surveyor General of Dakota Territory Opened July 1, 1861, in Yankton, South Dakota
William Tripp	May 23, 1866	Yankton, South Dakota
William H. H. Beadle	April 17, 1869	Resigned
William P. Dewey	December 18, 1872	
Henry Espersen	April 25, 1977	
Cortez Fessenden	May 10, 1881	Moved to Huron, South Dakota, July 2, 1883
Maris Taylor	May 27, 1885	Removed July 18, 1889
Boetius H. Sullivan	July 18, 1889	
Erastus A. Williams	April 25, 1890	Surveyor General of North Dakota Opened in Bismark, North Dakota, July 15, 1890
Andrew Blewett	May 29, 1894	Bismark, North Dakota
Erastus A. Williams	May 3, 1898	

Office closed and records transferred to the State of North Dakota July 1, 1908.

OFFICE OF SURVEYOR GENERAL OF OHIO

Name	Appointment or Date of Commission	Remarks
Rufus Putnam	November 5, 1796	Opened in Marietta, Ohio
Jared Mansfield	November 3, 1803	Moved to Cincinnati, Ohio, in May 1805
Josiah Meigs	November 24, 1812	
Edward Tiffin	November 1814	Moved to Chillicothe, Ohio, November 1814
William Lytle	July 3, 1829	Moved to Cincinnati, Ohio, in July 1829 Died March 18, 1831
Micajah T. Williams	April 23, 1831	
Robert T. Lytle	April 13, 1835	
Ezekiel S. Haines	June 6, 1838	
William Johnston	June 11, 1842	
Lucius Lyon	June 23, 1845	Moved to Detroit, Michigan

The Ohio office was closed in June 1845 and moved to Detroit; the records were transferred to the State of Ohio on August 11, 1845. Subsequent surveys were made under the Commissioner of the General Land Office.

OFFICE OF SURVEYOR GENERAL OF OREGON

Name	Appointment or Date of Commission	Remarks
William Gooding	September 28, 1850	Declined
John B. Preston	November 22, 1850	Opened May 5, 1851, at Oregon City, Oregon
Charles K. Gardner	June 30, 1853	Moved to Salem, Oregon, August 1, 1854
John S. Zieber	March 18, 1856	Salem, Oregon
William W. Chapman	March 22, 1859	Moved to Eugene, Oregon, October 25, 1859
B. J. Pengra	June 13, 1861	
Elisha L. Applegate	March 14, 1865	
William H. Odell	December 9, 1870	
Benjamin Simpson	February 28, 1874	Moved to Portland, Oregon April 1, 1875
James C. Tolman	April 27, 1878	Resigned June 1, 1886
Douglas W. Taylor	July 20, 1886	
William Henry Byars	June 12, 1890	
John C. Arnold	August 4, 1894	Died August 24, 1896
Robert A. Habersham	September 22, 1896	
Henry Meldrum	April 26, 1901	Removed March 14, 1903
John D. Daly	March 16, 1903	Died October 4, 1907
George A. Westgate	October 15, 1907	
Edward G. Worth	April 24, 1913	
Wesley W. Caviness	November 15, 1921	

Office abolished by Act of March 3, 1925, 43 Stat. 1141. Equipment and records transferred to Field Surveying Service July 1, 1925.

OFFICE OF SURVEYOR GENERAL OF SOUTH DAKOTA

Name	Appointment or Date of Commission	Remarks
Warner Lewis	April 23, 1853	Surveys began in Dakota Territory in 1859 under Surveyor General at Dubuque, Iowa
George D. Hill	March 28, 1861	Surveyor General of Dakota Territory Opened July 1, 1861, in Yankton, South Dakota
William Tripp	May 23, 1866	Yankton, South Dakota
William H. H. Beadle	April 17, 1869	Resigned
Henry Espersen	April 25, 1877	
Cortez Fessenden	May 10, 1881	Moved to Huron, South Dakota July 2, 1883
Maris Taylor	May 27, 1885	Removed July 18, 1889
Boetius H. Sullivan	July 18, 1889	Surveyor General of South Dakota Act of April 10, 1890 Removed January 8, 1894
Richard B. Hughes	January 20, 1894	
Frank A. Morris	January 12, 1898	
Clark B. Alford	November 27, 1907	
William A. Lynch	March 23, 1916	Closed June 30, 1922

Records transferred to State of South Dakota in 1923.

OFFICE OF SURVEYOR GENERAL OF UTAH

Name	Appointment or Date of Commission	Remarks
David H. Burr	March 7, 1855	Opened in Salt Lake City, Utah, July 27, 1855
John C. Hays	July 13, 1857	Salt Lake City
Samuel C. Stambaugh	May 19, 1859	(Vacated in 1861)
Francis M. Case	April 5, 1861	Utah surveys under Surveyor General of Colorado at Denver, Colorado
John Pierce	March 16, 1863	Denver, Colorado
William Lessig	March 20, 1867	
John A. Clark	July 28, 1868	Reopened Utah Office in Salt Lake City, Utah
Courtland C. Clements	July 7, 1869	
Nathan Kimball	December 17, 1873	Suspended July 3, 1877, by President's Order Restored by Secretary's Order, August 10, 1877
Frederick Salomon	February 13, 1878	Suspended October 12, 1885
Richmond S. Dement	October 12, 1885	
William G. Bowman	August 6, 1886	Died November 29, 1888
Ellsworth Daggett	May 6, 1889	Removed June 28, 1893
George W. Snow	June 28, 1893	
Jacob B. Blair	September 16, 1897	Died February 12, 1901
Edward H. Anderson	March 2, 1901	
Thomas Hull	July 26, 1905	
Ingwald C. Thoresen	March 13, 1914	Removed September 19, 1921
Erastus D. Sorenson	September 27, 1921	

Office abolished by Act of March 3, 1925, 43 Stat. 1141. Equipment and records transferred to Field Surveying Service July 1, 1925.

OFFICE OF SURVEYOR GENERAL OF WASHINGTON

Name	Appointment or Date of Commission	Remarks
James Tilton	August 1, 1854	Opened in Olympia, Washington, March 1855
Anson G. Henry	July 17, 1861	Drowned July 30, 1865
Edward Giddings	August 1865	Acting during vacancy
Selucius Garfield	February 19, 1866	
Elisha P. Ferry	April 17, 1869	
Lewis P. Beach	May 14, 1872	Died April 29, 1873
William McMicken	May 12, 1873	
J. Cabell Breckinridge	April 23, 1886	Removed July 8, 1889
Thomas H. Cavanaugh	July 8, 1889	Resigned June 24, 1892
Amos F. Shaw	June 30, 1892	Removed January 29, 1894
William P. Watson	February 7, 1894	
William McMicken	February 12, 1898	Died September 9, 1899
Edward P. Kingsburg	October 19, 1899	Resigned March 1, 1913
Edward A. FitzHenry	June 6, 1913	
Clair Hunt	July 27, 1921	

Office abolished by Act of March 3, 1925, 43 Stat. 1141. Equipment and records transferred to Field Surveying Service, July 1, 1925.

OFFICE OF SURVEYOR GENERAL OF WISCONSIN

Name	Appointment or Date of Commission	Remarks
Robert T. Lytle	April 23, 1835	Wisconsin Territory by Act of April 20, 1836 Surveys were under Surveyor General at Cincinnati, Ohio
Albert G. Ellis	June 28, 1838	Surveyor General of Wisconsin and Iowa Opened at Dubuque, Iowa, in February 1839
George W. Jones	February 4, 1840	At Dubuque, Iowa
James Wilson	April 24, 1841	
George W. Jones	May 9, 1845	
Caleb H. Booth	January 12, 1849	
George B. Sargent	March 24, 1851	
Warner Lewis	April 23, 1853	
Thomas J. Townsend	May 6, 1861	
Henry A. Wiltse	January 29, 1863	Closed June 30, 1866

Records transferred to State of Wisconsin on August 1, 1866. Subsequent surveys made under the Commissioner of the General Land Office.

OFFICE OF SURVEYOR GENERAL OF WYOMING

Name	Appointment or Date of Commission	Remarks
Silas Reed	March 2, 1870	Office opened in Cheyenne, Wyoming
Hiram Latham	March 26, 1873	
Silas Reed	July 18, 1873	Resigned August 23, 1875
Edward C. David	August 23, 1875	
John W. Meldrum	July 3, 1884	Resigned July 20, 1885
John Charles Thompson	November 20, 1885	Removed July 18, 1889
William A. Richards	July 18, 1889	Removed September 29, 1893
Perry Bickford	October 23, 1893	Resigned August 9, 1894
John Charles Thompson	September 5, 1894	Removed July 17, 1897
Alpheus P. Hanson	July 22, 1897	Removed June 21, 1913
Charles L. Decker	September 25, 1913	
Cyde W. Atherly	October 6, 1921	

Office abolished by Act of March 3, 1925, 43 Stat. 1141. Equipment and records transferred to Field Surveying Service, July 1, 1925.

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Innumerable miscellaneous text books, encyclopedia, publications by other authors, newspaper, library and historical society reference departments, and articles printed by the American Congress on Surveying and Mapping, were used as references, in the preparation of this book. Reference was frequently made to the original field notes and plats of the public land surveys.

APPENDIX
to
A HISTORY OF THE RECTANGULAR SURVEY SYSTEM

by
C. Albert White

INTRODUCTION

The following pages contain copies of selected letters, circulars, instructions and Manuals pertaining to the public lands surveys. Until 1910, the surveys were executed by Deputy Surveyors under contract with the Surveyors General. The Surveyors General were under the overall supervision of the Secretary of the Treasury and, after 1812, the Commissioner of the General Land Office.

Every effort has been made to retain the authenticity of the copies with regard to spelling, punctuation and phraseology. In the interest of space the documents are reduced to a printed form, requiring a change in the length of lines, but still retaining the paragraphing and other details as much as practicable. In the General Instructions to the Deputy Surveyors and in the Manuals of Surveying Instructions the page numbers are indicated, though there may (now) be several pages of the original printed on one page of this volume. The format of the sample field notes has been retained as much as possible. Due to the large volume of sample field notes, many pages of them have been deleted here but enough retained to show the general format and terminology. The text indicates the pages which have been deleted. Most of the mathematical tables have also been deleted because they had no direct bearing on the policies or procedures used in the original surveys.

A brief introductory statement precedes each document, indicating the source from which the copy was made.

I.

(The following letter and "plan of instructions for the District Surveyors" was sent to Gallatin by Jared Mansfield, Surveyor General. Both are copied from a microfilm of the original, Microcopy No. 478, National Archives.)

Marietta, August 20th, 1804

Sir:

I had the honour of receiving your letters of the 17th & 26th Ultimo by the last mail. In conformity to your request I enclose a plan of instructions for the District Surveyors, together with the number of miles, in each case, which I apprehend should be allowed them, according to the law, in estimating their fees. As to what they would have a right to demand on the principles of justice independent of the law, I am not settled in my opinion. It strikes me however, that the estimate does not deviate much from what is right in itself. In the division into quarters of a section surveyed under the law of 1800, there is indeed a large proportion of the traversing not allowed; but for this, the Surveyor will ultimately be compensated by the allowance of fees for each quarter, after the division for the first, which will require no resurveying. As Chain carrying & marking are comprehended in the very business of surveying, I cannot conceive that the expense of them should be defrayed by anyone other than the District Surveyor himself, especially as the law allows precisely the same sum per mile, as to any other Deputy Surveyor, who is always obliged to furnish everything incident to the business at his own expense.

I am making preparations to descend the river by the 15th of the next month. I think it necessary for me to be at Vincennes as early as possible, in order to fix my plans for the survey of the tract about that place, & particularly to endeavor to draw a number of meridian lines, with a view of rendering the surveys correct. It will be a public loss, & a subject of much regret to me if any accident should have injured or destroyed the instruments, or even if they should not arrive here this fall. In going down the river I may make some useful Astronomical Observations for settling the Latitudes & Longitudes of places, & I would derive no small advantage even in common Surveying from the use of some instruments I expect.

I have the honour to be Sir
Your Obdt. Humble Serv.
Jared Mansfield

Hon. Albert Gallatin
Secretary of the Treasury

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A plan of Instructions for the District Surveyors

The law of the last session of Congress, authorizing the sale of the public lands in quarter sections, & appointing District Surveyors, requires that the division of sections into halves & quarters should be made by lines running due East & West, & North & South; this however must be considered as merely descriptive of lines parallel to the boundaries of the tracts which have been surveyed; which boundaries, theoretically & by law are contemplated as running due North & South, & East & West. In practice these are found to deviate very considerably from what was intended, & the dividing lines drawn according to the strict interpretation of the law, will not only in such cases divide a tract very unequally, but cause it to differ materially in the contents of the subdivisions from the returns of the Surveyor General.

I conceive, therefore, that in all cases of the subdivision of any tract, the marks heretofore made by Surveyors for the corners of sections, or half sections are to be considered as invariable, & when found on the opposite sides of any tract, the division must be effected by running true line from one to the other, & in case of a further subdivision where there have been no marks for corners set by the Surveyors, the lines on each boundary must be measured, & posts established at the center, at an average distance from the corners, & the dividing lines run as before.

-2-

On these principles, with a view of providing uniformity & correctness in the surveys, I conceive it may be necessary to exhibit in detail the manner of proceeding in particular cases.

Case 1st

When a tract of 2 miles square surveyed under the law of 1796, is to be divided into sections.

Suppose A, C, E, G (No. 1 in the plan) to be the tract, & B, D, F, H, the posts set for the corners of the sections. Begin at one of those posts suppose F, & run a random line for its opposite post B; at the distance of every 5 chains from F, as you proceed on the random line, place a stake, until you have intersected the boundary line at b; measure the departure or distance of this point from B. Return on the line b,F, & from the marks on it, take offsets on that side where the point B lies, from every stake which you had set, in such proportion to the departure Bb, as your distance from F is to the whole distance bF, these will determine the points e, f, g &c in the true line from B to F. Blaze the true line from B to e, from e to f, from f to g, &c until you shall have arrived to F, & you will have completed the true divisionary line BF.

Proceed in the same manner, by running a random line Hd, in order to find the true line from H to D; at the intersection of the true lines at c, establish the center post for the corners of the Sections.

In this case the lines actually run & marked for a section are

-3-

FB = 2
AD = 2 – 4. price at $3 - $12

Case 2

When a half or quarter section is to be surveyed from the above tract of 2 miles square.

Proceed as before to run the divisionary FB, HD; but in going on the 1st random line from F to b, (No. 2 in the plan) set up a temporary post, at the estimated distance of the center of the line Fb, at 0, & in advancing on the 2d random line from H to d, note the distance of the point of intersection at n from H & from d; this will enable you to set off the quarter section corners, from the center c without a re-measurement of the interior sides of the sections; for adding mO to Ob, and subtracting it from FO, you will have mb & Fm, or cB & Fc; half these lengths laid from c to p, & from c to q respectively, will give the corners of the quarter sections on the line FB, & by laying half Hn from c to v, & half nd from c to s, you will have the corners v & s of quarter sections on the line HD. Or temporary posts may be placed for the corners of the quarter sections, after the random lines have been measured, & the distance from the temporary center post to the boundary lines of the tract has been determined. Afterwards the posts are to be permanently fixed, when the deviation of the central temporary post from the true dividing line shall have been ascertained.

-4-

The marks for the corners of the quarter sections, on the divisionary lines being made, you will next proceed to establish the corners on the exterior lines of the Section which is to be divided.

Suppose Section 7 (No. 2 in the plan) is to be divided; measure the distance from E to F, & establish the post v at half that distance; measure the distance from E to D, & establish the post w in like manner. By running random lines from v to x, & from q to y, & by taking offsets at the distance of every 5 chains, in the manner prescribed for the division of a tract of 2 miles square, you will ascertain & mark the true divisionary lines vs & qw; at the intersection of these at z the central post for the corners of the quarters of the Section must be established.

In case of a division for an half section, which by law can only be made by lines running due North & South, you need only find the center of the line FE, viz. at v, & run & mark as before the true divisionary line vs, which will divide the section into its East & West halves.

In this case, the lines actually run & marked for the 1st half section are miles

HD = 2
FB = 2
vs = 1 = 5 miles, price $15

For another half section, (as in Sect. 14 of the plan), the lines for the division having been previously run & marked except vg, on the principle of the law which allows payment for those lines only which have been run & marked, we can only reckon vg

-5-

= 1 mile & the price $3.

1st Quarter Section

HD = 2
FB = 2
vs = 1
qw = 1 =6 - Due $18

For any subsequent quarter Section (as in Sec. 14 in the plan)

vg = 1
hp = 1 = 2 miles Due $6

Case 3

When a division is to be made of a section surveyed according to the Law of 1800, either into halves or quarters.

1st When the dividing line for the half section is to be determined, begin at one of the half mile posts already set, as at E (No. 3) & by means of a random line & offsets, running & blazing the true dividing line FB. The distance actually run & marked for the 1st Section is that of the line EB = 1 mile - price - $3

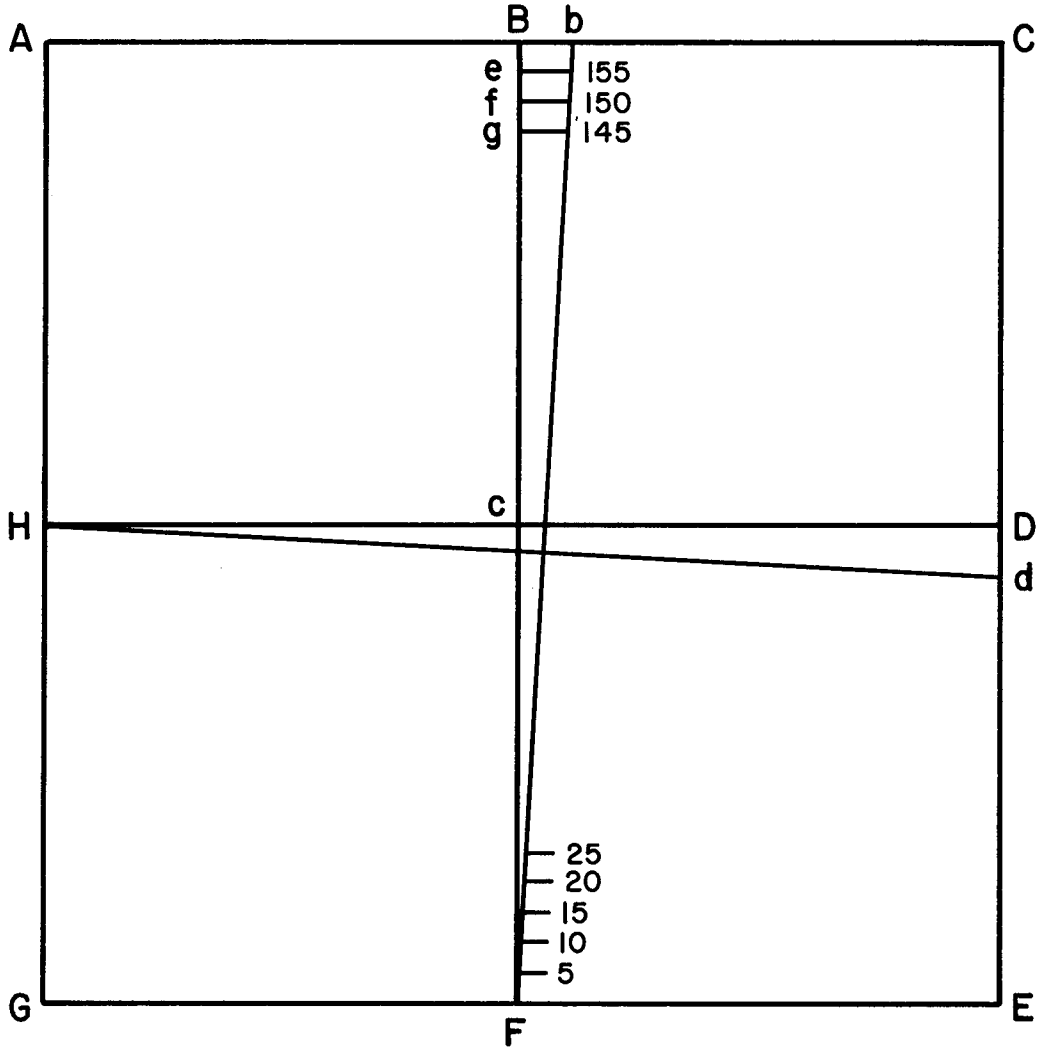
The quarter sections in this case, must be determined by first measuring the North & South lines AF, CD, & establishing posts at the bisecting points f & d, & then by means of random lines & offsets, running & blazing the true dividing line fd.

The distance actually run & marked, for the 1st quarter, or that which may be made prior to any other division will be

EB = 1
fd = 1 = 2 miles price $6

For each 2d quarter or one made after the 1st division into halves

fd = 1 mile - price $3



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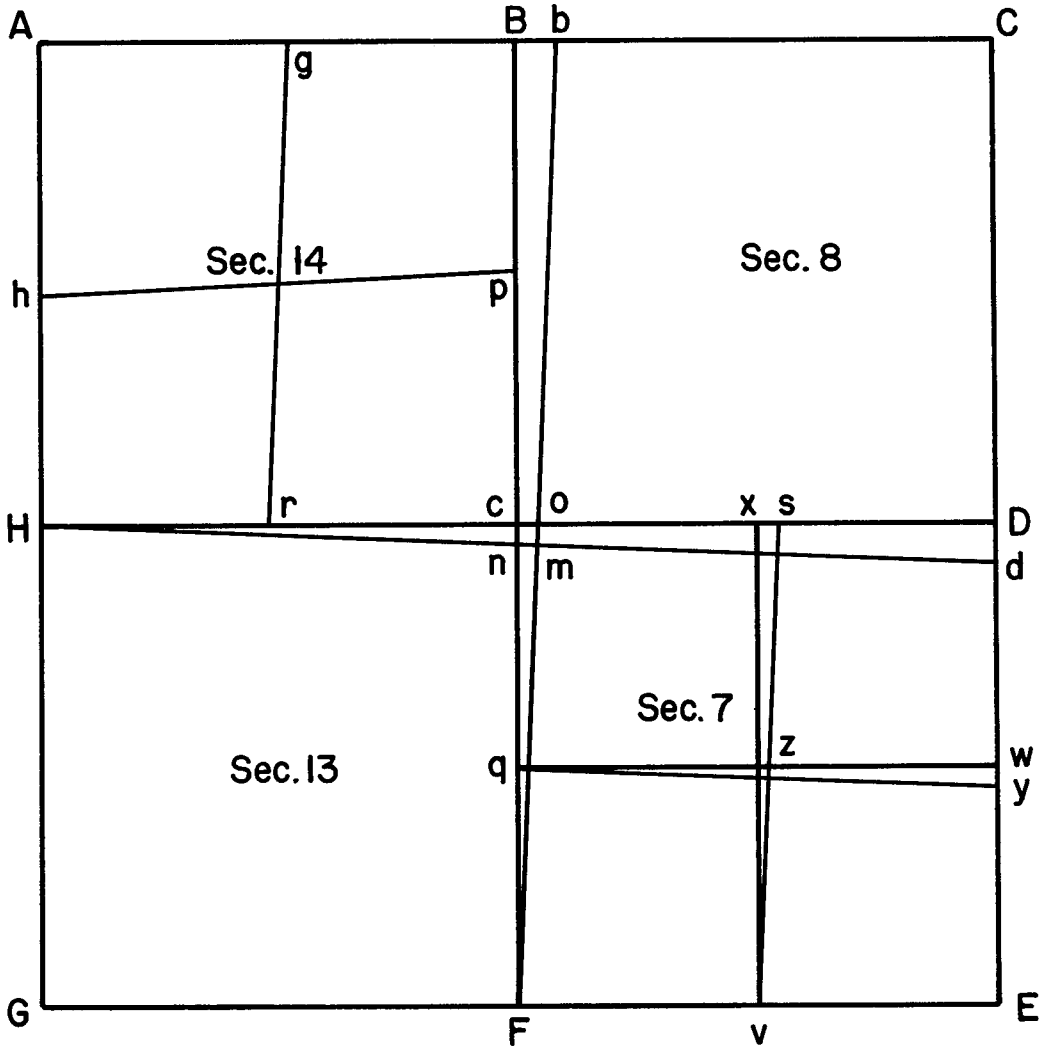

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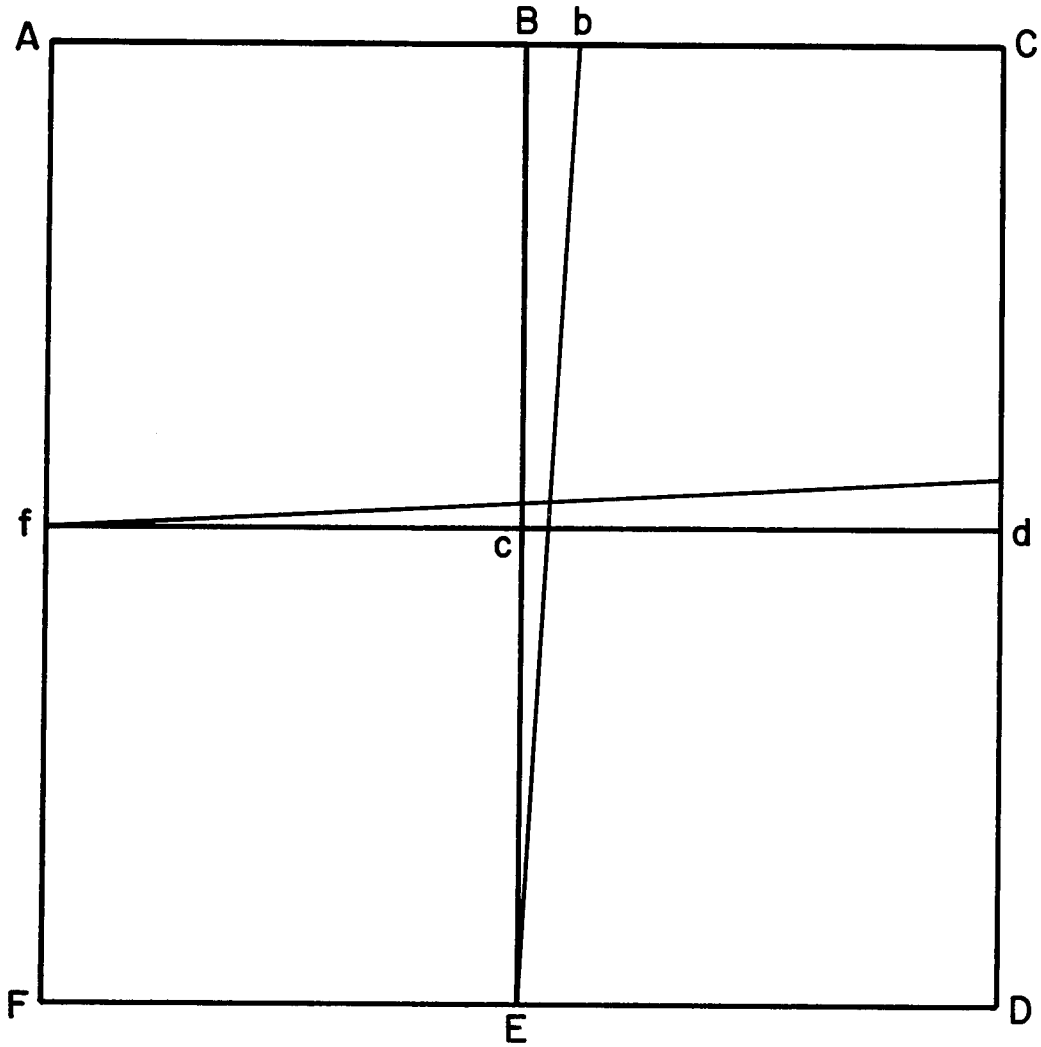

No. 3

II.

(The handwritten copy of these instructions was found in Records of the Michigan Department of Conservation, Lands Division. They are believed to be a blank copy of instructions, prepared by Jared Mansfield, to be completed and issued to a Deputy Surveyor along with his contract.)

General Instructions to Deputy Surveyors

1st. The Instrument called Ritenhouse Compass with a Nonius & a common 2 pole chain of 50 links, are to be used in running & measuring your lines. You will be careful that the needle traverses well in your compass, &, that your chain be compared & adjusted by the standard chain in the Office of the Surveyor General. It will be of importance that your Instruments, be also occasionally examined when in the Field; & corrected or allowances be made for the variations & errors if any should be found in them.

2nd. Whenever you may be prevented by insuperable Obstacles such as Swamps, Ponds, Rivers, Creeks &c from measuring by the chain on the true course of your line; the distance must be ascertained by Trigonometry or by a traverse very accurately run & measured, untill you fall in with the true line.

3rd. The Courses of all navigable rivers, which may bound or pass through your district must be accurately surveyed & their width in several places must be determined, & all those points where they may pass through the sectional or township lines which you will run. You will likewise not fail to make especial notice of all streams of water which fall into the rivers with their width & course from whence they appear to come.

4th. All Township & sectional lines which you may survey, are to be marked in the manner hitherto practised in surveys of the United States lands - vis. All those trees which your line cuts, must have two notches made, on each side of the tree where the line cuts;

[Page 2]

but no spot or blaze is to be made in them; & all or most of the trees on each side & near the line must be marked with two spots or blazes, diagonally, or quartering towards the line.

5th. Posts must be erected at the distance of every mile & half mile from where the Town or sectional line commenced, (except a tree may be so situated as to supply the place of a post) which post must be at least 3 inches diamater & rise not less than three feet. All mile posts must have as many notches cut on two sides of them as they are miles distant from where the line commenced; but the Town Corner posts or trees shall be notched with six notches on each side, & half mile sectional posts. [Ed. Note: The Tiffin instructions, which are much the same in this part, say "... the half mile sectional posts are to be without any marks;" indicating a possible omission in this copy of the instructions.]

The places of the posts are to be perpetuated in the following manner viz. at each post the courses shall be taken & distances measured to two or more adjacent trees in opposite directions as nearly as may be, which trees called *bearing trees*, shall be blazed on the side next the post & one notch made with the axe in the blaze, & there shall be cut with a marking Iron, on a bearing tree or some other tree near each corner of a section, the number of the section & over it the letter T with the number of the town & above this the letter R with the number of the range; but for the half section corners you are to put no numbers on the trees; they are to be distinguished by this mark ¼ S

6th. You will be careful to note in your field books all the courses & distances, you shall survey, the names & estimated diamaters of all Corner & bearing trees & those trees which fall in your line, called *station or line trees,* notched as aforesaid, together with the courses & distances

[Page 3]

of the bearing trees from their respective corners, with the letters & numbers marked on them as aforesaid, all rivers, creeks, springs & smaller streams of water, with their width, & the course they run in crossing the lines of survey, & whether navigable, rapid or otherwise also the face of the country, whether level, hilly or mountainous, the kinds of timber & undergrowth, with which the land may be covered, all swamps, ponds, stone quarries, coal beds, peat or turf grounds, the quality of the land, uncommon natural or artificial mounds, precipices or rocks all rapids, cascades, or falls of water, minerals, ores & fossils & all other natural or artificial permanent things over which your lines shall pass. The quality of the soil, & the true situation of all mines, salt licks, salt springs & mill seats which may come to your knowledge, are particularly to be regarded & noticed in your field notes.

7th. In all measurements, the level or horizontal length is to be taken not that which arises from measuring over the surface of the ground, when it should happen to be uneven & hilly, for this purpose the chainman, in ascending or descending hills must alternately let down one end of the chain to the ground & raise the other to a level as nearly as may be, from the end of which a plumb should be let fall to ascertain the spot for setting the tally rod or stick & where the land is very steep, it will be necessary to shorten the chain by doubling the links together, so as to obtain the true horizontal measure.

8th. Though the lines be measured by a chain of two perches you are notwithstanding to keep your reckoning in chains of four perches of one hundred links each & all entries in your field books & all your plans & calculations must be made according to the decimal measure of a chain.

[Page 4]

Your courses & distances must be placed in the margin of your field books on the left, for which purpose, it should be large & your remarks noted on the right in the manner following.

North 40.C.[s]	Between Sections 35 & 36, Town. 4, Range 5. Set half mile post, from which a black Oak 20 Inches diamater bears S 5° E 50 links & a sugartree 15 Inches diamater bears N 5° W 30 links
Chs Lks 80.00	Set post corner of sections No. 25, 26, 35 & 36, Town. 4, R 5. from which a white Oak 10 Inches diamtr. bears S 78° 30′ E 20 links and a hickory 15 Inches diamater bears N 50° W 30 links distant.
West 15.70	Between Sections No 25 & 36, Town. 4, Range 5 Over level upland to a brook 50 links wide course S 20° W _____ timber, Oak, Hickory, Ash &c
40.00	Set half mile post from which a Black Jack 10 In. diam.[r] bears S 50° E 100 links & a white Oak 20 In. Diam.[r] bears N 25° W 10 links
55.00	A white Oak 10 In. Diam.[r]
80.00	Intersected North & South line at the post corner of sections No 25, 35 & 36, Town 4, Range 5. This mile generally broken land, some bottom on the creek, timber, Oak, Ash, Hickory &c.

In this manner you are to enter all courses & distances, with the remarks which your contract & instructions require you to make of all the surveys in which you shall be engaged, the date to follow the close of each days work; which Field Book written with a fair hand of each township seperately, or true & fair copy with the original, you are to return to the Surveyor General's Office, together with the plats & descriptions of your surveys.

9th. Plats of each Township and fractional parts of a township are to be neatly & accurately protracted, on durable paper, by a scale of two inches to a mile, or forty chains to an inch & must be just & true in every part, the scale must be laid down at the foot, or on the margin of all plats, & a compass or at least the cardinal points, shewing the true & magnetic meridian & their variation, On the exterior lines of your plats the course & length of each is to be noted, when it varies from a true North & South or East & West line, with the names of the proprietors, Range, Township or Section bounding thereon.

The number of the Township, Range & District of Country, in which it lies must also be inscribed on the foot or margin of the plat.

The field books & plats of all surveys must be returned into the Office of the Surveyor General, within the time specified by the instruction & contract, which authorize any particular survey. And there shall be inscribed on the plat of each township & signed by you, a certificate of the following form bearing date the day when the survey was finished viz.

Pursuant to a Contract with & instructions from
Surveyor General of the United States,
bearing date the day of I
have admeasured, laid out & surveyed the above described township, or fractional part & do hereby certify, that it had such marks & bounds, both natural and artificial as are represented on said plat & described in the field notes made thereof & returned with the plat into the Surveyor General's Office.

Certified this day of 18

III.

(These Instructions to Deputy Surveyors were written by Thomas Freeman, Surveyor of the Land South of the State of Tennessee. This copy was sent to Gideon Fitz, a Deputy Surveyor. The location of the original is presently unknown.)

Surveyors Office Washington M. T.
June 1811

Instructions to Deputy Surveyors for surveying the public lands adjoining navigable streams, Lakes, Bayous, etc. in the Orleans Territory under 2d Sect. of the Act of the 3d of March, 1811.

The Surveyor should first take an accurate survey of the margin of the water course so far as surveys of tracts are to be extended thereon. Then lay down his survey on the large scale; and draw thereon right lines in the direction of the general course of the water course, and on these lines lay off the lengths of fronts of tracts 58 Rods or 14.50 (Ch. Lks.) chains and through these points draw right lines at right angles to the line first drawn which shall extend back from the margin of the water course 465 Rods or 116.25 (Ch. Lks.) chains and close his tract by drawing a back line at right angles to his side lines, or parallel to his first line, when the water course happens to be straight or nearly so, the back line of one tract may be extended so as to become the back line to several adjoining tracts.

The side lines of the same tract, will frequently be of different lengths, and insect the dimensions & contents of these tracts will frequently differ from each other, but that cannot be avoided. The law in this case can very rarely be accurately complied with in consequence of the very great irregularities of the water courses. Any unavailable and unimportant deviations from the Law, should be in favor of the neatness and convienence of the survey. On large curves or bends of the water course the side lines of tracts should be drawn converging, or diverging, as the case may require. Converging on the concave side to prevent the tracts from interfering with each other and diverging, on the convex side to avoid the inconvenience of small angular vacancies which would remain between the tracts if the side lines were drawn parallel to each other; In these instances the back lines may be drawn at right angles to one of the side lines and at 465 Rods from the margin of the water course, or front, which will necessarily make all the tracts having diverging side lines something larger than required. The tracts having converging sides would contain less, but the fronts of these should be extended so that the lines may include the quantity required or nearly so. It appears to be the object of Government to attach the fronts on the water courses all the lands from thence within the distance prescribed 465 Rods.

In short we may suppose any lake, bayou, water course, etc. to be circumscribed by lines drawn at 465 rods from the general course of its margin, and that the space included between these lines and the water course is to be divided into tracts of 58 Rods front and 465 Rods in depth. It should be the first object of the artist whose duty it becomes to designate those tracts to take an accurate survey of the water course, to lay that survey down on a large scale, and to divide the space as above into tracts as nearly conformable to the law as possible; To draw his lines on his Map both side and back lines noting their respective courses and distances; Thus prepared the surveyor can with great ease and accuracy transfer these lines of tracts from his plan to the ground and complete his survey agreeably to the intention of the Law and wish of the Government.

The first and principal object of the surveyor should to have his lines accurately run, distinctly marked, and the contents of his survey correctly ascertained. It is much more desirable both to the Government, and purchaser, that the lines of a tract of land should be plainly designated and its contents correctly determined, than that its dimensions should be precisely a given number of chains and links. Should one tract occupy a larger or better front on a water course than another, it will be more valuable, and consequently sell for more than the other.

The surveys contemplated by the 5th section of the Act above mentioned will be so very few in number if any for 2 years to come, that it appears almost unnecessary to say anything on that subject at this time, should application be made by any of the owners of front tracts, to have a back tract surveyed adjoining him, and only on application of proprietors of front tracts are these surveys to be made. The law is very plain on that subject. The front tract should not exceed 40 arpents in depth to Entitle its owner to an adjoining back tract: The back tract is not to Exceed 40 arpents in depth, nor to contain a quantity greater than the front tract, neither shall the back tract in any instance extend so far in depth as to include lands fit for cultivation on another water course, etc.

The only difficulty that can arise in marking these surveys is when, by reasons of bends in the River, lake, etc. bordering on and in rear of front and adjoining tracts; each claimant cannot obtain a tract equal in quantity to his front front tract; in that case the vacant land, in the rear is to be divided between the claimants in the direct ratio of the quantity contained in their respective front tracts.

Should the parties not consent to abide by the decision you may deem proper the make, you will send me a correct statement of the case, and I will make a division of these lands which shall be carried into Effect.

REMARKS

The Law does not point out any mode of marking or numbering the tracts to be surveyed under the 2d Sect. of the Act, so that they may be distinctly known from each other, this appears to be a defect which if not remedied will be productive of great trouble and inconvenience both to the Register & purchaser.

The following manner of marking those tracts is recommended. Let the tracts be numerically numbered from some well known point or land mark, such as a Bluff, the junction of some Bayou or water course, or the intersection of some of the meridians or parallels already run. Thus lot N. 1.2.3. etc. as it may be above or below the land mark (naming it) and on

the right or left of the water course as it may be situated. The surveyor should set a strong squared picket in the side of each track near the margin of the water course noting its distance therefrom. These pickets should be set firmly in the ground and numbered on each side with a marking Iron the number of the adjacet tract; the course and distance from this picket should be taken to a tree if convenient on each tract, which tree is to be numbered with No. of the tract on which it stands; a picket should in like manner be set in the ground at the termination of the side lines and the bearing and distance taken to two trees which shall be marked and No.^{d} as above. The whole is to be carefully noted in his field Book.

When the Surveyor shall find it impracticable from the interposition of lakes or impenetrable swamps etc. to extend his side lines their full extent required and to complete his tract by running the back lines he should set a picket at the termination of his side line which picket is to be marked with the No. of the adjoining lots and courses and distances taken from it to two trees which shall also be marked and numbered as in the first instance.

Should the depth required (465 Rods) extend so near another water course as to interfer with, or include lands fit for cultivation on it. Fronts of tract should be laid off on both water courses, and the lands between these water courses should be equally divided between the fronts on each. Provided the distance between the fronts or water courses be two miles or nearly so.

These surveys will frequently lie between private claims or tracts already surveyed, in that case the front or tracts may benumbered from one of those former surveys to the other; and should a fraction remain it should be annexed to the adjoining tract without running the side line between them.

I must here repeate a request I made when I first wrote to you on this subject. To report to the office as early as possible the number of tracts that can and ought to be surveyed either under the 2^{d} Section of the Act above mentioned or in the usual way into Townships and Sections and what No. of the latter description are already prepared for sale. Taking it as a positive order that no new surveys of either description shall be made this year but such as are immediately saleable, or will be certain to be sold in a reasonable time.

The enclosed diagram exhibits the mode recommended for laying off tracts on water courses etc. under the 2^{d} Sect. of the Act above mentioned. The Red lines represent the general course of the River etc. on which the fronts of the tracts are laid down. The courses and distances of the side and back lines can very readily be ascertined on the Map; and from thence with care and accuracy be transferred to the ground.

Any difficulty that may arise to you in the execution of this or any other part of your duty as connected with this office you will from time to time communicate to me and I shall with pleasure give you my advice and assistance thereon.

I am respectfully
Your Obt. Servant

Thos. Freeman

Gideon Fritz, Esq.
PD Surveyors

IV.

(This Letter from Josiah Meigs to Thomas Freeman is taken from Microcopy No. 27, National Archives.)

Treasury Department
General Land Office 13th
Mar. 1815

Sir,

I have acknowleged the receipt of your letter of the 13th Ult.° with the township plats, connecting plat, & list of british claims *reported,* mentioned in said letter. Commissioners have been appointed to mark the boundaries of the lands lately acquired from the Creeks, & the law directs them to furnish you with a copy of the survey; enclosed you have a copy of the said law, entitled "An act to provide for the ascertaining & surveying of the boundary lines fixed by the treaty with the Creek indians & for other purposes.

You observe that "the *descriptions* of the townships which you transmitted, do not accompany them because the deputy surveyors seldom or never noted the description of the soil or timber, nor have they taken references to, or lettered trees at the corners of the townships or sections."

I am astonished by this information, were not the deputies bound by contract, & by their official oaths to note the soil & timber, etc. & to mark the corners? If so, why were they paid before they had completed the contract? How will purchasers find their land? How will explorers know the township & ranges they traverse?

I am very respectfully
Your ob't servant
Josiah Meigs
Commissioner

Thos. Freeman, Esqr.
Surveyor General
Washington M.T^y.

V.

(This letter from Thomas Freeman to Josiah Meigs is taken from the publication General Public Acts of Congress with Instructions, Vol. II, 1838.)

THOMAS FREEMAN TO JOSIAH MEIGS

[GLO:Div. E, Miss. SG, vol. 53, 1810-1816:ALS]

Surveyor's Office Washington, M, T^y, April 29th 1815

SIR I have to acknowledge the rec^t of your letter of the 13th Ult° enclosing a copy of the law providing for the designation of the boundary lines fixed by the Treaty with the Creek Nation of Indians —and acknowledging the rec^t of my General & connected map of the Natchez settlement, and of the Township maps accompanying it.—

Your "Astonishment by the information that the deputy Surveyors did not mark & letter Trees at the corners of Townships & Sections within the limits of that Map", was reasonable & just, but, you will perceive, that the deputies were not so much to blame, when you are informed, that they were not instructed to take reference to, nor letter trees, at those corners—This omission however has only extended to the Survey of the Tract of country embraced by the Map above mentioned—& Washington County on the Tombigby river & adjoining the Line of demarkation contain^g about 30. Townships.—These surveys were made under the superintendance of Mr Briggs, who was the first surveyor of U. States lands South of Tennessee, The surveyors were paid & disperced and the principal himself had left the country long previous to my arrival here, so that I had no other agency or control over that survey, than, a variety of resurveys & corrections of the inaccuracies & blunders commited by Mr Briggs' deputies—

In all other surveys of public lands South of Tennessee, The Marking, Numbering & Lettering, of Refirence trees at the corners, or Angles, of Townships & Sections has been made part of the Surveyor's duty and punctually complied with.—I find by Mr Briggs' Instructions to his deputies that he was very attentive to the careful running, measuring & marking, Township & section Lines, but his mode of numbering & lettering corners was only on *posts* set in the ground at those corners—as will appear by the subjoined extract from his Instructions to his Deputies.

You ask "How will purchasers find their lands?—how will explorers know the Townships & ranges they Traverse?"—The difficulty to purchasers & Explorers, from a want of the proper Numbers & letters on the Trees, at corners of Townships & Sections in the Survey of the above mentioned Map, is not so great as may at first appear—That portion of it, clear of Private Claims, was Offered for sale whilst the corner posts were standing; and its surface is now intersperced with settlements of Purchasers, and Intruders or Squatters, who know the numb^r Township & Range of their respective positions—som corner Posts are yet standing—and the relative position, of other points, not sufficienty designated in the

field, can readily be ascertained in This, or the Register's office, by inspection of the Maps—. The vacant Sections & fractional sections lying between private claims and intersperced thro' the settlement will generally be purchased by the proprietors of the adjoining Tracts or their friends, The position of these vacant sections with respect to the adjoining or neighbouring Tracts, will be distinctly known to the purcher or explorer—and their Number Range & Township can readily be ascertained on application to the Maps—We cheerfully give all the Information applied for or required on this subject, which is generally satisfactory to applicants—so that no difficulty has yet occured on this subject & I hope there will not hereafter.

Extract from Mr Briggs Instructions to his deputies whilst Superintending the Survey of the public lands south of Tennessee—

"The lines must by carefully measured and *Well Marked* A Tree standing exactly in the Line, should have a Blaze & four Notches for a Township Line—a Blaze and three Notches for a Section Line on each side of it in direction of the Line. All Trees within a short distance on each side of your Line should be simply Blazed on the side facing your line.—Plant a strong substantial post at every corner of a Township, and a smaller one at every mile.

"The *West* side of each Township post, exhibits the Number of the Township—The *East* side, The number of Miles from the line of demarkation—The *South* side The Number of Miles from the Basis-Meridian—and the *North* side—whether it be East or West of the said meridian—

"The *East* side of of every post whether it be the corner of Township or Section, exhibits the Number of Miles on the Meridian; and the south side the Number of Miles on the parallel of Latitude."

From the above extract it appears that the numbering of sections in the field was not contemplated—which has arisen perhaps from the impossibility of correctly numbering the sections in a Township containing private claims, as the the survey progresses.—Each private claim whether large or small has a separate Number, so that a Township may contain any number of sections from 10, to 100, which cannot be ascertained until the survey of the Township is completed, and a map of it made. The surveyor will then be compel'd, to retravel over his lines, with his map, and transfer the proper Sectional N° from it to the corner Trees, or posts, of sections—This is a severe duty which the surveyors complain of but it cannot be avoided.

I fear I have extended this letter to a troublesome length on this subject not now very interesting —

I am very respectfully Sir your Obdt Servt

THOS FREEMAN

JOSIAH MEIGS Esqr commisr Genl Land office

VI.

(The following extract is taken from a letter from Edward Tiffin to Josiah Meigs, Microcopy No. 478, National Archives. The letter mentions Tiffin's instructions to Rector which were included.)

Surveyor General's Office
Chillicothe, July 26th, 1815

Sir,

I have this day received yours of the 18th inst. and am happy to find that you agree with me in the construction of the Act of the 28 of February 1806 for I had feared from the tenor of some of your former letters that you either had not adverted to it - or differed from me in its construction. As Mr. Rector and one of his deputies who have attended here to make some returns from the Kaskaskia District are both laid up with fever and will be here some time, I take the liberty of submitting to you copies of such instructions as I have prepared for his government in regard to the surveying to be done between the Rivers St. Francis and the Arkansas, so that if you should not approve of any part or should anything farther be necessary, you would have the goodness to point it out to me, as there will be time before he leaves his (if done promptly).

I beg leave further to observe that I have contracted for the standard lines and the range and township lines all to be done both in Michigan and North of the Illinois River and am now writing to those I had engaged to come on here and enter into contracts and receive instructions for subdividing the townships, for I presume the difficulties arising from the hostile disposition of the Indians will be removed by the Treaty to be held with them . . .

With great respect, I am
Your Obt. Servant

Edward Tiffin

Hon. J. Meigs Esq.
Commissioner of the
Genl. Land Office
Washington

VII.

(These instructions to Rector were included with the preceding letter. Microcopy No. 478, National Archives.)

INSTRUCTIONS FOR GENERAL RECTOR, PRINCIPAL DEPUTY SURVEYOR FOR THE TERRITORY OF MISSOURI

1st. You are required to have surveyed two million acres of land between the Rivers St. Francis and Arkansas, which have been appropriated by an Act of Congress for Military Bounties - (to which I refer you) - the annexed plan, on which these rivers are laid down, with the lands lying between them in Ranges and Townships, will show you the mode in which it is intended to have these surveys executed.

1st. Let a standard line be accurately run from the confluence of the Arkansas with the Mississippi due North according to the true meridian so far that a base line run due west from the mouth of the River St. Francis to the Mississippi will intersect it as laid down on the plan.

2nd. Lay off the lands South of this base or East & West line into Ranges and Townships of six miles square by running the North and South lines according to the true meridian and the East & West lines at right angles as near as may be, down to the Rivers Mississippi and Arkansas, and number them both Ranges & Townships as exhibited on the plan.

3rd. Let these townships be subdivided as has been heretofore practiced into Sections, establishing corners for quarter sections, and marking the lines, and Ranges, Townships, sections and quarter sections corners in the usual mode.

4th. Furnish every Surveyor you employ with one of the deputations enclosed, and see that both himself, his chain and axemen are duly sworn before they proceed to work and return a copy of such oaths to this office.

5th. Furnish every Surveyor with a plan of the whole Military district and a copy of the Instructions enclosed, that each man may be able to comprehend the plan how the surveys are to be executed and how to attend to his compass and chain, to mark his corners accurately, and make his returns in a proper manner.

6th. When work is done and returned to your office you are to examine and see that it is done agreeable to Law and the instructions given, and return it certified to the Office of the Surveyor General to wit—a copy of the field notes of every township or fractional township, and two setts of plats and descriptions laid down on paper of a uniform size with an inch space in the margin, so that all the plats when finished may by bound in a book.

7th. You are furnished with a copy of a form of contract, so that you may enter into contracts with the Deputies, observing always to have duplicates so signed, one of which is to be returned to this office when entered into.

8th. All the surveys contracted for to be done in the Michigan and Illinois Territories have been at 250 Cents per mile, it is therefore expected you will be able to get the Military Lands done in Missouri at the same rate, but if as you suggested this should be impracticable, you are authorized to give 300 per mile, but only in case of necessity—being satisfied you will guard the interests of the United States from imposition, inasmuch as by doing so, you are advancing your own interests.

9th. When any Deputy Surveyor has finished his contract, made his returns to your Office and it is certified and returned to this Office, the accounts will be paid off in such manner as may be most convenient to the claimant and the regulations of the Treasury Department.

signed E.T.

G.R.
Principal Deputy

(Tiffin's Instructions, 1815 are available from many sources. Copies may be found in the National Archives.)

INSTRUCTIONS for Deputy Surveyors by E. Tiffin Surveyor General United States

Instructions for Subdividing Townships.

1st When the township lines are completed, you must begin the survey of sections at the South east corner of the township, and move on in comtinued progression from east to west and from south to north in order that the excess or defect of the township as to complete sections may fall on the west and north sides of the township, according to the provisions of the Act of the 10th of May, 1800.

2nd Each side of a section must be made one mile in measure by the chain and quarter section corners are to be established at every half mile, except, when in the closing of a section if the measure of the closing side should vary from 80 chains or one mile, you are in that case to place the quarter section corners equi distant, or at an average distance from the corners of the section, but in running out the sectional lines on the west, or north side of the township you will establish your quarter section posts or corners at the distance of half a mile from the last corner and leave the remaining excess or defect on the west or north tier of quarter-sections; which balance or remainder you will carefully measure and put down in your field notes, in order to calculate the remaining or fractional quarter section on the north and west side of the township; also in running to the western or northern boundary, unless your sectional lines fall in with the posts established therefor the corners of sections in the adjacent townships you must set post and mark bearings at the points of intersection of your lines with the town boundaries, and take the distance of your corners from the corners of the sections of the adjacent townships, and note that and the side on which it varies in chains, or links or both.

3rd The sections must be made to close, by running a random line from one corner to another except on the north and west ranges of sections, and the true line between them is to be established by means of offsets.

4th In fractional townships on Rivers it will be necessary to vary from the foregoing rules; and the lines must be continued from the rectilinear boundaries of the township which may be parallel to the river, perpendicularly to those boundaries till they meet the river, the sections however must be made complete on the sides of the townships bounded by straight lines, and all excess or defect of measure must be thrown into the fractional sections on the river; the measure of the lines from the last entire sectional corner should be made very exact in order to calculate the fractional section with exactness.

Illustration.

Begin at N. the south east corner of the township, and run west 40 chains, and establish the quarter section corner at n of

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section 36, if it be not already established, continue 40 chains further and establish the corner at 0, of sections 36 and 35; from 0 run a true north course 40 chains and mark the quarter section corner between 35 and 36, continue

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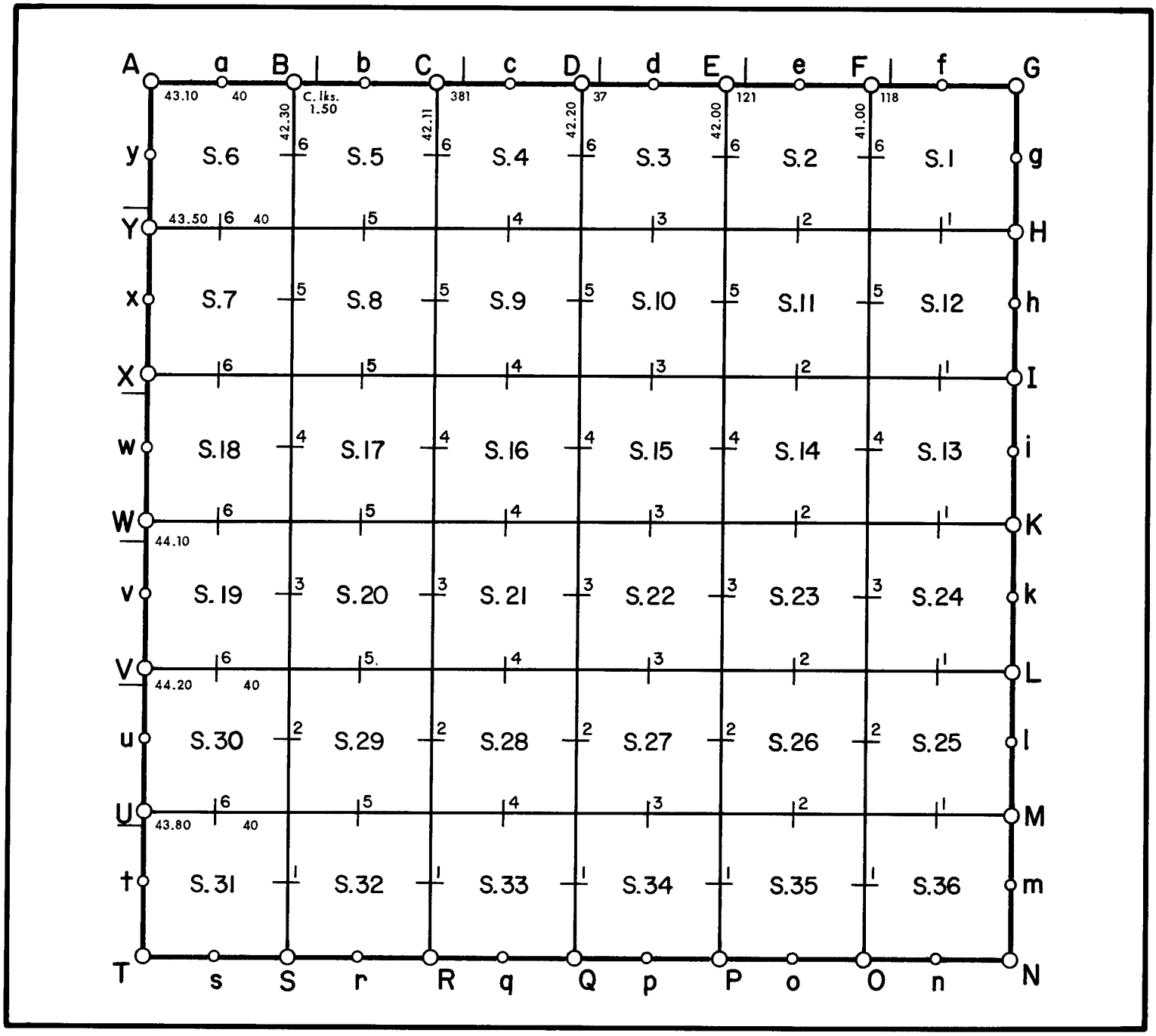
40 chains farther on the north line and establish the corner 25, 26, 35 and 36. From this corner run a random line for the post or corner of M, without blazing; at the distance of every 20 chains on this line set up a stake or post or mark some other mark on the random line; if you strike the post or corner M exactly, you have only to blaze the lines back and establish the quarter section corner, which you will take care to establish at the average distance between the corner at M and the corner between 25, 26 35 and 36; but if running for the post M you fall north or south of it, you must note the departure or deviation in your field book, and return on the true course observing to correct it by means of offsets from your marks made on the random line.

From the corner of sections 25, 26, 35 and 36, run due north one mile, setting the half mile post as before at 2 on the line, from 0 to F, return south to 0, and establish at 0 and P your quarter section and section corners; then run north from P and establish quarter section and section corners as before and run a random line from the section corner on the line P E to the corresponding corner on the line 0 F; proceed in this manner till you arrive to the last corner towards the western boundary of township from M to U, viz: between sections 29, 30, 31 and 32; from this corner run west and at the distance of 40 chains from it, established the quarter section corner at 6, in the line from M to U; continue west till you intersect the town boundary, suppose at U, note carefully the distance of the point of intersection from the last section or quarter section corner, and also the distance of this point from the section corner of the adjacent township west of you, or the distance of U from M and on which side it lies, viz: either north or south; at the point of intersection U set the section post or corner and take bearing trees.

In this manner you will proceed until your township is completed, observing always to move either in a range of sections from that at the southeast corner of the township to the western boundary, or from that section to the northern boundary, but when you shall have completed the sections to the north boundary of the township you will proceed from the last section corners, establish quarter section corners at 40 chains from them, and continue north till you intersect the town boundary in the same manner as on the western side of the township, observing to note the distance at which you intersect



the north boundary from the section or quarter section corner you left last. Also you will be careful to note the distance of the point of intersection from the corner of the section of the adjacent township and whether it be on the East or West side of it; then the distance from 6 to F or from 6 to E on the line 0 F and P E, must be carefully noted in your field notes and also the distance from F where you intersect to 0 the post on the town above and on which side whether east or west.

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5th Great care must be taken that the north and south lines be run according to the true meridian as required by law, and the east and west lines be run at right angles to them as far as is practicable in closing, but if on running on a true east and west line you find the post you are running for lies very much to the north or south of the lines, you are then to mistrust the measure by the chain, and if possible, the line on which the posts are established must be remeasured; also in running a meridional line by the compass, if you find the measurement of the closing lines of the sections, that is an uniform convergency on diagonally of these lines; you may then reasonably mistrust the accuracy of the direction of your lines by the needle. In such case it will be well to endeavour to run parallel to the meridian adjacent on which section closes, in order that it may contain a just or legal quantity viz: 640 acres or one mile square.

6th As the measurement by the chain is the principal source of errors in surveying, you will be careful to attend to your chainmen, that they carry the chain horizontally and to prevent their loosing a tally rod,

you must be provided with a set of them pointed with iron or steel, and to allow no other to be used but the precise number which you shall have selected for the purpose.

7th In meandering Rivers you will take the bearings according to the true meridian of the River and note the distance on any course when the River intersects the sectional lines, and the calculations of the contents of the fractions are to be made by the tables of Difference of Latitude and Departure, and returned on your plats; but the quantity of contents of the whole section only are to be put down; in all the other sections, and each of them is to be accounted one mile square or 640 acres, unless your closing lines deviate very much from 80 chains, in which case you will be careful to put down their true length on your plats.

8th You must frequently while in the field attend to the correction of your chain; for this purpose you should be provided with some measure taken from the Standard chain in the office of the Surveyor General.

9th All random lines, as well as the true, are to be noted in your field book at the time of running them, and are to be kept in the order in which the work is executed, also you must be careful to note the variation of the random lines from the corners or posts which they were intended to strike.

10th All courses of whatever lines, must be taken with the sight of your Compass set to the variation and estimated according to the true meridian for which purpose the variation of the needle at the place where you survey must be taken or previously known and your Compass regulated to it before you commence running the lines.

11th No lines of whatever description are to be run, or marks of any kind made by any person but yourself, or who may be under the immediate inspection of yourself or some Deputy Surveyor duly authorized from this office.

12th Any considerable departure from these instructions will be considered as a forfeiture of the conditions of the contract, or any claim for payment, and loose inaccurate or precipitate work will not be admitted, either as it respects surveys in field, or their returns on paper.

13th You will take care that your posts be well driven into the ground and that there be one or two sight trees marked between every quarter section corner; also at the section corners that there be marks for every section corner where they corner.

General Instructions for Deputies.

1st You will provide a good compass of Rittenhouses construction, having a nonius division and movable sights, and a two poles chain of 50 links; the chain must be adjusted by the Standard Chain in the Office of the Surveyor General, and it will be of importance that both it and the compass be frequently examined in the field in order to determine any errors and irregularities which may arise from the use of them.

2nd Whenever you may be obstructed by insuperable obstacles, such as ponds, swamps, rivers, creeks, etc., you will take the necessary offsets, or work by a traverse or trigonometry, in order to ascertain the distance on any line which is not actually run.

3rd The courses of all navigable rivers, which may bound or pass through your district must be accurately surveyed and their width taken at those points where they may be intersected by township or sectional lines; also the distance of those points from the sectional corners and from the commencement of any course where you are meandering the River, you will likewise not fail to make special notice of all streams of water which fall in your way with their width and course from whence they appear to come or run.

4th All township or sectional lines which you may survey are to be marked in the manner hitherto practised in the surveys of the United States lands, viz: All those trees which your line cuts must have two notches made on each side of the tree where the line cuts; but no spot or blaze is to be made on them, and all or most of the trees on each side of the line, and near it, must be marked with two spots or blazes diagonally or quartering towards the line.

5th The posts must be erected at the distance of every mile, and half mile from where the town or sectional line commenced (except a tree may be so situated as to supply the place of a post) which post must be at least three inches diameter and rise not less than three feet. All mile posts must have as many notches cut on two sides of them as there are miles distant from where the town or sectional line commenced, but the town corner posts, or trees shall be notched with six notches on each side, and the half mile sectional posts are to be without any marks; the places of the posts are to be perpetuated in the following manner, viz: at each post, the courses shall be taken and the distances measured to two or more adjacent trees in opposite directions, as nearly as may be, which trees, called *bearing trees*, shall be blazed on the side next the post and one notch made with an axe on the blaze, and there shall be cut with a marking iron on a bearing tree, or some other tree within and near each

corner of a section, the number of the section, and over it the letter T with the number of the township, and above this the letter R with the number of the range, but for quarter section corners, you are to put no numbers on the trees, they are to be distinguished by this mark ¼ S.

6th You will be careful to note in your field *book* all the courses and distances you shall have run, the names and estimated diameters of all corner or bearing trees, and those trees which fall in your line called *station or line trees* notched as aforesaid, together with the courses and distances of the bearing trees from their respective corners, with the letters and numbers marked on them as aforesaid; also all rivers, creeks, springs and smaller streams of water, with their width, and the course they run in crossing the lines of survey, and whether navigable, rapid or mountainous; the kinds of timber and undergrowth with which the land may be covered, all swamps, ponds, stone quarries, coal beds, peat or turf grounds, uncommon, natural, or artificial productions, such as mounds, precipices, caves, etc., all rapids, cascades or falls of water; minerals, ores, fossils, etc.; the quality of the soil and the true situation of all mines, salt licks, salt springs and mill seats, which may come to your knowledge are particularly to be regarded and noticed in your field books.

7th In all measurements the level or horizontal length is to be taken, not that which arises from measuring over the surface of the ground when it happens to be uneven and hilly; for this purpose the chainmen in ascending or descending hills must alternately let down one end of the chain to the ground and raise the other to a level as nearly as may be, from the end of which a plumb should be let fall to ascertain the spot where to set the tally rod or stick; and where the land is very steep, it will be necessary to shorten the chain by doubling the links together, so as to obtain the true horizontal measure.

-7-

8th Though the line be measured by a chain of two perches, you are notwithstanding to keep your reckoning in chains of four perches of one hundred links each, and all entries in your field books, and all your plans and calculations must be made according to the decimal measure of a chain.

9th Your courses and distances must be placed in the margin of your field books on the left, for which purpose it should be large, and your remarks made on the right in the manner following:

North		
Chains	Links	Between Sections 35 and 36, Town 4, Range 6.
20	30	A White Oak 20 inch diameter.
37	10	A stream 30 links wide SE.
40	—	Set half mile post, from which a B. Oak 18 inch diameter bears S. 50° E. 40 links, and a sugar tree 16 inch diameter bears N. 10° W. 34 links.
80	00	Set post corner of section No. 25, 26, 35 and 36, township 4 range 6 from which a White Oak 10 inch in diameter bears S. 78°30°E. distant 20 links, and a Hickory 15 inch diameter bears N. 50° W. 37 links distant.
East		
Chains	Links	Between No. 25 and 36 Town 4, Range 6, on a random.
16	40	A brook 30 links wide, course S. 20° W.
40	00	Set tempy quarter section post. This half mile overbroken land. Timber Oak, Ash, etc.
64	30	A stream 25 links wide, course SE.
79	90	Intersected N. & S. line 20 links south of section corner. Over hilly land, soil rich and good for farming. Timber, Oak, Hickory, Poplar, Ash, etc.
West		Between Sections 25 and 36, Town 4, Range 6 on true line.
Chains	Links	
39	95	Moved temporary post to the average distance for ¼ section corner, from which a Black Jack 10 inch diameter bears S. 50° E. 100 links, and a White Oak 19 inch in diam. bears N. 25° W. 40 links.
55	00	A White Oak 11 inch in diameter.
79	90	Section Corner.

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In this manner you must enter all courses and distances in your field book, the date must follow the close of each days work, which field book, written with a fair hand, of each township separately, or a true and fair copy, together with the original you will return to the Office of the Surveyor General.

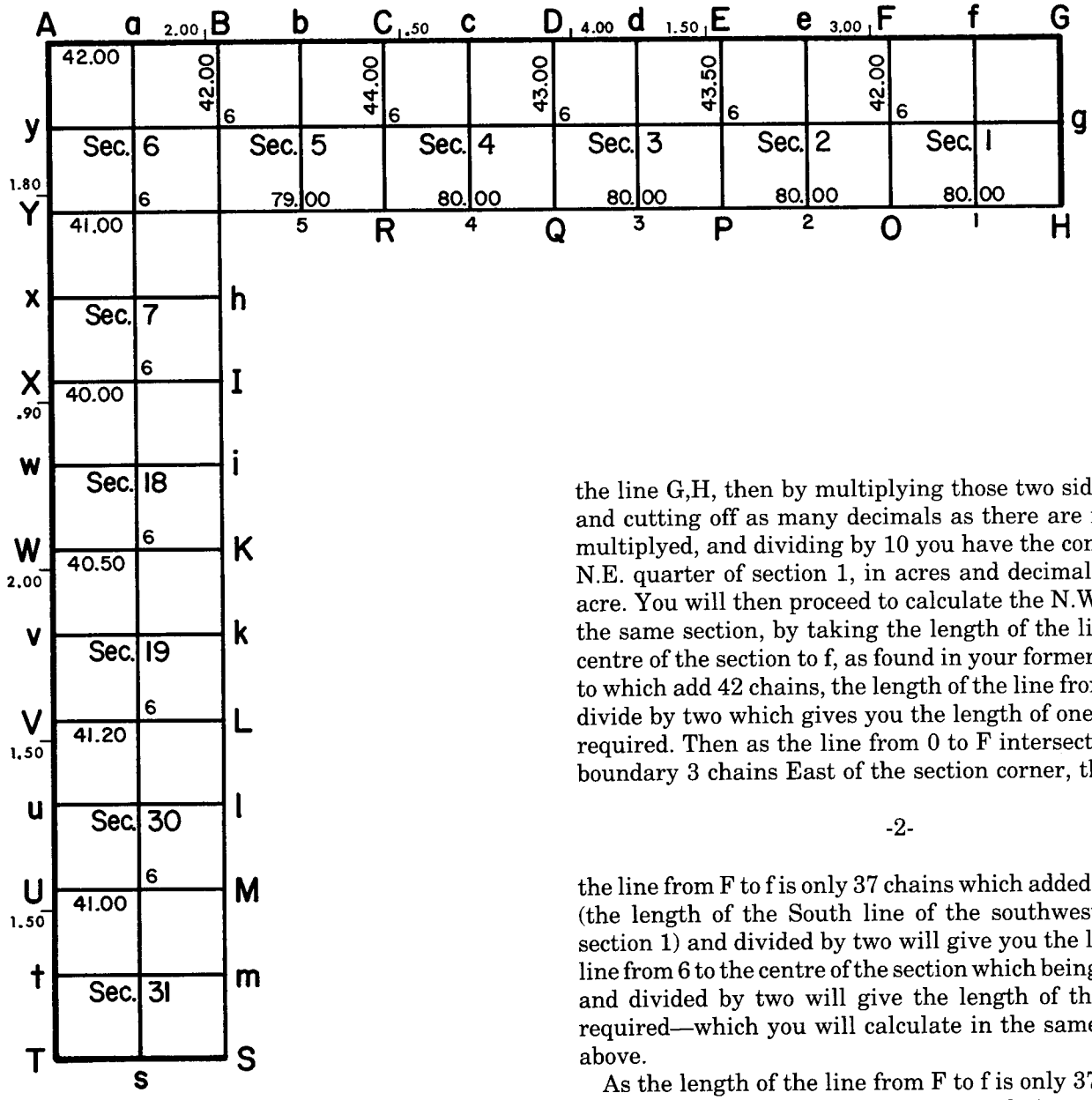
10th The plat of each township and fractional part of a township must be neatly and accurately protracted on *durable* paper, by a scale of 2 inches to a mile, or forty chains to an inch, and must be in such measure and proportions in every line and part as actually was determined by measurement in the field, a compass having the true and magnetic meridian, and the scale by which the lines are laid down, are to be placed on the SE. corner of the plat.

11th The following certificate must be inscribed on your plat and signed by you.

Pursuant to a contract with, and instructions from Surveyor General of the United States, bearing date the day of I have admeasured laid out

and surveyed the above described township (or fractional part) and do hereby certify that it had such marks and bounds, both natural and artificial as are represented on said plat and described in the field notes made thereof, and returned with the plat in the Surveyor General's Office.
Certified this day of

Method by which to calculate the Northern and Western tier of fractional quarter sections.



You will commence, say at the North-east corner of the Township, the length of the line from G to g being 40 chains as established in running the exterior boundary of the Township, you will proceed by adding the length of the line from 6 to F on the line from 0 to F which is 42 chains to the length of the line G,g 40 chains and divide it by two which will give you the length of the line from the centre of the section to f on the Town boundary, which being added to the length of the line G,g and divided by two will give you the length of one of the lines required for calculating the N.E. quarter of Section No. 1; then the length of the line from G to f being 40 chains, and the south boundary of the sec. being 80 chains the length of the line from H to 1 is 40 chains—the length of the line from G to f-therefore there is no necessity for additions or divisions as the line from 1 to f is parallel to the line G,H, then by multiplying those two sides together, and cutting off as many decimals as there are in the sums multiplyed, and dividing by 10 you have the contents of the N.E. quarter of section 1, in acres and decimal parts of an acre. You will then proceed to calculate the N.W. quarter of the same section, by taking the length of the line from the centre of the section to f, as found in your former calculation to which add 42 chains, the length of the line from 6 to F and divide by two which gives you the length of one of the lines required. Then as the line from 0 to F intersected the town boundary 3 chains East of the section corner, the length of

-2-

the line from F to f is only 37 chains which added to 40 chains (the length of the South line of the southwest quarter of section 1) and divided by two will give you the length of the line from 6 to the centre of the section which being added to 37 and divided by two will give the length of the other line required—which you will calculate in the same manner as above.

As the length of the line from F to f is only 37 chains, the length of the line from e to F must be 43 chains—the length of the line from E to e is 38.50 chains, the length of the line from to [sic] d to E 41.50 chains, &c. The quarter section corners not being placed at the average disance between the section corners, except when you strike the corners of the sections established in running the exterior lines of the township.

E.T

IX

(The following instructions from Thomas Freeman to Silas Dinsmore, for the St. Helena Meridian surveys is taken from a copy of the original, now in the possession of the State of Florida, Bureau of State Land Management, Title Section, Tallahassee, Florida. Some words are bound into the margins and are missing from the copy. These are shown here in parentheses as indicated by inference in the text to give the most logical sentences.)

Instructions to the Principal Deputy Surveyor of the Land District East of Island of N. Orleans

This district of which you are appointed Princip(al) Deputy Surveyor is bounded on the North by the Parellel of the 31°st degree of N.L. on the East by Perdido River & Bay on the South by the Gulf of Mexico & the Island of N. Orleans and on the West by the Miss. River. It is divided into two land Districts Called the District East of the Island of N. Orleans the Land Office for the East District to be held at Jackson Courthouse and for the Western District at St. Helena Courthouse.— The Registers of these land offices will furnish you with abstracts of the confirmation of all private Claims confirmed within their respective Districts, which abstracts with the plats of the Original Surveys will be necessary to enable the Deputy Surveyor to make the Survey or resurvey corectly.— You will proceed without delay to Survey the land district East of the Island of N. Orleans into Townships agreeable to the Instructions here inclosed. When the Townships Shall have been designated you will procede to Survey the Private Claims.

2

The Titles of which being confirmed by the boar(d of) Commissioners carefully locating and connecting wh(en) practicable these Claims with each other & with (the) Townships, So that when laid down on a Genl. Map (of the) District, the position, connection, and dimentions of (each) Claim may be distinctly exhibited.— When the Sur(vey of) the District Shall have thus far progressed the va(cant) Spots of Public Land shall be Surveyed into Section(al) Teritories and prepared for Sale. The Survey of these d(istricts) will be commenced by extending the Basis Mer(idian) of the Land Districts East and West of Pearl Ri(ver) & North of the parellel of the 31st. Deg. of N.L. (due) South from that parellel through the District to (the) Southern limits, whichMeridian when so run Shal(l be) the Basis Meridian. And the Parellel of the 31(st Degree) of N.L. will be the Basis Parellel for the Distri(ct) East of the Island of N. Orleans.— The Ranges will b(e nu)merically numbered East & West of the Basis Meridian and the Townships South from the Basis Parallel to (the) boundaries of the district. The Ranges and Township(s of) these Districts approaching each other will termin(ate) at Pearl River which River is the boundary between the (districts)

3

Standard Meridians must be accurately run, marked & measured due South from the Basis Parellel at 4 Townships or 24 miles apart through the Districts to their Southern limits, and one Standard Parellel Shall be run through the Districts at the distance of 24 miles from the Basis Parellel(1) This Standard line will be commenced at the termination of the 24th mile on the Basis Meridian, and be corectly run, marked and measured due East & West through the Districts intersecting the Standard Meridians (if practicable) at the termination of the 24th mile from the Basis Parellel and will of course become the Southern Boundary of the 4th Townships through the Districts.—

The Variation of the magnetic needle must be carefully ascertained on the Basis Parellel at the Basis & Standard Meridians and allso at the 24th mile or South Boundary of the 4th Townships on these Meridians.—A true Meridian must be distinctly disignated at the points on trees or by Pickets firmly Set in the ground, and allso the corect length of the Chain Measured on a tree or Sapling Cut down for that purpose, or by Pickets Set in the ground at those points for the Surveyors who may be imployed in Townshiping or Sectioning the Districts to Compare their Compasses and Chains with.—

4

Townshiping

The Townships lines must be run due South (from) the Township monuments established on the Basis Pa(rellel) and due East and West from the Township Corn(ers) previously established on the Basis Meridian, Closing (the) Townships at the points of Intersections of these lines on (the) East of the Basis Meridian at their South East Cor(ners) and on the West of the Basis Meridian at their South (West) Corners or Angles, begining with the Townships adjoing (the) Basis Meridian & Parellels, and Closing the Township(s) adjoining these lines first for the purpose of detecting (&) Correcting any inaccuracies that may be in them, th(ence) extend and Close the Townships progressively allwa(ys) running the Township lines from the Basis line.— In Closing the Townships on the Standard meridia(ns) (It not being expected that South Boundary will intersect (their) Meridians exactly at the Township Corners Previously est(ablished)) the Points of intersection of the Township lines with the Standard Meridians will be adopted as the Township Corners, (and) marked as hereafter directed. But in extending the (Survey) from the Standard Meridians, the lines both Township (& section) must be run from the monuments or Corners previously established on them.—

5

In Closing Townships or Sections on the Standard Parellel the lines must be run to the monuments previously established on that Parellel and thence proceed due South from these monuments.—

Directions for Marking and Lettering

All Trees on each side of a line for a Sufficient number to distinctly mark the line Shall be blazed on their Sides facing the line, and all line trees or trees Standing in the line blazed on each Side in direction of the line. On the Basis Meridian there Shall be one Chop under each blaze on each Side of the line, & two chops above & two below each blaze on line trees.— On Standard lines there Shall be two Chops below each blaze on line trees — and Section line trees are to be blazed without chops as above.—

Lettering

The lines must be carefully & distinctly marked at the termination of each mile a Square post must be firmly set in the ground its Sides facing diagonally the four Sections or

Townships to which it is a boundary haveing each Side lettered with the letter T for Township

6

R for Range & S for Section, with the proper numbers of the Township, Range & Section to whic(h) it is a boundary Prefixed to these letters as i(n) the margin. The Course & distance from the p(ost) to a tree in each of the adjoining Sections must (be) taken and these trees lettered & numbered with t(he) letters & numbers of the Township Range & Sect(ion) in which they Stand So that the face of the post and referance trees may be marked and lettered alike.— Posts must allso be Set in the ground at the termination of each ½ mile faced on two Sides & each Side marked thus ½ S for half Section Corner; the bearing & distance of two trees lettered thus ½ S (one on each Side of the line taken from the half mile post) All the numbers and letters m(ust) be painly & distinctly marked with a lettering I(ron) and the names of the reference trees with their lett(ers) & numbers and bearing & distance from the Corner p(ost) must be plainly noted in the Surveyors field Book.

T.1 R.1W. S.36	T.1 R.1E. S.31
T.2 R.1W. S.1	T.2 R.1E. S.6

7

On Section Corners in the interior of Township the Range & Township may be omited one the tree excepted

Misclosures of Townships

The misclosure of a Township or the difference in length of the north & South Boundaries ariseing from the figure of the earth Will be in your District about 40 Links which increase from the Basis to the Standard Parellel amounts to 160 links. The erors arising from the impfection of Instruments, and unavoidable irors in practice may be estamated at 300 links.— Then the admissible eror in Closing Townships in your District will be limitted to 500 Links Should the eror in closing a Township be more than that the Township line Should be run over again and Corrected.

Sectioning

The Sections of the Townships on the East of the Basis Meridian will be Closed at their S.E. Angles and on the West of the Basis Meridian at their S.W. Angles. The Townships on the East of the Basis Meridian will be Sectioned by

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by running a due South line from the first mile Monument on the north Boundary, establishing a ½ S (corner) at a half mile & a Section Corner at the termination (of) a mile Thence running a guide or experimental (line) West to the first mile monument on the West boun(dary) of the Township and retraceing or Corecting if neces(sary) that line from the Section Corner on the Township (line) to the Section Corner on the Section line establishing (the) half SectionCorner in the center of the line; the Se(ction) thus closed in the N.W. of the Township will be S. No. 6.— In like manner the meridian Section lines will be (run) due South one mile and the Section Closed by fir(st) running a guide line West and thence a correct line East between the monument on the South bou(ndary) of the Section allways establishing the half mile (corner) in the Centere of these lines.—

In Closing the Section on East and South Bound(ary) of the Township a guide line must be first run f(rom) the Section Corner to its Corisponding Corner on the Township line and the Section Closed by running

9

running a correct line between these corners fixing the ½S post in the Center of the line— The Guide lines will be measured but not marked, Fractional Section lines falling on the margin of water courses, Bayous, Lakes &C. may be run with out a guide line from the Sectional monuments priviously established but these lines must be continued in right lines across water courses correctly to the opposite boundary of the Township as if Such Water course had not intervened — At the termination of Section lines on the margin of water courses a post with two refierence Trees must be established to Identify the points and corect Sirvey of the margin of the water courses uniting these points must be taken to ascertain the contents of the fraction — Townships on the West of the Basis Meridian must be Sectioned in like manner / with the diffirence of commencing with the Section in N.E. Corner of the Township Closing the Sections at their South West Corners — on the South and West boundaries of the Township.—

10

Chain Carriers

The Chain Carriers must be Sworn faithfully (& honestly) to make all measurements on the lines agreable (to the) Instructions the may receive from the Surveyor (to) the best of their Skill & Knowledge, and faithf(ully) return at their measurements at all times make (to the) Surveyor when required.— The Chain must (be) exactly two Rods or 33 feet in length, and (of) fifty links of equal length, The measur(ement) will be kept in two pole chains and links— The (pin) must be of Iron or Iron pointed of about 12 In. (in) length with a Scrap of red Cloth attached to each, the may be con viently Seen amongst g(rass) & weeds, or found if lost.—

Flag

To avoid a constant Source of errors in running (lines) for want of a propper object at each Station to (retain) the direction of the line and to enable the Chain Carriers to measure correctly in the line each Surveyor m(ust)

11

must make use of a Flag, for that purpose. A man with a flag Staff and a Small Flag attached to it must be kept ahead and at each Station fixed in the line by the Surveyor to retain the true position or direction of the line for the Surveyor and to enable the Chain Carriers to continue their measurements Correctly in the line. This must not be omitted by any Surveyor throughout his whole Survey.

Variation

To determine the variation of the magnetic needle note exactly by a good watch when the Polar Star and the first in the tail of the great Bear (or Star next the Square) are vertical to each other, or range with a Plumb line. Ten minutes after wards the polar Star will be on the rue meridian a Stake or Small light placed at that time in a right line with the Plumb line and the Polar Star will point out a true meridian, To which

12

To which the Compass being applied will s(how) the Variation of the needle. Which Variation m(ust) be Carefully laid off on the index or limb of the Compass, so that when the needle p(oints) to the North and South points of the Base the ind(ex) or Sight will point out the true merdian. The most convenient, practical & accurate mo(de) for Surveyors to ascertain the Variation of the needle will be by the polar Star's greatest Elongation which will be visible from the first of November to the first of March (& to) the West and from the first of May to the first of Sept. to the East.— When the polar Star's Elongation is to the East, its Azimuth must be added or la(id) off to the West and when West its azimuth m(ust) be deducted or laid off to the East. The azim(uth) of the Polar Star for the year 1820 within y(our) District will be 1°58′30″ nearly, and Sufficient(ly) Correct for your Surveyors.— It will

13

It will be at its greatest Elongation West at midnight on the 1st of Jany and east at midnight on the third of July.—

Field Book

The Surveyors must take care to Record in their field Book the nature, quality & growth of the Soil the width depth & direction of water courses, the elevation of waters during their inundation and their greatest depression at low water.— The depth or width of the low or Alluvial Lands from the water Courses Capable of Cultivation; noteing all mines or mineral productions or appearances; all Salt or Mineral Springs or waters; and Mill Seats, with such further remarks & observations as may be necessary to give an accurate Topographical Knowledge of the Country in which the Survey.—

14

Their field notes must be plainly & distinctly kept, and their Original notes returned to the Su(rveyor) Office for examination without olteration or correc(tion) after taken on the lines.— The Sections in th(e) Township must be numbered as in the followi(ng) figure Commenceing with the Section in the N.E. No. 1 and Terminating with the Section in S. (E.) No. 36 when the Township does not contain priv(ate) Claims.— But when private Claims are included in a Township, each Claim or tract, (or) part of a private Claim, must be a Seperate Sectional number. The Sections and fracti(onal) Sections, in a fractional Township must be numbered as if the would be, had the Tow(nship) been complete.

	(	Surveyors Office
Silas Dinsmore Esq.	)	Town of Washington
P D Surveyor District	(	Sept. 15th 181(9)
E. Island N. Orleans	)	(Unnumbered Page)

All deviations from the True Cardinal point must be carefully noted by the Surveyor; when the Surveyor finds it necessary to alter the course of any Township or Section line from the due North or South, East or West to Close a Town(-)ship or Section, the Course and distance of Such line as actually run marked and measured must be recorded in his field book.—

N

	6	5	4	3	2	1
	7	8	9	10	11	12
	18	17	16	15	14	13
W	19	20	21	22	23	24
	30	29	28	27	26	25
	31	32	33	34	35	36

E

S

A Township of Public land Sectioned & numbered

All Townships of Public land Clear of Private Claims must have their Sections numbered as in the above figure whether the Township be in Range East or West of the Basis meridian.— Each private Claim or part of a private Claim in a Township must have a Sectional number.— No two Sectional numbers in a Township Shall be alike.—

X.

(Letter from Tiffin to George Graham. Copied from Microcopy No. 478, National Archives.)

Surveyor General's Office
Chillicothe Sept. 22nd 1823

Dear Sir,

I have received your letter of the 9th inst. and am entirely satisfied with the explanation it contains of the circular letter therein referred to.

The omission in the form of contracts with deputy surveyors which you advert, is supplied in the *Instructions* given them. You will observe by the contract that it binds the deputy to execute his surveys "agreeably with the laws of the United States, *and such instructions as he may receive from the said Edward Tiffin, Surveyor General*". To every surveyor is given in writing ample and detailed instructions regarding every part of his duty, and which instructions contain the following rule: "In case any corner should fall in a prairie or other place where there may be no trees for bearings within a convenient distance, you will, at the mark of such corner raise around the post a mound of earth or pile of stones, not less than two and a half feet high and two and a half feet diameter at the base.

It has never been the usage in this Surveying department for Deputy Surveyors to Stipulate in their contracts for the correction of Errors at their own expense should any be subsequently discovered in their Surveys. But it has often been and still is required of them to correct, where material errors have been committed by them, especially when done through inattention or carelessness.

It would be particularly desireable if I could reduce the price per mile which is paid for Surveying the public lands; and under more favourable circumstances than those which have of late years attended the public Surveys this might be effected. During the war, and until within the last three years, the prices of all kinds of provisions, the wages of hands, and the cost of transportation were very high. Within that period, the public Surveys, which commenced at the old Indian boundary where the Settlements terminated, were extended in general from fifty to more than one hundred miles into the wilderness. The Surveyors have Still to obtain their provisions from the Settlements, and are obliged to transport them on pack horses through a trackless wilderness, in many parts literally impenetrable from Swamps, fallen timber, etc. So that in general by the time the Surveyors get their provisions to where their work lies, they *really* cost them more than they did five years ago, when the Surveying was contiguous to the Settlements, and provisions dear. It may with propriety be added, that at least two thirds of the Surveyors are obliged to abandon their work before it is finished and return home, either on account of the Sickness of themselves or their hands, or both, or from high waters, the loss of their pack horses, breaking of their compasses, and other casualties—any of which oblige them to return to their Settlements, at a heavy expense and loss of time. Another circumstance may be added:—To prevent Surveyors from employing *journeymen* (on a per diem pay) to Survey their districts on the plea of their own Sickness, I have adopted the rule to give no Surveyor more than *five* townships, in quantity, to Survey in one trip.

From those considerations it appears to me that the present allowance of *three dollars* per mile will not enable the Surveyors to realize more than a reasonable compensation for their Services. Nevertheless, if you think it best, I will make the attempt, although I am persuaded it will drive some of our most skillful and efficient Surveyors from the work.

Your *circular* to Surveyors' General, of the 4th & 5th Augt. last, I have been obliged to lay over for the present on account of the Sickness of myself and two of the three clerks in my office, who have been some time confined with the prevailing fever which afflicts our town and the Surrounding country. These letters shall be attended to so soon as the clerks shall be able to get to work again.

I am with great regard
Your Obidient Servant
Edward Tiffin

George Graham, Esquire
Commissioner of the
—General Land Office

XI.

(This letter is copied from the publication "1811-1844 Instructions to U.S. Deputy Surveyors" issued by the U.S. Department of Agriculture Forest Service, as prepared by Walter G. Robillard. The spelling and paragraphing are unverified with the original.)

Principal Deputy Surveyor's Office

Southwestern Land District, State Of Louisiana
Opelousas, March 1830

Mr. Edward R. Downing
Deputy Surveyor.

Sir:

Along with the printed instructions accompanying and attached to this for your Governance in surveying your District, you are to attend to and be governed by the following additional ones, to-wit:

For surveying the exterior and section lines of a Township you are never to run towards, but always from an established point or corner within your own District, which can always be done therein except when you intersect the boundary of another surveying District on the opposite side from you the basis or standard lines from which your lines were started, in that case you may establish your corner where you intersect it if you have committed no error in running the line towards it but as your line must have perfect continuity throughout your own District without offsets, therefore when they are commenced on any of the basis or standard or standard lines they must be continued on in the same direction as far as they may be extended by you. Should however by some mismanagement have unavoidably to run a line towards an established point or corner within your District you may make a small inclination of the line to enable you to close at the point already established.

In the law directing the manner in which the public lands shall be surveyed into sections it is required that the section meridians shall each be exactly one mile and the parallels of latitude to be run so as to close thereto, except the closing lines, on the North or South boundaries of the Township. (According as your District may be situated North or South of the 31st Latitude) North on the Northside thereof and south on the southside. Therefore beginning at the post one mile from the corner of the Township nearest the basis on Standard lines you are to run the meridian one mile North or South then run a Random or guide line on the parallel to the Township boundary and if you do not intersect at the true point, connect the line in direction back again so as to close at the point established on the Meridian (Should you however intersect with your Random line with five or six links of the true point on the Township line you need not connect the direction of the line, but merely mark it properly back again) proceed in the same manner with the next mile of the Meridian and with the parallel to close therewith and so on until you arrive at the opposite boundary of the Township; then travel back to the boundary thereof at which you commenced and begin another Range of Sections and proceed in the same manner with it and so with every range of sections, until the township is completed.

You will mark a tree in each Section at every established corner with the number of the Section in which it stands with letter S. annexed thereto; and on one of these trees at least the number of the Township and Range in which it stands, with Appropriate letters T and R before as above the figures for which purpose you ought to be provided with good marking irons similar to those used for marking Casks by Coopers and others. You will insert all these marks in your Field Book correctly; you will also take the bearing and distance in links from the corner to at least two of these trees, (one of which should always be the one marked with the number of the Township and Range) which bearings and distances you will note correctly in your Field Book Stating also whether the bearing is taken from the true or magnetic meridian; should any of your corners fall in prairie you may either erect a mound of the dimensions, stated in your contract or else plant a good substantial post at least four inches diametre, of light wood, or some other durable timber, squared and set up so as to front the four sections, with the appropriate numbers marked thereon, and on one side the number of the Township and Range as directed above.

As you are confined chiefly to subdividing Townships in which claims favourably reported on by the Register and Receiver in their report dated the 1st of October, 1825 and confirmed by an Act of Congress approved the 16th of May 1826 and as these claims are not to be surveyed you are in conformity with instructions received from the Commissioner of the General Land Office, to ascertain as well as may be in your power the situation shape and extent of the improvements under which the claimant is entitled to and confirmed in his claim in what section it maybe situated and whether it extends into one or more sections besides, and the numbers of such sections, and how much of it is in each section as nearly as you can judge without a survey, and insert all in your field notes, to be laid down in the Township Map to enable the Register and Receiver to point out the different half quarter sections to which the claimant may be entitled - You are not authorized to survey any of these claims but you may do so at the request and expense of the claimant, and in that case must include only half quarter or quarter sections as laid off by the public lines and as nearly in a square as may be.

Your Chain carriers must be sworn faithfully and honestly to carry the chain to the best of their skill and judgment, and agreeable to your instructions from time to time given them and to make true return of all measurements which they shall execute for you as required by you from time - You will pay particular attention to ascertaining the true and correct variation of your compass from the true Meridian, and insert it your field notes and returns to this office.

Wishing you all success in your expedition and that you may do credit to yourself as a man of science and to the department, I am

Respectfully your friend etc

John Dinsmore Sr.
Principal Dep. Surveyor

XII.

(These letter instructions to the Surveyors General from Elijah Hayward are taken from Microcopy No. 27, National Archives. The copy given here was originally sent to Gideon Fitz.)

Gideon Fitz, Esq.
Surveyor General
Washington,
Mississippi

28th July 1831

Sir,

In continuation of my replies to the several subjects of your letter of 10th April last, I have intentionally omitted to advert to the internal arrangement of your Office as they are Subjects which come within the special conusance of Mr. King the Agent of the Department who ere this date, has most probably, reached your Office.

I therefore proceed to shew what are the requirements of the Department in reference to the township surveys and the mode of making returns thereof in order that you may model & adapt your contracts with your deputies, and instructions and forms of field books precisely to suit those requirements.

In the preparation of the township plats, it is requisite that they exhibit a perfect delineation of the country, as represented in the field notes of the survey.

1st. The plats are to be so constructed as to indicate, both by protraction and by figures, the courses and distances of all lines, viz: The exact distance between the posts planted at the corners of each section or fractional section, and the *courses of the lines where, from any cause,* they *vary* from the *cardinal points*; also, the precise delineation, by courses and distances, of private claims, reservations, and other tracts of land not conforming to sectional lines.

2d. Whenever the continuation of a surveyed line is interrupted by an *impassable swamp, or from any other cause,* the distance of the line actually run, between the starting and finishing posts, is to be truly represented be the platting, and also by figures.

3d. The distance on a *surveyed line*, at the points where streams *cross* the same, is to be indicated by *figures*, and the *general course* of such streams, where they are *not navigable*, between such different points of intersection, is to be delineated on the plat, as nearly as the same can be conjectured. The courses and distances of the meanders of *navigable streams* are to be truly delineated, and also represented by *figures on the plat* opposite the delineation, wherever it is practicable so to do; and where the same are too numerous to admit of their exhibition by *figures* on the plat, in that mode, the same are required to be exhibited in a detached tabular form, either on the face of the plat, or connected therewith, as may be found most expedient. The width of all water- courses, rivers, creeks, &c., is to be represented in *figures* on the plat.

4th. The plat is to exhibit the *received names* of all rivers, creeks, lakes, swamps, prairies, hills, mountains, and other natural objects, and the surveyors should be instructed never to give *original names* to such objects, where names have heretofore been given. All lakes or ponds of *sufficient magnitude* to justify such expense are to be *meandered* and platted agreeably to courses and distances, which are also to be exhibited by figures. In passing such ponds or lakes as are not to be meandered, offsets are to be taken, which offsets are to be carefully noted on the plat, to show that the distance across has been correctly ascertained. Such ponds or lakes are to be exhibited on the plat as accurately as practicable, from careful ocular observation, to be made by the Deputy and noted in his field book.

5th. Swamps are to be represented in the ordinary method, by slightly shaded *black* lines and dots, and the outlines of the same should be distinctly exhibited.

6th. *Prairies* are to be represented by slightly shaded *green* lines and dots, and the outlines of the same to be distinctly exhibited.

7th. The plats should also exhibit, as far as practicable, all *mines, salt springs, salt licks, and mill seats;* also, *towns, villages,* and *settlements*, and the names of the same; also, *forges, factories, cotton gins,* and all other such items of information; also, the *general course* of travelled *roads* and *tracks*, denoting the place to which they may lead.

8th. The exterior lines of the township plat should be double the thickness of the sectional lines, and both of them should be in *black* ink. The lines denoting the quarter sections and the subdivisions of fractional sections should be in *red.*

9th. The quantities of the subdivisions of fractional sections are to be indicated by *red figures*, within the respective subdivisions. The numbers and quantities of the sections and fractional sections are to be exhibited in black figures, at the centre of each, as nearly as practicable; and in cases where the marks and figures on the plat are too numerous to admit of the convenient exhibition of the quantities in that way, the quantity of each section and fractional section is to be exhibited in a neat *tabular statement*, on the *right side* of the plat; and where there are private claims in the township, the quantities of such claims are to be exhibited under a separate head in the tabular statement, which is to exhibit *separate totals* of *public lands* and *private claims*; where any private claim, Indian or other Reservation, &c., is exhibited, the name of the *confirmee* or *reservee* must be given; also, such other reference as will clearly identify the tract, with the Report by which it was confirmed, or the Treaty, &c., under which the individual claims the title.

In cases where the quantities are exhibited in the centre of the section or fractional section, and it is not necessary to resort to a *tabular statement*, the sum total of the public lands in the township is to be exhibited as *one item*, near the foot of the plat.

10th. At the foot of each plat the surveyor general must give an Official Certificate, of the following purport, viz:

The above map of Township No. _____, of Range No. _____, is strictly conformable to the field notes of the survey thereof on file in this Office, which have been examined and approved; (or if any exceptions are taken to the field notes, by reason of their not standing the test of correct platting, such exceptions are to be stated in the margin of the plat, as before mentioned, and exhibited on the face of the plat by *red dotted lines*, and alluded to in the certificate thus: "with the exception stated in the margin hereof.") The Certificate is then to be closed, by indicating the name of the Deputy or Deputies by whom the exterior boundary lines, and the subdivisional lines, were respectively surveyed,

shewing the sum total of miles run by each Deputy Surveyor, also the date of the contract, the quarter of the year in which the survey was made, and the quarter in which the same was paid for and charged in the accounts of of the Surveyor General.

11th. All lines in a township survey, which have not been actually run, must be represented on your plat of survey by *red dotted lines*, and any portion of a survey *found* or *suspected* to be erroneous must also be represented by *red dotted lines*, and payment for the same is to be suspended until the error is corrected, or the cause of suspicion done away, to the full satisfaction of the Surveyor General; and in every case when the survey of a township is incomplete, *from any cause*, such cause must be fully set forth by a *marginal note on the face of the plat,* and certified thereon in the mode designated in the 10th article of this letter.

12th. *Navigable streams* are declared by law to be *public highways*.—Except in cases where navigable streams constitute the boundary line between two Land Districts; and where the Ranges and townships in each District are numbered from different meridians and base lines, they are not to interrupt the regular survey of the Township lines, which are to be continued across such stream for the exact distance. Each border of such stream is, however, to be meandered, by course and distance, and a fractional portion of the same township will be constituted on each side thereof, to be denominated, as the case may be, the fraction of township North or South, or East or West, of such stream, having special regard in such designation to the *general course* thereof, from its source to its mouth.

A Deputy Surveyor continuing Surveys on the opposite banks of streams must invariably be made to shew the connections of such survey with certain established posts or points in the opposite survey; which connections, as well as the mode by which the same was ascertained, are to be shewn in the field book and exhibited in the plat of survey; and, in passing up or down rivers, frequent connections with the surveys across should be made and exhibited, both in the field book and plat.

The *width of navigable streams* and *bayous* binding on the surveys should frequently be ascertained by trigonometrical process. Where the width of the stream does not sensibly vary in the township, the measurement thereof is to be made at the two extreme points of intersection of such objects with the township line; but where there is a sensible variation in the width, measurement thereof must be made as often as may be justly deemed necessary for the accuracy of the survey in connection with the adjoining lands, and the correct exhibition thereof in the township plats.

13th. Where it is necessary to make a return to this Office of township *boundaries* merely, prior to the subdividing of such townships into sections, and the rendition of the regular plats of survey, such boundaries are to be platted in connection, on a scale of from two to three inches to six miles.

14th. The paper to be used on your plats of survey must be of the best quality and of uniform size.

The descriptive notes are to be written on paper of the folio post size, best quality. The records of the plats and field notes to be kept in your Office must be made out on paper of the best quality—. Great care and neatness are to be observed in the execution of the work, and in the particular examination thereof after the same is completed.

SURVEYS AND CONTRACTS.

15th. You are to require bond and approved security for the due execution of all surveying contracts, in the penalty of *double the value* of the contract; and in case of failure to comply with the terms of a contract, unless such failure arise from causes satisfactorily proved to be beyond the control of the contractor, immediate measures are to be taken to recover the penalty of the bond, agreeably to law; and no Deputy Surveyor, who has improperly failed to fulfil his engagements, is afterwards to be employed by you, and of every such failure you are required to give immediate notice to the Department.

The surveys must be executed under the personal and immediate superintendence of the contractor. *Sub-contracts are illegal.* The contract and bond of the Deputy are expressly to provide against sub-contracts.

16th. The act of 18th May, 1796, (Land Laws, new edition, page 420,) provides, that the public lands "shall be divided by North and South lines, run according to the true meridian, and by others crossing them at right angles, so as to form townships of six miles square."

"The corners of the townships shall be marked with progressive numbers, from the beginning; each distance of a mile between the said corners shall also be distinctly marked, with marks different from those of the corners."

The same law requires that "townships shall be subdivided into sections, containing, as nearly as may be, six hundred and forty acres each, by running through the same, each way, parallel lines at the end of every two miles, and by marking a corner on each of the said lines at the end of every mile. The sections shall be numbered, respectively, beginning with the number one in the northeast section, and proceeding west and east, alternately, through the township, with progressive numbers, till the thirty-six be completed."

"And it shall be the duty of the Deputy Surveyors to cause to be marked on a tree, near each corner made as aforesaid, and within the section, the number of such section, and over it the number of the township within which such section may be; and the said Deputies shall carefully note in their respective field books the names of the corner trees marked, and the numbers so made."

The Act of 10th May, 1800, (Land Laws, new edition, page 456,) prescribes the mode of subdividing Sections into half Sections of three hundred and twenty acres each, as nearly as may be, "by running parallel lines through the same, from East to West, and from South to North, at the distance of one mile from each other, and marking corners at the distance of each half mile on the lines running from East to West, and at the distance of each mile on those running from South to North," and making the marks, notes, and descriptions, prescribed to Surveyors by the Act of 18th of May, 1796. The same act also provides that, "in all cases where the exterior lines of the townships, thus to be subdivided into Sections or half Sections, shall exceed, or shall not extend, six miles, the excess or deficiency shall be specially noted, and added to or deducted from the Western and Northern ranges of Sections

or half Sections in such townships, according as the error may be in running the lines from East to West, or from South to North. The sections and half sections bounded on the Northern and Western lines of such townships shall be sold as containing only the quantity expressed in the returns and plats, respectively, and all others as containing the complete legal quantity." By a vigilant and faithful attention to duty on the part of the Deputy Surveyor, the excesses and deficiencies alluded to by the law, except to a trifling extent, will be of rare occurrence.

The Act of 11th February, 1805, entitled "An Act concerning the mode of surveying the public lands of the United States," (Land Laws, new edition, page 515,) prescribes general regulations for dividing townships into Sections, and subdividing such sections into half sections and quarter sections. The following is a summary of those regulations:

The lands are to be laid off in townships of precisely six miles square, by lines running due North and South, and East and West. On each of those lines, precisely at the distance of one mile apart, corners are to be established for sectional lines. Parallel lines are to be run through the township each way, from each Sectional corner to the corresponding sectional corner on the opposite side of the township; on each of which lines Sectional corners are to be established, at the distance of one mile apart; which process will divide the township into thirty-six sections. In running the exterior township lines, and also the interior Sectional lines, intermediate half-mile posts or corners (precisely equidistant between the corners of the Sections) are to be established, as the boundaries of quarter Sections.

17th. Each Deputy Surveyor is to provide himself with two two-pole chains, containing each thirty-three feet, and subdivided into fifty links, which are to be regulated by the *Standard Chain* in the Surveyor's Office; one of which chains is to be specially reserved by the Deputy, as a Standard for his field work, and by which he will adjust the one in active use, at least every other day, if not oftener. Each Deputy will also provide himself with a good compass, with a nonius or a theodolite, (which latter in some respects is preferable, by reason of its peculiar adaptation to the taking of long sights,) which will be compared with the Standard in the Surveyor's Office.

18th. The Surveys are required by law to be made agreeably to the true meridian, and at right angles therewith. The variation of the magnetic meridian is to be observed and ascertained, from time to time, as often as the Surveyor General may deem expedient, and is always to be indicated on the township plat.

19th. The *greatest care* is to be taken in levelling the chain, and plumbing the pins, so as to obtain the *true horizontal distance*, where the surface of the country is irregular and hilly.

The oath to be taken by the chain-men must specially provide for such levelling and plumbing. The Deputy Surveyor must ever be vigilant over the conduct of his sub-agents, (chain-men, marker, and flag-bearers,) whose oaths, with that of the Deputies, are to be filed in your office.

You are to enjoin on your Deputies a strict regard to the moral integrity of their sub-agents. None must be employed in whom *implicit confidence* cannot be reposed, as the interest of the public service is at stake.

AS TO MARKING.

20th. The greatest possible caution is to be observed in marking the corners of townships, &c., in a plain, distinct, and permanent manner.

Where a tree is not found immediately at the corner, a corner is to be established by planting a post, on which is to be marked the number of the township, over which is to be marked the number of the Range, and underneath the number of the Section.

The bearing and distance, also the names and respective diameters of the nearest trees from such corner are to be carefully taken and noted in the field book. The nearest of such trees [where there are more than one] is to be marked to correspond with the *marked corner*. The mark should be [in a regular *chop, squared off*,[1] to be] made into such tree in such a way [so] as to be always distinguishable from a mere *blaze*. The letters B T, to denote the fact of its being a *"bearing tree,"* should be distinctly cut into the wood, some distance below the other marks. All these particulars are to be most intelligibly and minutely noted in the field book. The post used in forming the corners of townships must always be larger [for the sake of distinction] than those which denote the sectional and quarter sectional corners, and should be neatly *squared off* at the top, to correspond with the cardinal points.

[The marks on the posts and bearing trees should be deeply burnt into the wood with marking irons.]

The posts must always be made of the most durable wood that can be had, and should be set in the earth to the depth of two feet, and very securely rammed in with earth and stone. [It is highly, important, in reference to their durability, that the portion of each post below the surface should be charred, and the whole of it rubbed over with tar, except the portion which bears the Surveyor's marks.] The sectional posts are to indicate, by a number of notches on each of the four corners directed to the cardinal points, the number of miles that it stands from the outlines of the townships; the side of the post will be numbered to correspond with the number of the Section it faces. Each half-mile post on a section line, and quarter-section post on a township line, should be marked, to indicate that it is a quarter sectional ["1 4 S"] post, and the nearest adjoining tree on *each side* of such a post must be similarly marked; the Surveyor to note in his field book the kind of tree, its diameter, bearing and distance from the true corner.

Posts denoting the same kind of character of boundary should be of uniform construction, and there should always be a striking difference between posts denoting different kinds of boundary.

[To create *additional* and *increased* facility in the discovery of boundary lines by the purchasers of public lands, and to prevent errors of entry, you are to require your Deputies to fasten to the sectional and quarter sectional posts, near the ground, but so as to be plainly seen, a finger board, on which is to be *distinctly* marked with *black oil paint*, the appropriate number of the tract. This board to point *diagonally* across the tract, and to be marked similarly to this: N.W. ¼ S.1. T. 1 N. R. 1 E.]

1. The words included in the brackets were omitted in the letter to the surveyor general of Arkansas.

In prairie countries, where bearing trees cannot be had, *mounds*, to be covered with sod, are, agreeably to contract, to be erected. Such mounds should be of uniform size, and conform precisely to instructions to be given by you. As mounds are subject to be worn away, by the action of the weather and other causes, I would recommend that a stone be planted in the centre of the mound, and that a few handfuls of charcoal be enclosed therein. [I would further recommend, that at each corner of a square, which will enclose the mound and conform to the cardinal points, there be planted a chestnut, hickory-nut, walnut, or acorn.

A stake to be set up in the centre of the mound, to which is to be fastened a finger-board, on which is to be designated in black oil paint the appropriate numbers.

All the particulars relative to the construction of a mound are to be minutely indicated in the field book.

The perpetuation of the corners of the public surveys is a subject of *primary importance*. Every possible care and precaution to secure correct and durable corners must be observed by your agents, whose fidelity you should test by every means in your power.

AS TO FIELD BOOKS.

21st. You are to furnish your Deputy Surveyors with a printed specimen form of field book, which is to be so constructed as to exhibit every particular required either by law or instruction, so as to admit of a perfect topographical exhibition of the country, and accompany such form with special instructions on every point in relation to which it can be presumed that instructions are necessary.

In the field book, the number of miles, chains, and links, run on a line, are to be exhibited in a column, which is to be added up at the foot of each page, and carried forward from page to page, so as to form at the conclusion of the book the aggregate of miles, chains, and links, run in the township or fractional township.

The Act of Congress approved 18th of May, 1796, (Land Laws, new edition, page 420,) requires that "every Surveyor shall note in his *field book* the true situation of all Mines, Salt licks, salt springs, and Mill Seats, which shall come to his knowledge; all water courses over which the line he runs shall pass; also, the quality of the lands. These field books shall be returned to the Surveyor General, who shall thereupon cause a description of the whole lands surveyed to be made out, and transmitted to the Officers who may superintend the sales. He shall also cause a fair plat to be made of the townships and fractional parts of townships contained in the said lands, describing the subdivisions thereof, and the marks of the corners. This plat shall be recorded in books to be kept for that purpose; a copy thereof shall be kept open at the Surveyor General's Office, for public information, and other copies sent to the places of sale, and to the Secretary of the Treasury."—.

As the protraction of the surveys at the Office of the Surveyor General, from the field books furnished by his Deputies, is the *test* of the accuracy or incorrectness of the survey, the greatest caution is to be observed in making such protractions.

The field books are to indicate the examination and approval thereof, (or disaproval, as the case may be,) by the Surveyor General, with the date of such examination and approval, under his own proper signature; also, the date of the contract, the quarter of the year in which the land was surveyed, and payment made therefor.

The field books are to be signed by the Deputy Surveyor, and also by the chain-men, marker, and flag-bearers, employed in the survey.

SUBDIVISIONS OF SECTIONS AND FRACTIONAL SECTIONS.

22d. The Act of 24th of April, 1820, entitled "An Act making further provision for the sale of the public lands," (Land Laws, New Edition, page 770,) requires that the public lands be offered for sale in half-quarter sections, and requires that the lines, supposed to divide 1 the quarter sections into half-quarter sections, are to run *North* and *South*. This law also requires that the corners and contents of half-quarter sections shall be ascertained in the manner and on the principles prescribed by the Act of 11th of February, 1805. (Land Laws, New Edition, page 515.)

The same Act requires that "fractional sections containing One hundred and sixty acres and upwards shall in like manner, as nearly as practicable, be subdivided into half-quarter sections, under such rules and regulations as may be prescribed by the Secretary of the Treasury; but fractional sections containing less than one hundred and sixty acres shall not be divided, but shall be sold entire."

The instruction of the Secretary of the Treasury, under the aforesaid act, is, that the lines of the subdivisions of fractional sections containing one hundred and sixty acres or upwards may run either North and South, or East and West, so as to preserve to the respective subdivisions the most compact and convenient forms.

The lines of the subdivisions of quarter sections and fractional sections are to be merely indicated on the maps. It is not contemplated by the existing laws that they should be actually surveyed at the expense of the United States.

In the subdivision of fractional Sections, you are requested to observe, as a general rule, points equidistant between the half-mile posts, as the the supposed boundaries, whether North and South or East and West, between the subdivisions.

I am, very respectfully,
your Ob't Servant,
Elijah Hayward

(Ed. Note:)
(Copies of this letter were sent to William McRee, John Coffee, M. T. Williams, Robert Butler and H. B. Triste, Surveyors General on September 23, 1831. A copy was sent to Jame S. Conway, on July 6, 1832, following his appointment as Surveyor General of Arkansas. The words included in the brackets [ ] were omitted in the letter to Conway.)

XIII.

(This extract from a letter to Gideon Fitz from Hayward is copied from the publication "General Acts of Congress with Instructions, Vol. II, 1838.)

INSTRUCTIONS.—SURVEYS.

No. 912.—(S. G. vol. 5, p. 18.)

From the Commissioner to the Surveyor General, Washington, Miss.

October 24, 1831.

SIR: I have received your letter of the 21st ultimo, in reference to certain points in my letter of instruction of 28th July last.

Inasmuch as you have suggested so many difficulties attending the use of branding irons in various situations in which the surveyors may be placed, I request that you will consider so much of the 20th article of my letter of instructions of 28th July last, as relates to that peculiar mode of marking, as being hereby suspended until you receive farther instructions. Meanwhile, you will continue the mode of marking hitherto in use, enjoining on your surveyors the observance of every particular necessary to effect the primary object of that instruction, which is the proper designation of boundaries, and the perpetuation of the same. You propose to have red paint traced in the groove cut by the common marking irons, to give a conspicuous appearance to the letters of figures. I see no objection to this mode.

The objections to the charring and tarring of the posts appear to be principally the loss of time attending those operations, for which the surveyors would require extra pay. Under these circumstances, as increased pay cannot be granted, those precautions against the decay of the posts must, of necessity, be abandoned.

I am not satisfied with some of the reasons assigned by you against the use of finger boards; but, although desirous of adopting them as a precaution against errors of entry, and for increased facility in the discovery of boundary lines, it is not intended to introduce any innovation which would unnecessarily retard the execution of the public surveys. If surveyors cannot be found to undertake the placing of finger boards without increased pay, the plan cannot be put into operation.

XIV.

(The following complete copy of Instructions is taken from an original volume now in the possession of the National Archives.

INSTRUCTIONS FOR SURVEYING THE LANDS OF THE UNITED STATES, IN THE STATE OF Mississippi.

PREPARED

BY GIDEON FITZ,

"SURVEYOR OF THE LANDS OF THE UNITED STATES, SOUTH OF THE STATE OF TENNESSEE."

NATCHEZ,

Printed by Robert Semple, Main Street.

1832.

INSTRUCTIONS

FOR SURVEYING IN THE STATE OF MISSISSIPPI.

Surveyor's Office, Washington, Mississippi

DECEMBER, 1831.

Elijah Hayward, Esq. Commissioner of the General Land Office, in his instructions of the 28th July 1831, having requested that instructions be prepared for the Deputy Surveyors, and printed, with a specimen form of a field-book, in order that the returns to this office, may be more correct, and uniform in every respect; I have prepared the following instructions, with a specimen field-book, which, it is hoped, will answer the purpose.

In preparing these instructions, I have thought it best to take a review of the several Acts of Congress, relating to the subject, which acts will be noticed in the order of their dates; Beginning with the act entitled *"An act, providing for the sale of the lands of the United States, in the Territory North-West of the river Ohio, and above the mouth of Kentucky river."*— Approved on the 18th May, 1796. [See Land Laws, new edition, page 420.]

By the 10th and 11th sections of the act of the 3rd March, 1803, entitled "An act regulating the grants of land, and providing for the disposal of the lands of the United States, South of Tennessee," the provisions of the foregoing act of the 18th May, 1796, are made applicable to the surveys of this State, so far as relates to the formation of instructions for the Deputy Surveyors, administering to them the necessary oath upon their appointment, and removing them from office for negligence or misconduct in office.—Also, the method of surveying the public lands into Townships of six miles square, by lines run according to the true meridian, due North and South, "and

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others crossing them at right angles," and to divide the Townships into thirty-six square Sections, containing each as nearly as practicable 640 acres.—Also, the mode of numbering the Sections by one uniform rule, commencing with the number one, in the North-East corner of each Township, and proceeding West and East alternately with progressive numbers, till the thirty-six numbers be completed. The sections of fractional Townships are numbered in the same manner, as if such fractional Township was full and complete. Fractional Townships are occasioned by Indian boundaries, District or State boundaries, and not by navigable streams passing through them. Fractional Sections are occasioned by Indian boundaries, District boundaries, State boundaries, navigable water courses, and individual or private claims. On navigable water cources, the sections may retain their square form, and yet become fractional, because part of the area of such sections, are taken out by such water course; and the parts of such sections are separated, and may not be connected by their boundaries continuing on the same right line across such stream, nor is it necessary that the lines in such situations should be continued directly across such navigable streams, because the fractional part of such sections on opposite sides of such streams, have their areas determined independent of each other.

Fractional sections, in the meaning of the law, are not occasioned by the section containing more or less than 640 acres, but become fractional only in situations as above mentioned, on navigable water courses, Indian boundaries, district, or State boundaries, and by individual claims.

The act of the 18th May, 1796, is the only act which prescribes the mode of marking the corners of Townships and sections, and requires that the deputy Surveyors respectively, shall "cause to be marked on

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a tree near each corner of each section, and within such section, the number of such section, and over it, the number of the Township within which such section may be, and to note carefully in their respective field-books, the names of the corner trees marked, and the number so made. That all lines shall be plainly marked upon trees, and measured with chains containing two perches of sixteen feet and one half each (each perch) subdivided into twenty-five equal links, which chain shall be adjusted by a standard to be kept for that purpose. That every Surveyor shall note in his field-book the true situation of all mines, salt licks, salt springs and mill seats which shall come to his knowledge; all water courses, over which the line he runs shall pass, and also the quality of the land. That these field-books shall be returned to the Surveyor General, (or officer acting as such,) who shall therefrom cause a description of the whole lands surveyed to be made out, and transmitted to the officers who may superintend the sales. He (the surveyor General) shall also cause a fair plat to be made of the Townships and fractional parts of Townships, describing the subdivisions thereof, and the marks of the corners. The plats shall be recorded in books to be kept for that purpose; a copy thereof shall be kept open at the Surveyor General's office for public information, and other copies sent to the places of sale, and to the Secretary of the Treasury."

This law is very important, as prescribing the manner of making the surveys generally, numbering the sections and manner of keeping field-books, to be returned by the deputy Surveyors.

The second act of Congress to be noticed, is that passed on the 10th May, 1800, entitled *"An act to amend an act entitled "An act providing for the sale of the lands of the United States in the Territory North-West of Ohio, and above the mouth of Kentucky river."* [See Land Laws, new edition, page 456.]

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Although this act is referred to in the Commissioner's instructions, it seems very doubtful whether its provisions generally, can now be applied to the surveys to be made in this State. Its general provisions are, that twenty-five of the sections of each full Township, shall each, contain the exact quantity of 640 acres, and that the error of measurement on the township lines, shall affect the sections only on the Northern and Western tiers, and in the Northern and Western parts of those sections respectively. This mode of surveying was certainly impracticable, because it presupposes

that the measurement on the South and East boundary of each Township, will be without error, and the section lines of twenty-five of the sections respectively were to be returned by the surveyor, as being just one mile in length each, whether he found them so or not. Then it only became necessary to measure those lines to set the quarter section corners, and note the water courses. The quarter section corners would stand at half a mile from the section corner run from, without regard to the true length of such section line, and therefore could not answer the purpose properly, of dividing the sections into four equal parts. The measurement would not, on one set of the section lines at least, have any check short of four, five, or say six miles. If there was only a difference of ten links in the measurement on each mile, which may seem to be small in rough woods, that error would accumulate in running across the Township to 40, 50 or 60 links in the closing miles. The next line East or West, North or South of the first one run across the Township, would have its errors in measurement accumulated in the opposite direction, and consequently increase the angle which a line would make with the true cardinal points, in running across any section, and the four quarters of each section according to such rule, would differ

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from each other in area. It seems to have been contemplated by this act, that the section lines might be run alternately across the Township. I believe that no practical surveyor will admit that lines run in this way, would be measured with sufficient accuracy to set the quarter section corners according to the provisions of other laws, which require them to be set equidistant from the section corners, on the same lines, nor would the crossing of streams be noted on the lines in their proper places. The provisions of this act, as relates to the forms of the sections, and the principles of fixing quarter section corners, were effectually repealed by the act of the 11th Feb. 1805.

The third act of Congress to be noticed, is that which governs the forms of the sections, the areas of sections and parts, under all circumstances, and consequently fixes the principles on which the surveys are to be made. This act is entitled *"An act concerning the mode of surveying the public lands of the United States."*—Approved on the 11th February 1805. (See Land Laws, new edition, page 515.)

It is evident from the words of this act, that it was intended to supercede, so far as it goes, the provisions of all other acts, in relation to the mode of surveying the public lands. Its general provisions are, that all the lines and corners established under the authority of the Surveyor General, or surveyor of public lands South of Tennessee, and the areas of the sections and fractional sections, and their subdivisions resulting from the measurement and courses of the boundaries of the sections and fractional sections, shall be deemed to be correct, and the section lines and subdivisional lines shall proceed from the established corners by straight lines to the opposite corresponding corner, without regard to course, except on navigable water courses, Indian boundary, or other external boundary of fractional Townships, where no opposite

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corresponding corner has been, nor can be established; then the lines of such fractional sections and subdivisions, shall be run due East, West, North or South as the case may be, to such Indian boundary, water course, State or district boundary. This act recognises the same principle, as all the other acts referred to, of running the Township and section lines as nearly as practicable, due East, West, North and South, and only admits that they may deviate from the true cardinal points, when it becomes indispensable from errors of former surveys, where corners erroneously established, cannot with propriety be removed. This act also requires that the quarter section corners shall be set equidistant from the section corners on the same line. The quarter section corners therefore cannot always be just half a mile from either of the section corners on the same line, but must be governed by the length of the section lines on which they stand, whether on the North and South, or East and West lines. This will make it necessary in practice, to go over many of the lines twice. It is impracticable to avoid this inconvenience, and it must therefore be submitted to, wherever necessary, both for the purpose of complying with this law, and to do justice to purchasers of the public lands. The Surveyor will therefore see the necessity of running the lines in the first instance, with great care, and in such manner as to avoid the necessity of running towards the Basis lines, but always in a direction from them, that all the lines may be continued in a direct course through the district or State, as nearly as practicable.

The fourth act necessary to be noticed, is the act entitled *"An act making further provisions for the sale of the public lands."*—Approved on the 24th April, 1820. (See Land Laws, new edition, page 770.)

This act provides that from and after the first day of July 1820, all the lands of the United States, the

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sale of which is, or may be authorised by law, shall, when offered at public sale to the highest bidder, be offered in half quarter sections; and when offered at private sale may be purchased at the option of the purchaser, either in entire sections, half sections, quarter sections or half quarter sections; and in every case of the division of a quarter section, the line for the division thereof shall run North and South, and the corners and contents of half quarter sections which may thereafter be sold, shall be ascertained in the manner, and on the principles directed and prescribed by the second section of an act, entitled, "An act concerning the mode of surveying the public lands of the United States," passed on the 11th day of February, 1805; and fractional sections containing 160 acres, or upwards, shall in like manner, as nearly as practicable, be subdivided into half quarter sections, under such rules and regulations, as may be prescribed by the Secretary of the Treasury; but fractional sections containing less than 160 acres, shall not be divided, but shall be sold entire; provided, that this act shall not be construed to alter any special provision made by law for the sale of land in town lots.

The Secretary of the Treasury has directed, that the lines of the subdivisions of fractional sections containing 160 acres or

upwards, may run either North & South, or East & Wast so as to preserve to the respective subdivisions the most compact and convenient forms.

The subdivisional lines of quarter sections and fractional sections, are merely to be indicated on the maps by red or dotted lines. It is not contemplated by existing laws that they shall be actually surveyed at the expense of the United States.

By reference to the act of 24th April, 1820, it is evident that the act of the 11th February, 1805, should

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govern, in the mode of surveying the public lands, and not the act of the 10th May 1800, which last mentioned act is not referred to in the act of 24th April, 1820. It is also evident that to do justice to the purchasers of public lands, the quarter section corners must be placed equidistant from the section corners on the same line, for all sections that are intended to be offered for sale in half quarter sections. This circumstance then fixes the principle upon which the surveys must be made.

The principle for running the Township and Range lines in a direction from the Basis lines, is recognised in the law of the 10th May, 1800, as it requires the Townships to be closed at the North-West angle, because it is presumed, the district lay West of the Basis Meridian, and North of the Basis Parallel. This is a correct principle as relates to Township, Range and section lines. It is supposed that the Basis lines will be well run and measured, and if lines be run due East, West, North or South from such Basis lines, there will be seldom a necessity for making objectionable unsightly offsets, at the corners of Townships, nor for changing the course of the closing miles to intersect at corners previously established.

The Meridians should be run in like manner from the Basis Parallel, North or South, untill the natural convergency, or divergency becomes so considerable as to require a new standard Parallel, or East and West line on which to lay off exact miles, to continue the surveys North or South. On these East and West standard lines, there must of necessity be two sets of corners, otherwise the closing lines of the Ranges, on those lines would in some instances diverge from the true cardinal points by very large and objectionable angles.

Having referred to the provisions of the several acts of Congress relative to the proper mode of survey-

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ing the public lands, and preparing them for market, according to the requisitions of the act of the 20th of April, 1820, and finding by the first section of the act of the 18th May, 1796, that it is the duty of the Surveyor General, and the Survyor of the United States ands South of Tennessee, respectively to frame regulations and instructions for the government of the deputies, I have given the necessary instructions, in compliance, as far as practicable, with the views of the Government, expressed through the Commissioner of the General Land Office, that the lines may be well run and marked and the corners be established in a manner the most conspicuous and durable, which the price of surveying will justify and the nature of the country admit.

The first object was to have the Basis Parallel and the Basis Meridian of the Choctaw land district, extended through the country lately acquired from the Choctaws from which to number the Townships North from the Basis Parallel, and the Rranges respectively East and West from the Basis Meridian. It was an object to have as few Basis lines in the State as practicable, to number Townships and Ranges from, because, to have many Basis lines to number from, is calculated to produce confusion in the surveyor's office, and if the name of the district happens to be omitted on the field-notes or maps, as has sometimes happened already, those notes and maps may become doubtful, if not useless. In order to prevent the errors of the old surveys from being extended into the new purcace, a standard meridian was directed to be run with great care, observing the variation of the needle carefully, and run due North between Ranges six and seven from the Basis Parallel, to the distance of ninety-six miles, measuring the line with two sets of chain carriers, one set following the other at a short distance, to detect any error that might happen

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in the measurement. From the North end of this line, another line was ordered to be run due West to intersect the extended Basis Meridian, and then to return on the line measuring exact miles from the Basis Meridian East, so as to throw any excess or deficiency of measurement between the Basis Meridian and the standard Meridian, on the mile next to the standard Meridian, where it would not affect the surveys of the new work, or but very slightly so. This line too, was directed to be double chained. Also the Basis Parallel and Basis Meridian. Also an East and West line to be run across the country, at the distance of forty-eight miles North, and another at ninety-six miles North, and another at one hundred and forty-four miles North of the Basis Parallel, all East of the Basis Meridian, and one from the Basis Meridian due West, at the distance of 144 miles North of the Basis Parallel. One standard Meridian, West of the Basis Meridian, has been ordered, to be run at the distance of 36 miles from the Basis Meridian, and one standard Meridian, to be run on the East side of the first mentioned standard Meridian, between Ranges 12 and 13, extending from the Basis Parallel to the Chickasaw lands. All these lines are to be run with peculiar care, as standard lines to check the errors which may arise in running the Township lines.—They are all to be double measured, and the variation of the needle carefully observed on them, by which to govern the running of the Township and section lines. For all these standard lines, the price of six dollars per mile is allowed, to be deducted from the section lines in the open parts of the country.—The next business will be, to run out the Township lines, by which means, a knowledge of the character of the country will be obtained, and then the districts for sectioning will be designated, some to be sectioned at three dollars per mile, and others at five, ac-

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cording to the nature of the country and difficulties which may attend the surveying; so as to average the whole at four dollars per mile, or as the law provides that, the whole ex-

pense of surveying the country, shall not exceed four dollars per mile.

These are the general outlines of the plan, the advantages or disadvantages of which, can only be tested by time and experience. It is a plan proposed by myself and accepted by the Government. I fear no derangement, but that which may arise from too much hurrying of the surveys, and a want of skillful, experienced surveyors to conduct it.

Remarks on the mode of running Section lines, as heretofore generally practised.

In Townships North of the Basis Parallel, the general rule was to begin on the line between sections 35 and 36, and run due North half a mile, fixing the quarter section corner, and proceeding to the end of the mile, and fixing the section corner permanently. Thence a randum line due East, between sections 25 and 36, measuring the line without marking, and leaving a temporary quarter section post at half a mile, and on reaching the corner on the township line and noting the misclosure, if any, the line was run Westwardly on a straight direction from corner to corner, marking the line and fixing the quarter section corner equidistant between the section corners. Thence due North between 25 and 26, fixing the quarter section corner at half a mile, and the section corner at a mile, as before, and thence due East on a randum line as before, and returning on the straight line from corner to corner. Thus the first tier of sections were run until the surveyor arrived at the South-West corner of section one, where he run a randum line between sections one and two due North, and corrected back, marking the line on his return, and fixing the quarter

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section corner equidistant from the respective section corners. Then he travelled back to the beginning point, or to the corner of sections 34 and 35 on the South boundary of the Township, and proceeding as before, to carry on another tier of sections to the North boundary of the Township. In Townships South of the Basis Parallel the order was reversed, so as to run South instead of North. To this mode, there are two strong objections. The East and West section lines are run in a zig zag manner, seldom conforming to the cardinal points, and all the lines are governed by the measurement, and not by the compass. All the interior section lines had to be gone over twice, that is, once in running them, and once in back travelling, which occasioned much loss of time and in thick woods the randum lines have to be cut open, and require as much labor and time, as when marking them. The sections are not of uniform size.

To obviate these objections, I propose the following plan, in which the compass will have its due share of credit, and the surveyor may have the measurement always under his control, it being checked at every mile, and most of his back travelling will be on marked lines, which will be of great advantage in thick woods. All experience has shown, that the compass, in the hands of a skillful surveyor, is much more to be relied on for accuracy, than measurement, and particularly so in hilly rough woods. It is presumed the Township and Range lines will be well run and measured, in which case the errors in the sections will be very small. This mode too, will be in compliance with the laws, so far as practical surveying can be made to comply with them, in causing the lines generally to conform to the cardinal points, in equalizing the areas of the sections, and marking quarter section corners, so as to divide the sections and fractional sections into equal parts as the law

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directs. It will be only necessary to back travel 35 miles in the Townships generally, instead of 60 miles as has been heretofore required. In Townships East of the Basis Meridian, and North of the Basis Parallel, the township lines are to be run North and East respectively, closing them at the North-East angle, except those adjacent to the old choctaw boundary, which of necessity will be closed on that boundary. Those West of the Basis Meridian and North of the Basis Parallel, will be closed at the North-West angle, except along the old Choctaw boundary, where they must be closed on that boundary. Those South of the Basis Parallel have already been surveyed, except one tier of Townships East of Pearl river, which will be run North, and closed on the Basis Parallel, making corners wherever the Range lines and the Meridianal section lines may intersect that line.—All the miles (as we must call them) on the Township and Range lines, are intended to be exact miles, except on the closing lines, where they may be more or less than a mile. On these closing lines, or miles, the surveyor must return, and fix the quarter section corner equidistant from the Township corner and the nearest mile, or section corner, both on the Township and Range lines.

Plan for running interior Section lines, In Townships East of the Basis Meridian and North of the Basis Parallel.

Beginning on the South boundary of the Township at the corner of sections 31 and 32 and running due North between those sections half a mile and fix the quarter section corner, and continue to the end of the mile and set a temporary corner stake. Thence run due West on a randum line between sections 30 and 31, measuring carefully half a mile and set a temporary quarter section stake, and continue on to the in-

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tersection with the West boundary line of the Township, and note the misclosure, if any, and return from the corner previously established, on the township line due East, marking as you go and noting the crossings of water courses &c. on the true line, and fixing the quarter section corner on that line equidistant from the section corners, and take bearings. Continue on due East untill you intersect the line first run, and fix the corner of the section at the point of intersectien, and take bearings &c. Thence continue the line due East between sections 29 and 32 half a mile, marking the line as you go, and fix the quarter section post, take bearings, and continue the line one mile, and set a temporary corner stake. Then travel back on the line, and run due north one mile between sections

29 and 30, marking the line as you go, and fixing the quarter section corner, and setting a temporary section corner post. Thence on the randum line due West between sections 19 and 30 setting a temporary quarter section stake, and noting as before, the intersection on the West boundary of the Township—Return and mark the line from the corner due East, noting the crossings of streams &c. on the true line till you intersect the Meridian section line, and there fix the section corner, taking bearings &c. and continue on due East between sections 20 and 29 one mile and set a temporary section corner stake—return on the line, having as before fixed the quarter section corner at the half mile, run due North between sections 19 and 20, and continue in like manner to run and mark in the following order all the lines, between sections 18 and 19, 17 and 20, 17 and 18, 7 and 18, 8 and 17, 7 and 8, 6 and 7, then run a randum line due North between sections 5 and 6, measuring carefully, leaving a temporary quarter section stake at half a mile, and noting the intersection on the North boundary of the Township, East or

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West of the corner and then correct the line back on a direct course from corner to corner, and mark the true line, noting the crossings of the streams on that line and fixing the quarter section post equidistant from the section corners—then run due East, marking the line as you go, between sections 5 and 8, fixing the quarter section corner, and setting a temporary mile corner—then run a randum line due North from the last mentioned corner between sections 4 and 5, leaving a temporary stake at half a mile, and note the intersection East or West of the corner on the Township line, and length of the line, and run due South from the corner to intersect the section line last run by you; fix the section corner at the intersection, and run the line due East between sections 4 and 9, and return on it having set a temporary mile, or section post, and fixed the quarter section corner at half a mile, and then run due South between sections 8 and 9 in like manner as before, marking the lines and fixing the quarter section corners to suit the measurement which you may have found on the opposite side of each section respectively, till you arrive at the North-East corner of section 32—then run a randum line due South between 32 and 33, and correct back on a direct line from corner to corner of these sections, and then run due East marking the line between 28 and 33 one mile, and set a temporary mile post, having marked the quarter section as before directed, and then run a randum line due South between sections 33 and 34, and note the intersection and length of line—then return due North from the corner, marking the line and fixing the quarter section as you go, and noting the crossing of streams to the intersection, at, or near the section corner; set the corner at the intersection, and run due East between sections 27 and 34 one mile, setting the quarter section corner and a temporary mile post—return on the

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line and run due north between sections 27 and 28, on the same plan as before and mark the line between sections 22 and 27, 21 and 22, 15 and 22, 15 and 16, 10 and 15, 9 and 10, and then run a randum line due North between sections 3 and 4, and correct the line back on a straight course from corner to corner, fixing the quarter section corner equidistant from the section corners, and noting the crossing of streams on the true line. Then run due East between sections 3 and 10, marking as you go, and setting a temporary section post. Then run due North between sections 2 and 3 on a randum line as before, and return from the corner due South marking the line and fixing the quarter section corner, and make the section corner at the intersection, take bearings and run due East between sections 2 and 11 one mile and set a temporary mile post, and fix the quarter section corner, and then return and run due South between sections 10 and 11. Then East between 11 and 14.—Then South between 14 and 15, and so on to the North-East corner of section 34. Then run a randum line between sections 34 and 35, noting the intersection and length of the line, and correct back on a straight line from corner to corner, of the sections. Then run due East between 26 and 35 one mile and set a temporary mile stake, and run due South between sections 35 and 36 to intersect the South boundary of the Township, and return from the corner due North fixing the quarter section post, and making the section corner at the intersection. Thence run due East on a randum line between sections 25 and 36, and correct back on the straight line from corner to corner as before. Then due North between sections 25 and 26. Then East between 24 and 25, and so on till you arrive at the South-West corner of section one. Then run due East on a randum line and correct back between sections 1 and 12, and likewise

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between sections 1 and 2, and you will end the work at the South-West corner of section one. By this plan two of the sectional meridians will be run South, and the other three North, through the Township.—The measurement will be checked at every mile, and can never err much. The only lines which may diverge from the cardinal points, will be those between sections 5 and 6, 3 and 4, 1 and 2, 32 and 33, 34 and 35, and the tier on the East side of the Township, between 1 and 12, 12 and 13, 13 and 24, 24 and 25, 25 and 36, and these will diverge very little, if the measurement on the Township lines be correct, and the section lines well run. The measurement on the interior lines cannot derange the work, which will be a great advantage in the plan. All the interior lines will be run due North, South, East or West, except those mentioned on the exterior tiers of sections. If on intersecting at the interior section corners in open level land, you come within twenty-five links of the temporary corner, then the quarter section may stand as first set, because it is presumable that in common rough woods, another set of chain carriers might make that much difference in a mile, and the quarter section corner would only be affected by half the error, that is twelve and a half links. It is not to be taken for granted that one measurement is better than another, in small differences, when both are made with equal care. In very broken country, and difficult to measure, then double that allowance may be made. but if the error in closing a section exceed that, then the quarter section corner must be corrected. It will not be very inconvenient generally, to go on

a marked line half a mile to correct a corner. It will still be much better than the old plan of going over all the lines twice. It is believed that very few of the quarter section corners will need correction, except the outside tiers, because all the interior lines

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may generally be chained by the same chain carriers, and they will not make much difference in each mile. The surveyor, too, may exercise his judgment as to which of the half miles are best measured, and make allowances of that nature. In deep swamps where the land will not be saleable till long after the posts are decayed, the surveyor may correct the quarter section bearings by calculation, and not return to remove the stakes, because if removed they will not be of use in such places, but this should not be done in any position where those stakes might mislead a person who may be exploring the country to purchase land.

In Townships East of the Basis Meridian and North of the Basis Parallel, the sectioning will commence on the South boundary of the Townships generally, between sections 31 and 32, and end at the South-West corner of section one.

In Townships West of the Basis Meridian and North of the Basis Parallel, the sectioning will commence between sections 35 and 36, and end at the South-East corner of section 6. By the same rule, in Townships South of the Basis Parallel and West of the Basis Meridian, the sectioning would commence between sections 1 and 2 and end at the North-East corner of section 31, and in Townships South of the Basis Parallel and East of the Basis Meridian, the beginning would be between sections 5 and 6, and end at the North-West corner of section 36. But it is not supposed that there will be any now to run South of the Basis Parallel in this State, except a tier of Townships East of Pearl river, which will have the section lines run North and West to close on the Basis Parallel, to complete the old district in that quarter.

If navigable rivers or lakes pass through the Townships or into them, the section lines on one side of

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such rivers and lakes may be run, and then on the other side, running the lines due North, South, East or West from the Township lines to such rivers or lakes, keeping as much as possible to the order and principles of intersecting at the corners to form the sections on the general plan. In noting the banks of streams, instead of North or South, East or West, always use the terms right, and left bank, applying the terms as if you were decending the stream, and not ascending it.

Corner posts and marks.

The posts must be large enough to mark the necessary numbers on. Those at the corners of Townships should be larger than others, to distinguish them. They should be all hewn square from the top about a foot down. The Townshp corner posts should not be less than 5 inches square, the section posts about 3 to 4 inches square, and the quarter section posts hewn on two sides only, made smaller than the section corner posts. They should all be set firmly in the ground, say to the depth of 18 inches or more, if the surveyor has the means of setting them to that depth, but as it will not be practicable for the surveyor to carry a spade, or other instrument to dig holes of such depth in all situations, he must fasten the posts in the best manner in his power, the time he can spare for that object, and his means of performing the work. The posts should be about two and a half feet above the ground; if they are taller, they are more liable to be loosened, or pressed down by cattle. All the posts are to be of the most durable wood at hand. I had intended not to have the posts marked, except in the absence of trees, because they are liable to be twisted round from their proper positions, by designing persons, by carelessness or ignorance, and are in that situation, calculated to deceive persons who may take numbers from them to enter land;

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but as the Commissioner has directed that the section numbers shall be marked on the posts, it must be done untill further orders. In a Southern climate, where posts of the best wood will last but a few years, it is time thrown away, to mark such posts as the surveyors are generally compelled to use, of young, green, perishable wood, many of which posts are gone in 2 to 3 years, and some in one year. In prairies or other places, where there are not trees convenient to mark, then all the necessary numbers of sections, townships and Ranges must be marked on the posts.—The quarter section posts must be marked thus ¼ the letter S. for section may be omitted on all the posts and trees, as it is sometimes mistaken for the figure 8, or 3, and the numbers are as well understood without it as with it, particularly if they are marked in a uniform manner, as they must be.

In prairies a small mound of sod is to be thrown up around the post, say 18 inches high and thirty inches across the base.

The proper numbers of section, Township and Range, are to be marked on trees, if trees are found standing within 500 links of such corners, and for quarter section corners, if within 300 links. Four trees are to be marked at each corner that is intended as a common corner to four sections, but if it is a corner to two sections only then two trees are to be marked in like manner, corresponding with the sections in which the trees stand.

At each of the interior section corners, one of the trees only need to be marked with the number of the Township and Range. The letters T and R, must be marked on the left of the respective numbers, and the letters E and W, on the right to designate the Rrange East, or West, of the Basis Meridian; always marking in one uniform manner, that is, Range first, then Township underneath, and the section number

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under that, as the law directs. The quarter section reference trees, must be one on each side of the line, if practicable, and marked as the stake, thus ¼. On Range lines, the number of Range and Township must be marked at each section corner, on two trees, one on each side of the line, following the same rule on the Township lines which run East and West.—Red oil paint is required to be traced in the grooves of all the letters and figures on the trees, but may be omitted on the

posts, on account of their perishable nature, except in prairies where there are not trees to mark.

The paint recommended by painters, as being most durable and cheap, is called Venetian red. It can be had in Natchez at 25 cents a pound, ready ground and mixed with oil. It has cost 37 1-2 cents in this town. From the small trial which has been made, it required about one pound to six corners of four sections each. It may be more or less. Strong tin cases have been used to carry it in, and a small one for one of the hands to carry each day.

At the Township and section corners, as well as at the quarter section corners and fractional section corners, on water courses or elsewhere, the distance and course from the corner, must be taken to two of the reference trees, if practicable and noted in the field book, with the name and diameter of such trees. The bearings and distance to two trees will do, because that number is required to fill the form prescribed for the descriptive notes, and may be sufficient to perpetuate the corner.

Marking of lines.

All trees in the lines are to be blazed where the line strikes them, and on the opposite side, where the line leaves them. Trees within three feet of the line where the timber stands verry thick, and within five

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or six feet on either side where timber is scattering may be blazed on the side facing the line, or a little turned in the direction of the line, so as to be easily seen by a person who may be following the line. On one side of the line let the blazes be a little turned one way, and on the other side, in the opposite direction, so that the line may be easily followed either way.

Trees on the Township and Range lines, are to have two chops below the blaze, and those standing in the section lines in the interior of the Townships are to have one chop under each blaze. Where the timber is scattering, it will be proper to note the distance to a tree now and then, on the line, from the section corner run from, which tree may be notched instead of being only chopped. The surveyor will notice the shape of water courses, ponds, prairies &c. as he goes along the lines, and in passing through the sections, by which he may be enabled to lay down in the maps, a good eye draft of all those objects with the conections of streams, and the bearings and connections of roads and paths. He should have the form of a Township, with the square sections in his field-book, and while on the ground, represent as well as he can judge by the eye, on such maps, all the objects above mentioned, and the windings of swamps, or low land along the water courses of note.

By a little and proper attention to these matters on the ground, the maps may be made to represent the country, much better than has generally been done heretofore. It will hinder very little time to do it, and it is the duty of the surveyor to give as good a representation of the country as circumstances will justify, particularly in shaping and connecting water courses, swamps, ponds and roads.

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Of Marks on Trees.

It is proper to instruct the surveyor as to the manner of marking letters and figures on trees. It is known that marks on the bark of trees are more durable than those made on the wood. There are few persons who perhaps have not noticed dates cut on Beech trees near public roads. From such dates it is evident that the wood could not have endured so long. If a block be cut out to make a flat surface to mark on, water will lodge in the cut and destroy the tree. It would not be practicable to cut small trees so much as to make a flat suface to mark on, without injuring the tree. Nor would it be practicable to block out many kinds of trees, as proposed by the Commissioners suggestins, even with the help of a mall and iron wedge. All trees therefore that have bark smooth enough to mark on, must be marked on the bark. If pine trees are cut to the wood, the turpentine will soon obscure the marks, which will soon be destroyed by fire. They should therefore be marked on the bark only, scraping off the scales to get a smooth surface. On old oaks & hickory trees, the bark must be removed, and marks made on the wood, and the place should be made so wide as to prevent its growing over in many years.

Variation of the Needle.

I shall make some remarks on the variation of the needle to show the importance of attending to it. In running long East and West lines, it would be best to ascertain the variation at each end of the line, and some intermediate points, as it may not be uniform on the whole line, but it will not vary much from uniformity in such distances as across a district, or State perhaps. It has been found to change much faster in going East from the Mississippi river in this State than was at first supposed.

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On the Basis Parallel East of the Choctaw district, it was found to alter twelve minutes in the first thirty miles, and fifteen minutes in the next thirty miles, which occasioned that line to incline too much to the North in going East, because the surveyor, did not change his variation for the first thirty miles, which carried the line too far North by an angle equal to six minutes, or half the difference for that distance, being equal to a departure of 420 links, and again at the end of the next thirty miles, equal to an angle of 7 1-2 minutes, making another departure North, equal to about 525 links, which added together will make the whole error about 945 links. This error will be corrected on the first Township line North of the Basis Parallel, by directing the surveyor to change his course two and half minutes for every six miles, except in Range 12, after the first six miles from the standard Meridian to the Alabama State line. On the vernier of Stancliff & Draper's makes of compasses, the angle of two and an half minutes may be seen, the vernier being divided to every five minutes. The East and West district lines, as I shall here call them for explanation, are to be laid off at 48 miles apart. Now suppose a Meridian on the West side of such district, near the old Choctaw boundary, to be run due North

forty eight miles, and another Meridian run with the same compass, without altering for variation near the East side of the district, say at 60 miles East of the first Meridian, and the error in the course of the latter would make a departure at the end of the forty-eight miles of thirty chains and twenty-four links. This shews the propriety of observing the variation carefully, at short distances and conforming to it in runing the lines. The natural convergency of the Meridians in going North is equal to about thirty six chains and sixty links, in forty-eight miles, between two Meridians starting sixty miles apart,

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on the said Basis Parallel. This shews the propriety of having standard Parallels at about forty-eight miles apart, on which to measure exact miles to continue the surveys North or South.

There is a considerable difference between different compasses as to the variation of the needle. At this office there has been found by comparison on the same lines, a difference of twenty-four minutes. This shews the propriety of comparing the compasses which are to be used on the surveys, because in this case if one of these compasses were set to the angle of variation indicated by the other, they would run lines diverging from each other by the angle, of their difference, which in this case is 24 minutes, which in a line of forty-eight miles in length, would make the departure between them, equal to 26 chains and 88 links, being considerably more than a quarter of a mile. It is probable that for want of the proper attention to these circumstances, the public surveys have been found to differ so widely from each other in many places.

These differences between instruments, and inattention to the variation in different parts of the country, with some carelesness and want of skill, added to bad measurement, is calculated to bring the buisiness and the surveyors into disrepute, and produce a deplorable derangement in the public surveys.

While on this subject, I think it proper to make a few remarks on the methods of tracing a Meridian, which is so essential to the accuracy of the public surveys. The easiest and most practicable mode, is by observing the pole star on the meridian of the place, which is known by the star called Alioth passing over the pole star, being the one next to the square, in the tail of the Great Bear, (Epsalon Ursa Majoris,) four minutes after which, the pole star is on the Meridian of that place. The other star commonly used for the same purpose, in the winter season, when Alioth

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is below the pole, in the night, is the star called Gamma, in the Constellation, Cassiopea, nine minutes and twenty-five seconds after this star is vertical to the pole star, the pole star is on the Meridian, at which times respectively, a Meridian may be staked out, and by applying the compass to it, the needle will shew the variation.

I perceive from Ellicotts journal, that while he was on the line of the 31° lat. on the South boundary of this State, he traced Meridians, by taking the greatest elongations of the pole star, East and West, then measuring a convenient distance on each line, and then a line across the angle, and bisecting it in the middle. He used for this purpose, several of the stars which revolve round the pole. As it is presumed, however, that every surveyor, before he depends on his own observations, will practice taking them, with some experienced person, I shall only refer him to Gummere's treatice on surveying, a very good work which explains the method of tracing a Meridian by the greatest elongation of the pole star, and the manner of fixing a plummet line which mode of fixing a plummet line will serve for both methods.

I shahll only remark that in practice in the woods, the compass sight may be more conveniently used by setting the compass on a stake South of the plummet line, and turning the compass on the ball and socket, to follow' the motion of the stars, than by using a sliding board, it being inconvenient to carry a board in the woods for that purpose. The sight of the compass next to the plummet line, must be taken off, at the time of making such observation.

It may be proper to caution the surveyor, that if he suffers the glass of his compass to rub against woollen cloth, in carrying it, the glass will be affected by electricity and cause the needle to adhere to it, which may be removed by blowing the breath on the glass, or

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moisten it in any way. The surveyor should leave a stake where he moves his compass from, on a line, in order to take a back sight. This precaution is necessary to detect local attraction, or error in setting the compass. The flag staff may have fastened to it, a straight stick about an inch square and a foot long, at the hight of the eye, with a common wood screw or nail, through the centre for it to turn on up or down, by which the flagman may set it in the direction of the line back, and see how to pursue his course forward, leaving a stake to guide the surveyor and chain-men. In open woods this may facilitate the work.

In traversing water courses, the section lines must be extended to such water course, before the traverse is taken, in order to connect the traverse with the lines, and the surveyor must see by the help of the traverse tables, whether the surveys will close well, before leaving the Township. This matter must be strictly attended to. The annexed table will show the natural convergency of the Range lines of Townships, from the Basis Parallel to the distance of forty-eight miles North, which, with little alteration will apply as far North as to the Tennessee line, for each distance of forty-eight miles. The Ranges are considered to be just six miles wide on the Basis Parallel, and will be about five miles and 76 chs. 24 lks. wide when they reach the standard Parallel, on which Parallel it is intended to close those Ranges and lay off exact miles again, from which to carry on the surveys North.

With these instructions and remarks, accompanied by a specimen form of a field-book and map, and the requirements set forth in the "Contract," it will be easy for the surveyor to make his surveys and returns in a uniform manner, according to the provisions of the laws, and forms prescribed by the Government.—I have been lengthy and particular, because the instructions are to be printed, and become permanent;

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and the cost will be but a trifle more on account of their length. The surveyor will be put out of doubt upon, perhaps, every point, on which he will need instructions. He will see the reasons and authority on which the instructions are founded, which is a good general rule as far as practicable in relation to public officers and agents in our government. Officers and agents should know that nothing unreasonable or illegal is required of them, and they will cheerfully comply with their duty, and be enabled to give satisfactory information to others who may ask it, in relation to their business.

The measurement must be made in a horrizontal manner as much as possible, by holding up the hind end of the chain over the pin, in going up hills, and the fore end in going down hills, letting the pins drop from the end of the chain to the ground, or by taking the angle of elevation or depression or rising ground, and make the proper allowance, which would be more correct. The pins must be made of iron, about a foot long, and half inch thick two inches from the point, and tapered from that upwards to the size of large wire, having a ring turned at the top, of half inch or three quarters diameter, in which to fasten a bunch of red cloth or ferritin.

The surveyor should have a spare chain, by which, to adjust the other, and compare them every morning. If a spare chain cannot be had, then he must have two sticks, each three feet in length, and measure the chain by stretching it on smooth ground, a log, or cut down a small straight tree for the purpose, holding one stick fast while the other is carried forward alternately. The sticks should be square at the ends, and used with care. They must agree with the standard measure of this office.

I subjoin a list of compasses which have been compared at this office, shewing the variation on each,

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that the surveyor may thereby adjust his compass to agree with others in any part of the country in which they may be used.

The distances set down in your field-books, must be in four pole chains, and links, and not in two pole chains, as has frequently been done heretofore.

As it is desirable that there should not be two corners on the same line, very near to each other, I think it proper to direct the Surveyor, in closing the last mile to the standard Parallels, or standard Meridians, to run a guide line, and if it intersect nearer to the mile post, than ten four pole chains, then to close such last mile to said mile post, by a straight line from the last corner set, and make this a general rule in all cases, except some particular reason may render it improper, which will not apply generally. There are inconveniences arising from two corners being near to each other in the public surveys. There must not be two sets of corners on the Standard Meridians in any case.

As it is possible that the tier of sections, along the standard lines, may, in some instances, be much larger or smaller than it was intended to make them, by reason of those lines having been run of great length, without any check on the course or measurement. It is necessary to give general instructions as to the closing sections along the lines. If the section lines, of the tier of sections next to the standard parallels, be longer than one mile, and less than one and a quarter miles, then the quarter section corner must be set half way on such closing lines; but if those closing lines are a mile and a full quarter long, then the mile corner shall be set at the mile, and the additional quarter of a mile shall make a lot in the same section, turning such lot with its longest sides in the direction of East and West, and making ten lots in the section; eight of which may contain eighty acres each, and

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the other two, nearly or quite, the same quantity each. But if the lines are more than a mile and a quarter long, and less than a mile and three quarters, then, the mile and half mile corners are to be set at an even mile, and even half mile from the nearest interior section corner on the same line, South of such standard parallel, and the lots will be laid off with their lengths North and South as other sections; in which case a section adjoining a standard parallel may have twelve lots, laid off as half quarter sections, eight of which may contain each eighty acres, and the other four, being the northern tier, may contain more or less than eighty acres each. This is, I presume, as far as I need go with these instructions, as it is hardly probable that the standard lines will close so badly as to exceed three quarters of a mile more, or fall short that much, in their closing points of intersection. If they should, however, we cannot, according to law, make more than thirty-six sections in a township of public land, but must divide the tier of sections into more lots next to the standard lines. The large or small sections, which may happen along the standard Meridians, must be governed by the same principles, but the lots, in that case, will seldom exceed a quarter of a mile in width, East and West; but if the closing lines are not more than a mile and half a quarter of a mile in length, then the excess may be divided equally among the eight half quarters of the section, and if the measurement exceeds that, then let there be ten lots made in the section, giving a quarter of a mile, in width, to each of the eight half quarters as usual, and the balance to the fractional quarters next to the standard Meridian.

To remind the Surveyor, more fully, of the necessity of causing the measurement to be made in a horizontal manner, I refer him to the Traverse tables, where, at one view, may be seen the difference in the

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length of the sloping line up or down the surface of hills. The latitude will be the horizontal length of the base line, where the angle of elevation, or depression, is less than forty-five degrees, and the departure will be the level, or base line, if the angle exceeds forty-five degrees.

The angle of elevation, of only ten degrees, which the Surveyor, perhaps, would not notice, will make the base or level line sixty-one links shorter than the line measured on the surface, with the slope of the hill, in half a mile—being equal to 122 links in a mile. Steeper hills make a greater difference. If one side of a section pass over hilly land, and the opposite side over level land, the difference of measurement on the two sides will be very considerable if strict attention is

not had to levelling the chain, or taking the angles of elevation and depression, and making the proper allowance for such elevations and depressions. It is desirable that this part of the business be strictly attended to.

It is proper to caution the Surveyors against a habit, which has been too much indulged in, of making abbreviations in words in an unusal manner. The field notes are intended to be recorded, and the language should be clear, full and comprehensive, so as not to be misunderstood. Such words as occur frequently and the abbreviation of which cannot be mistaken, as Diam., for diameter of a tree—Ins., for inches—Ch., for chains, and Lks for links, may be admissible; but the names of trees should be written in full—as white oak, water oak, sweet gum, &c., because there are other kinds of gums, and other kinds of oaks, &c. The word cross should be written, instead of a X. If this manner of abbreviating words is permitted, every Surveyor will have a different mode of abbreviating, until some may write in short-hand, which others cannot understand.

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There has been a practice permitted, in suffering persons to come into the Surveyors Office, who have no particular business, and who disturb the regular order of business, by talking on subjects not necessary for the time and place. The Deputies are particularly requested not to practice this kind of conduct; but with as few words as practicable to do their business, and leave the office to give place to others who may have business to do.

The Deputy Surveyors and others are requested, particularly, not to handle the files of papers in the office: because, by that means, the papers may be misplaced and the business retarded. The second clerk, when there are two or more clerks, will be entrusted with the files of papers, and to him application must be made for any information in such papers or field books. The chief clerk, in the absence of the Surveyor General, will have charge of the office, and give general directions, as to the manner of carrying on business in the office, so far as may be consistent and proper.

The Deputy Surveyors are requested not to use the paper, quills and instruments belonging to the office. If one is permitted to take these privileges, another will claim an equal right. There is a regular estimate of stationary and contingent expenses for the office; and, except blanks, it is not contemplated that the Deputies are to use the office paper for their returns. They should have their returns made out in good order before such returns are presented. The returns must not be pepared in the office. The practice, by the Deputies, of preparing returns in the office, has been indulged in too much. The office should be as free from noise, and as little crowded as practicable.

If irreconcilable difference of opinion should exist as to the business, between the Deputy and the Sur-

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veyor General, then the matter in question must be referred to the Commissioner of the General Land Office for his decision.

It is proper, too, to caution the Surveyors against a too confident expectation of receiving their pay for surveys, when their returns are ready for the office. Great inconvenience has arisen to the Deputies and others from this source. The funds, supplied by the government, have frequently been, and may again be, exhausted, and leave many accounts unpaid for months after such accounts have been approved by the Head of the Department. In some instances, there are errors in the returns, or omissions, which may occasion delay in the payment. All these contingencies should be guarded against, by the Deputies, by not contracting more debts than may be indispensable in the prosecution of the surveying, until their accounts are paid.

Respectfully,

GIDEON FITZ,

Surveyor of the lands of the United States, South of the State of Tennessee.

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The following table, shewing the natural convergency of Meridians of the Range lines of Townships, was politely furnished by Mr. ROBERT W. BOYD, one of the Cadets of Jefferson College, Mississippi.

No. of Town.	Latitude of their commencement.	Lengths of the East and West Township lines mil's ch's l'ks
0	31,52, 5,73	6,00,00
1	31,57,18,30	5,79,55, 4
2	32,02,30,87	5,79,09 2
3	32,07,43,44	5,78,63 6
4	32,12,56,01	5,78,18
5	32,18,08,58	5,77,72 3
6	32,23,21,15	5,77,26 6
7	32,28,33,72	5,76,79, 1
8	32,33,46,29	5,76,34 5
8	32,33,46,29	6,00,00
9	32,38,58,86	5,79,52 8
10	32,44,11,43	5,79,07 6
11	32,49,24,	5,78,59, 3
12	32,54,36,57	5,78,11 1
13	32,59,49,14	5,77,65, 6
14	33,05,01,71	5,77,18, 6
15	33,10,14,28	5,76,71 4
16	33,15,26,85	5,76,24 2
16	33,15,26,85	6,00,00
17	33,20,39,42	5,79,53 4
18	33,25,51,99	5,79,03 9
19	33,31,04,56	5,78,55 8
20	33,36,17,13	5,78,07 7
21	33,41,29,70	5,77,59 6
22	33,46,42,27	5,77,11 2
23	33,51,54,84	5,76,62 9
24	33,57,07,41	5,76,1432

No. of Town.	Latitude of their commencement.	Lengths of the East and West Township lines mil's ch's l'ks.
24	33,57,07,41	6,00,00
25	34,02,19,98	5,79,52 5
26	34,07,32,55	5,79,01 7
27	34,12,45,12	5,78,52 4
28	34,17,57,69	5,78,03 1
29	34,23,10,26	5,77,53 6
30	34,28,22,83	5,77,04 1
31	34,33,35,40	5,76,54 3
32	34,38,47,97	5,76,06 3
32	34,38,47,97	6,00,00
33	34,44,00,54	5,79,47 8
34	34,49,13,11	5,78,97 3
35	34,54,25,68	5,78,46 8
36	34,59,38,25	5,77,96 1

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WASHINGTON, Mississippi,

Tuesday, October 11, 1831.

This evening, Gamma, the third star in the Constellation Cassiopea, was vertical with Polaris, at 11h 26m 10s

Time to elapse after those stars are on the same vertical line 9 25

Gives time at which Polaris is on the Meridian 11 35 35

At this moment a very satisfactory observation was made, to trace a Meridian, agreeing, without the least apparent difference, with a mean of nine preceding observations made on the same ground, by Levin Wales, Esq., some, of Polaris in his transit of the Meridian, others, at his greatest Easterly elongation.

Carefully compared with this Meridian, the following compasses indicate the variation respectively set opposite to each, viz:

Owner of compass.	By whom made.	Where made.	Easterly variation.
Levin Wales.	Chandler.	Winchester, Va.	8, 40, 00
A. Downing.	Stancliff & Drapet.	Philadelphia, Pa.	8, 32, 00
D. W. Connely.	ditto.	ditto.	8, 32, 00
Edward R. Christie	ditto.	ditto.	8, 35, 00
Henry T. Williams	ditto.	ditto.	8, 27, 30
Wm. L. S. Dearing	ditto.	ditto.	8, 16, 00
John B. Peyton.	ditto.	ditto.	8, 35, 00
William Dowsing.	ditto.	ditto.	8, 30, 00
George Dougherty.	B. Stancliff.	ditto.	8, 35, 00
Jacob R. Sharkey.	ditto.	ditto.	8, 30, 00
Reuben McCarty.	ditto.	ditto.	8, 30, 00

(The following copy of the Speciman Field Notes as prepared by Fitz were taken from the original document now in the possession of the National Archives.)

SPECIMEN FIELD NOTES FOR THE USE OF DEPUTY SURVEYORS, IN THE STATE OF MISSISSIPPI, PREPARED IN COMPLIANCE WITH INSTRUCTIONS FROM ELIJAH HAYWARD, ESQ. Commissioner of the General Land Offices; bearing date 28th July, 1831;

BY GIDEON FITZ,
Surveyor of the Lands of the United States
South of the State of Tennessee.
May 1832

WASHINGTON MISS.
PRINTED BY ANDREW MARSCHALK.

STATE OF MISSISSIPPI,

North East **District.**

FIELD NOTES[1]

of Township No. 26 in
Range No. 20, East
Numbered from the Basis lines of the Choctaw district extended;_____

Surveyed by
Jonathan Straightline,

Deputy Surveyor
in year 1832.

Variation of the Needle *East,*

Approved by
Surveyor of the Lands of the United States, South of the State of Tennessee.

January 10th, 1833.

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NORTH BOUNDARY, T. 26—R. 20 E.

Commenced January 10th 1831.
George Careful, } *Chain Carriers.*
James Justice. }
John Keepline, *Flagman,*
Ezekiel Sharpaxe, *Marker.*

The Chain Carriers duly sworn to perform their respective duties faithfully, as may be seen by reference to their several oaths and certificates, subjoined to this Field Book. *[Or other book, as the case may be.]*

Began at the North West corner of this Township,[2] and run due east.

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STATE OF MISSISSIPPI,
North East District.

Ch.	L.	
		North Boundary, T. 26, R. 20, E.
		1st mile, run due East.
18		Through open woods to swamp,
26	50	Cross small branch, runs S. W.
30	10	To Young Woman's Creek, runs S. E. 20 links wide,
38		To open woods,
40		Set 1-4 section post, whence a
		White oak, 10 in. diam. N. 10 E. 20 L.
		Red oak, 15 in. diam. S. 20 W. 30 L.
60		Touch bend of said creek thus
70		To high land,
80		Set 1st mile post, whence a
		Red oak, 12 in. diam. S. 30 E. 22 L.
		Hickory, 10 in. diam. N. 27 W. 10 L.
		Undulating second rate land, oak and hickory; cane along the creek.

1. For the notes of each separate mile, see reference table at the end of the book.

2. If it is known to the Surveyor that the Corner is common to the three other adjacent Townships, he may add—"being the common corner of the three adjacent Townships," or if he knows it is not and knows the distance, he may add, "being 00 ch. due E. W. N. or S." [as the case may be] "from the Corner of the two adjoining Townships.

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STATE OF MISSISSIPPI,
North East District.

Ch.	L.	
		North boundary T. 26, R. 20 E.
		2nd mile due East.
10		Cross plain path, bears N. E. and S. W.
20	50	Cross branch 15 L. wide, runs N. W.
30		To deep pond, offset due South three Ch.
		Run due E. 5 Ch. to large creek 50 L.
		cross runs N. W. offset due North 3 Ch. to line
35	50	To East side of pond thus,
40		Set ¼ sec post, whence a
		Black oak 15 in. diam. N. 14, W. 13 L.
		White oak 10 in. diam. S. 10, E. 10 L.
46		Cross road leading from to
80		Set 2 mile post, whence an
		Elm 16 in. diam. N. 9, W. 150 L.
		Ash 20 in. diam. S. 15, W. 200 L.
		First quarter level 2nd rate land residue poor and hilly.

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STATE OF MISSISSIPPI,
North East District.

Ch.	L.	
		North boundary T. 26, R. 20 E.
		3d mile due East.
		Through open woods, hilly poor
		Land, pine and oak.
30		To left bank Tie river, runs N.
		Set a stake, whence an
		Ash 18 in. diam. N. 10 W. 20 L.
		Red elm 17 in. diam. S. W. 100 L.
		Marked with proper numbers of
		T. R. and S. Run a base line from
		stake due South 3 Ch. whence a
		stake in the line on the opposite bank of the river,
		bears N. 59 E.
35		to stake on right bank, whence
		a Sweet gum 18 in. diam. N. 10 W. 30 L.
		Ash 24 in. diam. S. 30 E. 20 L.
40		Set ¼ sec. post whence an
		Elm 18 in. diam. N. 20 W. 60 L.
		Beech 20 in. diam. S. 10 E. 8 L.
48		Touch a bend of the river thus
		high bluff bank.

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Ch.	L.	
		NORTH BOUNDARY T. 26, R. 20 E.
		3d mile due East.
80		Set 3d mile post whence
		Beech 12 in. diam. S. 20 E. 10 L.
		Sweet gum 18 in. diam. S. 20 E. 10 L.
		The river low ground is
		rich strong cane, above high water, except a few places.
		Growth Mulberry, Sassafras and sweet gum.
		4th Mile due East.
30		To low land overflows 2 feet
40		Set ¼ sec. post, whence a
		Mayple 40 in. diam S. 40 W. 16 L.
		Sycamore, 18 in. diam. N. 10 W. 15 L.
60		To high land open woods.

Ch.	L.	
80		Set 4 mile post, whence a
		Red oak 12 in. diam. N. 15 W. 20 L.
		White oak 15 in. diam. S. 8 E. 6 L.
		Land 2nd rate, part overflows 2 feet.

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STATE OF MISSISSIPPI,
North East District.

Ch.	L.	
		North boundary T. 26, R. 20 E.
		5th mile due East.
40		Set ¼ sec post, whence a
		Red oak 17 in. diam. N. 20, W. 109 L.
		Post oak 10 in. diam. S. 10, W. 100 L.
80		Set 5 mile post, whence a
		Chesnut tree 10 in. diam. N. 3 W. 5 L.
		Chinkapin tree 8 in. diam. S. 4 E. 10 L.
		First half mile level, 2nd rate,
		residue broken and poor, Oak, Hickory and some pine.
		6th Mile due East.
30		Touch bend of a creek runs
		N. W. thus
35		To low wet land
[3]40	80	Set ¼ sec. post, whence a
		Red oak 20 in. diam. N. 15 W. 10 L.
		Persimmon tree 10 in. diam. S. 10 E. 20 L.
50		To high land, open woods.

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Ch.	L.	**NORTH BOUNDADY OF T. 26 R. 20 E.**
		6th mile due East, continued,
[3]80	60	Intersect East boundary of the
		Township 130 L. North of the Temporary post, and
		set the corner at the intersection, whence
		a large white oak bears N. 20 E. 30 L.
		Red oak 15 in. diam. S. 14 W. 103 L.
		Poor hilly land, oak pine and hickory.

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Ch.	L.	**STATE OF MISSISSIPPI,** *North East District.*
		East boundary T. 26, R. 20 E. (see note page 2.)
		1st mile due North.—January 5th, 1832.
40		Set ¼ sec. post, whence
		White oak 12 in. diam. N. 8, W. 20 L.
		Post oak 8 in. diam. S. 5, E. 30 L.
80		Set 1st mile post, whence a
		Red oak 18 in. diam. N. 4 W. 15 L.
		Hickory 12 in. diam. S. 9 E. 5 L.
		Second rate level land, oak and Hickory.
		2nd Mile due East.
20		Cross road leading from to
40		Set ¼ sec. post, whence a
		Pine 14 in. diam. N. 2 W. 20 L.
		Mayple 10 in. diam. S. 10 E. 34 L.
80		Set 2 mile post, whence a
		Dogwood 8 in. diam. N. 30 W. 40 L.
		Pine 20 in. diam. S. 15 E. 12 L.
		High steep hills, Poor land, pine and oak.

3. The distance to the temporary quarter section corner and section corner on the closing miles, should not be inserted, nor the bearings taken until the intersection is made, but a stake should be set at the supposed distance, or half mile and at the end of the mile to be removed if necessary, after the intersection is made.

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STATE OF MISSISSIPPI,
North East District.

Ch.	L.	
		East boundary of T. 26, R. 20 E.
		3d mile due North.
20		To swamp.—Boggy
30		Cross a lagoon, bears N. E. and S. W. 20 L. wide,
40		Set ¼ sec. post whence an
		Elm 18 in. diam. N. 20 W. 60 L.
		No other tree near
60		To high land
80		Set 3rd mile post whence
		Red oak 20 in. diam. N. 20 E. 300 L.
		No other tree near.
		20 Ch. boggy marsh, residue
		Narrow ridges poor land, oak and pine

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Ch.	L.	**STATE OF MISSISSIPPI,** *North East District.*
		East boundary T. 26 R. 20 E.
		4th mile due North.
20		To left bank Tie river, set a stake,
		whence a red oak 12 in. diam.
		Bears N. 20 W. 10 L. no other tree near,
		From the stake run a base line N. 20 W. 5 Ch.
		whence a stake on the opposite bank of
		the river in the line bears,
		N. 30 E. width of river on the
		line found by calculation 766 L.
27	66	to stake on right bank of the river, whence a
		Mayple 10 in. diam.
		bears S. 10 E. 20 L. and a
		Dogwood N. 30 W. 40 L.
40		Set ¼ sec. post whence
		Red oak 10 in. diam. S. 10E. 20 L.
		Beech 15 in. diam. N. 20 W. 15 L.

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Ch.	L.	**EAST BOUNDADY OF T. 26 R. 20 E.**
		4th mile due North continued,
80		Set 4 mile post, whence
		Red oak 10 in. diam. N. 10 E. 20 L.
		White oak 15 in. diam. S. 30 W. 40 L.
		North side of the river the soil is good, residue is poor
		Timber, generally oak and hickory.
		5th Mile due North.
40		Set ¼ sec. post, whence a
		Pine 20 in. diam. N. 20 W. 10 L.
		Hickory 10 in. diam. S. 20 E. 30 L.
80		Set 5th mile post, whence a
		Red oak 30 in. diam. N. 40 W. 20 L.
		Black oak 18 in. diam. S. 30 E. 10 L.
		Second rate land lies well for cultivation. Oak,
		Hickory and some pine.

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Ch.	L.	**STATE OF MISSISSIPPI,** *North East District.*
		East boundary T. 26 R. 20 E.
		6th mile due North.
40	65	Set quarter section post, whence
		Red oak 24 in. diam. N. 20 E. 30 L.

		White oak 20 in. diam. S. 30 W. 100 L.
81	30	Intersect North bounder of Township
		60 Links East of temporary corner,
		Set post at the intesection
		See bearings on the North boundary.
		See note, page 8.
		Land on this mile is somewhat broken,
		2nd rate. Oak and pine.

GEORGE CAREFUL, } *Chain Carriers.*
JAMES JUSTICE.

JONATHAN STRAIGHTLINE,
Deputy Surveyor.
January 20th, 1832.

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STATE OF MISSISSIPPI,
North East District.

Ch.	L.	
		INTERIOR SECTION LINE T. 26 R. 20 E.
		Due North between sections 31 and 32.
[4]40	15	Set ¼ sec. post, whence a
		Pine 20 in. diam. N. 20 W. 32 L.
		white oak 8 in. diam. S. 15 E. 30 L.
[4]80	30	To corner of sections 29, 30, 31 and 32
		See bearings on line between sections 30 and 31

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Ch.	L.	**TOWNSHIP 26, RANGE 20 EAST.**
		North East District of Mississippi.
		True line due East between sections 30 and 31.
[4]39	80	Set ¼ sec. post, whence a
		White oak 10 in. diam. N. 20 W. 50 L.
		Red oak 20 in. diam. S. 20 E. 10 L.
[4]79	60	Intersect at corner of sec. 29, 30, 31 and 32.
		30 L. North of post, set the post at the intersection,
		whence a
		Beech 18 in. diam. N. 10 E. 20 L.
		Black oak 24 in. diam. S. 15 W. 100 L.
		First half is first rate level land
		Residue 2nd rate, oak and hickory,
		Sassafras, Mulberry &.
		For inserting the length of line to the quarter and section corners, and taking bearings, see note in page 14, at the end of the line between sections 31 and 32.

4. The length of the line for the quarter sections and sections, should not be inserted until the intersection is made, but a stake should be set at the estimated distance and bearings taken at the quarter section corners, as the line progresses, which bearings should afterwards be corrected if necessary as advised in the "instructions," page 18.—That is, if the quarter section stake stands within 12 links of the point, equidistant from the section corners on the same line, in open level country, it may remain without correction, or double that distance in very hilly or difficult country to measure, because it is found in common practice, that another set of chain carriers may make that difference, but if the error excoed that, then the quarter section stake must be removed, and the bearing corrected, except in low swamp difficult of access, where the land and timber is not saleable, the bearings may be corrected in the field book by caculation, or by taking similar angles and measurement at any suitable place, as that which would be necessary at the quarter section corner to correct it. The quarter section stakes in low swamps will soon decay, and if the field notes will furnish the means of finding the proper point from the reference trees, it may suffice. The operation by the chain and compass, to get the corrected bearings, will be preferable to calculation, and quicker done.

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Ch.	L.	**STATE OF MISSISSIPPI,**

In running guide lines between the sections, the distance need not be taken more than half the estimated length of the line, because in returning on the true line the other half of the distance will be measured and will shew where the quarter Section should be set.—The crossings of streams, roads &c., must be noted on the true line, and not on the guide line, because the distances may be different on the two lines. In the Maps the distances are to be laid down on the true lines.

In running guide lines where it is probable that the true line will diverge from the cardinal point, and the woods is thickly set with under growth, so that it is necessary to cut the way, then it will be best to run on the course which will probably intersect at the point aimed at, because the guide line being cut open, and very near the true line, may facilitate the return on the true line, and in some instances be in the proper place for the true line.

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Ch.	L.	**TOWNSHIP 26, RANGE 20 EAST.**
		North East District, Mississippi.
		Guide line between sections 5 and 6.
		Intersect East of corner on the Township line
		70 links, corrected back.
		True line between sections 5 and 6 S. 1.30 E.
[5]40	70	Set ¼ sec. post, whence a
		Beech 10 in. diam. N. 10 E. 40 L.
		Ash 18 in. diam. S. 5 W. 4 L.
[5]81	81	To corner of sections 5, 6, 7 and 8,
		See bearings on line between 6 and 7.
		2nd rate land, gentle undulating
		Oak Hickory &c., thick undergrowth of bushes
		and vines.

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STATE OF MISSISSIPPI.

The foregoing examples and remarks it is believed will suffice for the purpose of attaining uniformity in the arrangement of the field books, and manner of noting generally. Other necessary information will be obtained from strict attention to the printed "instructions;" with which each surveyor will be furnished. It is intended that field books shall be furnished to the surveyor's from the surveyor's office; which books will be of uniform size, and ruled in a proper manner. They will be the length and width of this book, or they may be of fool scap paper, folded into eight pages per sheet, which will be the same in length up and down as this book, but a little wider, which will make the lines to write on some longer than these.

Generally, it will be best to allow a page for each mile. This arrangement will facilitate the reference to any particular mile, and if some blank should be left on the page, it will not be objectionable.

5. For length of line and bearings to reference trees, see remarks in pages 14 and 16.

GENERAL REMARKS.

All streams deemed to be navigable even for small keel boats, and likely to be used as such, by the public,

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STATE OF MISSISSIPPI.

are to be traversed on both banks to give the areas of fractional sections on each side of such streams. All Lakes of considerable size, say one hundred yards wide, having land fit for cultivation on their margins in quantity sufficient to induce a purchase of it, must also be transversed for a like purpose. In noting channels, the most appropriate terms should be used to convey the proper meaning. As a wide, or deep ravine, which is a channel generally dry in the summer and fall. Lagoon for a channel, filled with water, but which as no current; gully or dry branch, may serve for water courses, near their sources, which get dry in the summer and fall. In taking offsets to get round ponds or lakes, where it is not necessary to ascertain their exact shape, it may be done in the most convenient manner, but where a traverse is taken for the purpose of ascertaining the areas, of adjacent fractional sections, it must be done by course and distance, along the margin of such lake or water course, and the traverse connected with the section lines. In such traverse the mouths of creeks &c., must be noted, and out lets from such river or lakes. Base lines should be noted and intersections taken, to the upper and lower end of the Islands, in rivers and lakes worthy of being

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STATE OF MISSISSIPPI.

noted, so as to represent them properly on the Township Maps.—The width of the Mississippi river, should be taken at suitable places.

Particular care should be had in noting the depth of inundation; and the quality of soil, whether fertile, loose, loam or sandy, wet or boggy. The field book should be dated frequently, and signed by the surveyor. If the same chain carriers measure all the lines of the Township, or lines noted in the field book; then a certificate to that effect, at the end of the book, signed by them will suffice; the object being to have their acknowlegement of services rendered; which cannot afterwards be disputed.

The following may serve as a form of oath for chain carriers &c.

We George Careful, James Justice, John Keepline and Ezekiel Sharpaxe, employed by Jonathan Straightline, Deputy Surveyor; do solemnly swear that, each of us will faithfully perform the duties of chain carrier, marker or flagman, as may be required of us, by said Deputy Surveyor; and make true report of the measurement, in such manner as he may lawfully direct, so long as we continue in his employ. Sworn to and subscribed before

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STATE OF MISSISSIPPI.

me this day of
A. B. Justice of
the peace in and for
County, State of Mississippi.

(Signed,) { GEORGE CAREFUL,
JAMES JUSTICE,
JOHN KEEPLINE,
EZEKIEL SHARPAXE.

In case a Magistrate cannot be conveniently had, the surveyor may administer the oath and certify it. It is not necessary to swear the Marker or Flagman, as the law does not require it, and slaves may be employed for this service.

In traversing streams, the terms right and left bank must be used, always applying the terms as if you were descending and not ascending.

For travers of any particular section, say, "traverse of right or left bank;" (as the case may be,) in or fronting section No.

Base lines to calculate inaccessible distances, should be as long as they can conveniently be, because the compass is not calculated to take very accute angles with accuracy. An error of three chains is thought to be a liberal allowance to make in closing Townships, and

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STATE OF MISSISSIPPI.

fifty links in closing sections in the most difficult ground to measure.

The course and distance to two trees at each corner is to be noted, but four are to be marked as mentioned in the printed instructions, except it be a corner to two sections only.

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REFERENCE TO TOWNSHIP AND SECTION LINES.

For East Boundary of Township see page
West do.
North do.
South do.

LINES BETWEEN SECTIONS.

MERIDIANS.				*PARALLELS.*			
Between Sections.	Page.	*Between* Sections.	Page.	*Between* Sections.	Page.	*Between* Sections.	Page.
1 and 2		19 and 20		1 and 12		16 and 21	
2 -----3		20 -----21		2 -----11		17 -----20	
3 -----4		21 -----22		3 -----10		18 -----19	
4 -----5		22 -----23		4 -----9		19 -----30	
5 -----6		23 -----24		5 -----8		20 -----29	
7 -----8		25 -----26		6 -----7		21 -----28	
8 -----9		26 -----27		7 -----18		22 -----27	
9 -----10		27 -----28		8 -----17		23 -----26	
10 -----11		28 -----29		9 -----16		24 -----25	
11 -----12		29 -----30		10 -----15		25 -----36	
13 -----14		31 -----32		11 -----14		26 -----35	

14 -----15	32 -----33	12 -----13	27 -----34
15 -----16	33 -----34	13 -----24	28 -----33
16 -----17	34 -----35	14 -----23	29 -----32
17 -----18	35 -----36	15 -----22	30 -----22

Specimen form for descriptive field Notes.

STATE OF MISSISSIPPI, North East District.

TOWNSHIP No. **RANGE No.**

Quality of Land on the Boundaries of the Township.

East Boundary, run North.

1st	Mile,	Poor land, Pine timber and reed brakes
2	"	Low wet land, soil poor, timber Pine and Oak
3	"	Low wet land, some parts boggy
4	"	Level poor land, pine timber, sandy
5	"	Hilly poor land, oak, Hickory and Pine
6	"	Level 2nd rate land, oak and hickory.

West Boundary, run North.

1st	Mile,	Level 2nd rate land, oak and hickory
2	"	Very broken steep hills, soil 2nd rate
3	"	Rich level land, oak hickory and walnut
4	"	First kalf good land, residue low swamp
5	"	30 Ch. sypress swamp, residue low inundated land
6	"	20 Ch. low land good quality, residue hilly and poor.

South Boundary run East.

1st	Mile,	Broken poor land, pine and reed glades
2	"	Level sandy land, pine and small oak timber
3	"	2nd rate land, undulating, hickory and pine
4	"	Narrow ridges of land, with reed brakes
5	"	1st rate high land, sassafras, walnut and Mulberry
6	"	30 Ch. first rate river bottom, above high water.

North Boundary run East.

1st	Mile,	Open pine woods large timber
2	"	Stony hills, thinly timbered, oak timber,
3	"	Poor blackjack ridges
4	"	Braud ridges, gently undulating, hickory growth
5	"	First half good level land, residue swamp
6	"	30 Ch. swamp, residue high land 2nd rate.

[Pages 2 through 8 of the descriptive notes are deleted here. The pages contain blank forms of no particular value. The footnote at the bottom of page 8 is included - following the deletions[6].]

6. The advantages of this form of descriptive Field Notes, over that formerly used at the office of Surveyor of public lands, South of Tennessee, are that, it dispenses with the necessity of reference letters on the Township Maps, at each Section and half Section corner, on the boundaries of the Township, and the descriptive notes may follow the order in which the exterior lines were run. The left hand column of figures refering to the interior sectional lines being arranged in numerical order, will make it easy to refer to any particular section line. If the deputy Surveyors should at any time be required to make out descriptive notes for the townships, which they may survey, the necessary blanks on paper of the proper size, will be furnished to them, but that is not contemplated at present; and this specimen is furnished merely to make the Surveyor better acquainted with the system generally, and to show the propriety of being particular in preparing the field notes.
May 1832.

XVI.

(The copy of this circular was obtained from Records Group No. 49, National Archives.)

Circular to Surveyors General.

GENERAL LAND OFFICE,

8th May, 1832.

SIR:

Enclosed is a copy of the instructions to Registers and Receivers of the District Land Offices, prescribed by the Secretary of the Treasury, under the act of Congress, approved on the 5th ult., entitled "An act supplementary to the several laws for the sale of public lands."

The Registers of the Land Offices within your surveying department have been requested to furnish you with a schedule of such fractional sections, and parts of fractional sections, remaining unsold, as are liable to be subdivided under the act referred to.

The Secretary of the Treasury directs that in making the subdivisions of those lands into quarter quarter sections, in pursuance of the provisions of this act, and on the principles of the act approved on the 11th February, 1805, entitled "An act concerning the mode of surveying the public lands of the United States," you will be particularly careful not to leave fractions of less quantity than that contained in a quarter quarter section, or thereabouts, as nearly as practicable.

Where a portion of a fractional section has heretofore been sold, the residuary portion will of course have to be subdivided, subject to any embarrassments resulting from the previous subdivisions of the portion sold.

In all cases where the quantity of the fractional section or the portion thereof remaining unsold, and liable to be subdivided under the act of 5th April, 1832, admits of the sale of one or more quarter sections, you will subdivide such quarter sections into quarter quarter sections, and they will be described by the Registers as quarter quarter sections; and in describing the residuary lots or portions of such fraction, due reference must be had to the mode adopted in describing the portion of the fraction which has been sold. For instance, where the portion of a fraction heretofore sold has been described as a lot bearing a special number, the residuary fractions will have to be described as lots bearing numbers in a series consecutive to that commenced by the former subdivision. But where the lots or portions heretofore sold in the fraction have been described in reference to their relative position in the fraction and not by numbers, the description of the residuary portions of the fraction is also to be in reference to their position, and not by numbers.

Fractional sections containing less than one hundred and sixty acres, or the residuary portion of a fractional section, after the subdivision into as many quarter quarter sections as it is susceptible of, may be subdivided into lots, each containing the quantity of a quarter quarter section, as nearly as practicable, by so laying down the line of subdivision as that they shall be twenty chains wide; which distances are to be marked on the plat of subdivision, as are also the areas of the quarter quarters and residuary fractions.

In all cases where the land is described in reference to its relative position in the fraction, and not as a lot bearing a special number, the proper mode of describing it must be written in a tabular statement annexed to the plat of subdivision.

You will be pleased to prepare and transmit to the several Registers the necessary plats of subdivisions as promptly as practicable after they shall have furnished you with schedules of the tracts to be subdivided. Copies of such plats are to be furnished at the same time to this office. The township plats hereafter to be prepared at your office must exhibit the subdivisions authorised by this act.

I am, very respectfully,
Your ob't. servant,

(Signed) ELIJAH HAYWARD

Surveyor of Public Lands.

XVII.

(These Instructions are copied from an original volume now in the possession of the National Archives. The volume has a hand-written notation "Rec'd with S. G.'s letter dated Aug. 30, 1833.")

INSTRUCTIONS TO DEPUTY SURVEYORS.

[ARKANSAS, 1833]

INSTRUCTIONS

TO

DEPUTY SURVEYORS.

Office of the Surveyor of Public Lands
for the Territory of Arkansas,

LITTLE ROCK, 183

SIR:

You will provide yourself with a good compass, of Rittenhouse's construction; having a nonius; or, with a theodolite; also two two-pole chains of fifty links, which are to be regulated by the standard compass and chain in this office: one of which chains you will specially reserve as a standard for your field work, and by which you will adjust the one in active use at least every other day, if not oftener.

Whenever the continuation of a surveyed line is interrupted by an *impassable swamp, or from any other cause,* the distance of the line actually run between the starting and finishing posts is to be truly noted; and if the impassable obstacle is a *lake or swamp,* of sufficient *magnitude* to require meandering, you will in that case and in all such cases, establish a corner at such interruption, in the same manner as is directed in cases of intersecting a navigable river. In order to ascertain the distance on any line not actually surveyed in consequence of insuperable obstacles, you will work by a traverse, or by offsets. If by offsets, you are to note them, as they are to be represented on the plat, to show that the distance across has been correctly ascertained; and also you will enter in your field-book, a description of such lakes or ponds, as a careful occular observation may suggest, that the same

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may be exhibited on the plat, for which purpose you will please keep on a page of your field-book a plat of a township or line, on which you may portray such and other objects, as streams, prairies, &c.

You will *meander* all lakes or ponds, if they are of *sufficient magnitude* to justify the expense.

The courses of all navigable rivers, which may bound or pass through your district, must be accurately surveyed, and their width taken at those points where they may be intersected by township lines, and at other points, by trigonometrical process. The width must be frequently taken, particularly where there is a sensible variation in the width, to test the accuracy of the survey in connection with the adjoining lands, and the correct exhibition thereof in the township plats. And should you continue surveys on opposite banks of a navigable stream, you are to show the connections of such surveys with certain established posts or points on the opposite side and these connections, as well as the mode by which they were ascertained, are to be shown in your field-book. Thus, in meandering, if you are careful to render the established points, as sectional corners, &c. on the opposite side obvious, their bearing, taken from two stations, will not only give the width, but the connection which is desired.

You will give the *received names* to all the rivers, creeks, lakes, and swamps, as also of prairies, hills, mountains, and other natural objects. You will never give *original names* to such objects, where names have heretofore been given.

You will note precisely the distance to, and the width of, all streams, not navigable, which your line may traverse; also their general course, as accurately as you can conjecture.

All mines, salt springs, salt licks, and *mill seats;* also *towns, villages,* and *settlements,* and the names of the same; also *forges, factories, cotton gins,* and all such items of information; also the *general course* of travelled *roads* and *tracks,* denoting the place to which they may lead; are to be noted in your field-book.

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All township and sectional lines which you may survey, are to be marked in the manner heretofore practiced in the surveys of the United States, viz: all trees, which your lines cut, must have two notches made on each side of the tree where the line cuts it; but no spot or blaze is to be made on them; and all or most of the trees, on each side of the line and near to it, must be marked with two spots or blazes diagonally, or quartering towards the line.

You will be careful to note in your field-book all the courses and distances you shall have run; the names and estimated diameters in inches, of all bearing or corner trees, and those trees which fall in your line called *station* or *line trees,* notched as aforesaid, together with the courses and distances of the bearing trees from their respective corners; also, the face of the country, whether level, rolling, hilly, or mountainous; the kinds of timber and undergrowth with which the land abounds, and the quality of the soil, &c.

Though your lines be measured by a chain of two perches, you are notwithstanding to keep your reckoning in chains of four perches, or one hundred links each; and all entries in your field-book, and all your plans and calculations, must be made according to the decimal measure of a chain.

Each of your sub-agents must take and subscribe the following oath or affirmation, before they enter on their duty:

I, A_____ B_____, do solemnly swear *(or affirm, as the case may be)* in the presence of Almighty God, that I will faithfully and impartially execute and fulfil the duty which may be assigned me as chain-man, or marker, or any other service which may be required, in executing the surveys of the public lands, to the best of my abilities, so help me God.

A _____ B_____

Sworn to and subscribed before the undersigned, the _____ day of _____ 18 .

B_____ C_____, *Dep'y. Surveyor.*

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This affidavit you will place in the front part of your field-book, and return the same with your field-book to this office.

As the measurement by the chain is the principal source of errors in surveying, you will be careful to attend to your chain-men, that they carry the chain horizontally, and plumb

the pins. To prevent their losing a tally-rod, you must be provided with a set of them, pointed with iron or steel, and to allow none other to be used but the precise number which you shall have selected for that purpose.

It is enjoined on you, not to employ any person whose character is known or suspected for wanting correct principles, as chain-man, marker, or any other important business in executing the surveys which you are to perform; nor is any one to be employed in the capacity above stated who is not a free white person, and who has not attained years of discretion sufficient to understand the nature and solemnity of an oath.

The page of your field-book containing notes of the first work performed by you, must be numbered one (or 1), and progress in numerical order to the end of your book, or to the last page containing notes of your surveys. A blank page is to be left on the front part of your field-book, preceding the oaths of your chain-men, marker, &c. on which you are required, after having filled your book with notes, to make an index, showing the page at which the notes of every line or part of a line may be found.

No lines of whatsoever description are to be run, or marks of any kind made by any person but yourself, or persons under your immediate inspection. Subcontracts are illegal.

The United States' surveys are required by law to be made agreeably to the true meridian, and at right angles therewith. You will therefore ascertain the variation of the needle, when sub-dividing townships, at least once in every third township, or eighteen miles, when they lay east and west, with respect to each other; and in every fourth township, or twenty-four

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miles, when they are situated north and south, with respect to each other; and when surveying exterior boundaries, once at least on every fourth range, or north and south line; and once on every fifth township, or east and west line. The variation you will ascertain by an observation of the pole star.

The posts must be erected at every half mile and mile from where the township or sectional line commenced, (except a tree may be so situated as to supply the place of a post.) All mile posts must have as many notches cut on each side of them, directed to the cardinal points, as they stand miles from the outlines of the township; and the township corner posts must be notched with six notches on each side, and the half mile quarter sectional posts are to be without any mark. All posts are to be at least two and a half feet above the surface of the ground, and in size not less than four inches in diameter at township corners—nor less than three inches in diameter at sectional and quarter section corners—and in all cases to be planted firmly in the earth in an erect position, and their places are to be perpetuated in the following manner, viz: At each post the courses shall be taken and the distance measured to two adjacent trees, in opposite directions, as nearly as may be, which trees, called *bearing trees,* shall be blazed on the side next the post, and one notch made on the blaze; and there shall be cut, with a marking-iron on the bearing tree, or some other tree within and near each corner of a section, the letter S., with the number of the section, and over it the letter T., with the number of the township, and above this the letter R., with the number of the range. But, for quarter section corners, you are to put no numbers on the trees; they are to be distinguished by the mark "¼ S."

The above instructions are required by law; in addition to, or extension of which, I have received the following instructions from the Commissioner of the General Land-office, the execution of which is enjoined on you.

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"Where a tree is not found immediately at the corner, a corner is to be established by planting a post, on which is to be marked the number of the township, over which is to be marked the number of the range, and underneath the number of the section.

"The bearing and distance, also the names and respective diameters of the nearest trees from such corner, are to be carefully taken and noted in the field-book. The nearest of such trees (where there are more than one) is to be marked, to correspond with the *marked corner.* The mark should be made into such tree, in such a way as to be always distinguishable from a mere blaze. The letters B. T., to denote the fact of its being a *"bearing tree,"* should be distinctly cut into the wood, some distance below the other marks. All these particulars are to be most intelligibly and minutely noted in the field-book. The posts used in forming the corners of townships must always be larger (for the sake of distinction) than those which denote the sectional and quarter sectional corners, and should be neatly *squared off* at the top, to correspond with the cardinal points. The sectional posts are to indicate, by a number of notches on each side of the four corners, directed to the cardinal points, the number of miles that it stands from the outlines of the township—the side of the post will be numbered to correspond with the number of the section it faces. Each half mile post on a section line, and quarter section post on a township line, should be marked to indicate that it is a quarter sectional post, thus: ¼ S.—and the nearest adjoining tree on *each side* of such post, must be similarly marked. The surveyor to note in his field-book the kind of tree, its diameter, bearing, and distance, from the true corner.

"Posts denoting the same kind or character of boundary, should be of uniform construction; and there should always be a striking difference between posts denoting different kinds of boundary."

In prairie countries, where bearing trees cannot be found within a reasonable distance of a corner which

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you are to establish, you must, in that case, and in all such cases, erect mounds of earth, covered with sod, to perpetuate such corners. The mounds must be, for quarter section and section corners, two feet six inches high, and two feet diameter at the base; for township corners, three feet high, and two feet six inches in diameter at the base. And at all corners where mounds are necessary, you will deposit a rock, or rocks, weighing not less than ten pounds; a cylinder of charcoal, not less than six inches long and two inches diameter; or

a quantity of glass, or cinder from a black-smith's shop, not less than half a pint.

In your field-book, the number of miles, chains and links, actually run and marked on a line, are to be exhibited in a column, which is to be added up at the foot of each page, and carried forward, from page to page, so as to form, at the conclusion of the book, the aggregate of miles, chains and links, run in the township or fractional township.

Your field-notes are to be signed by yourself, and must give the names of the chain-men, marker, &c., employed in the survey, by their signature, or otherwise.

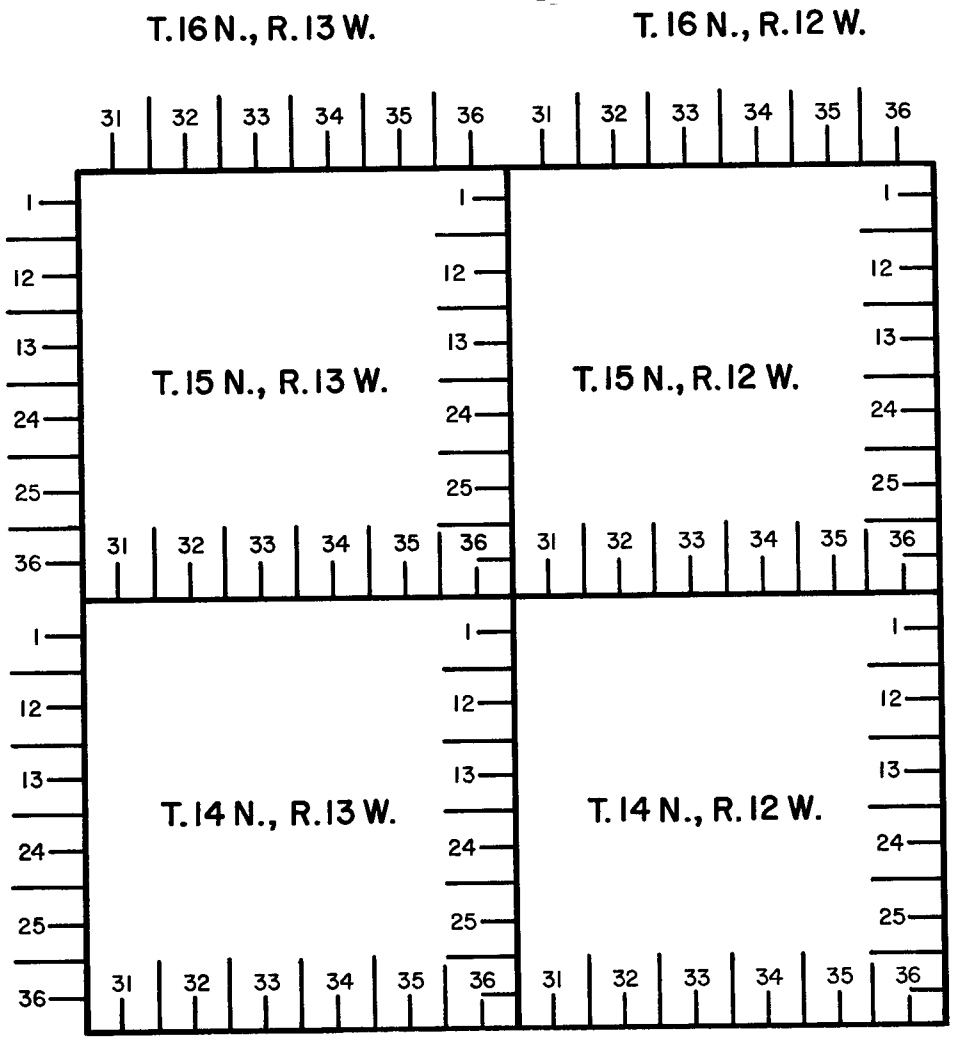
Instructions for laying off and surveying the exterior boundaries of townships.

In surveying the exterior boundaries of townships, when running north or south, you must establish sectional corners for the townships west of the line, and not for the townships east of the line, except at township corners, where the number of the range, township, and section, must be marked in the corner of each township or fractional township, as represented on the sketch herewith furnished, marked No. I.

On the east and west lines between townships, you will establish corners for the townships north of the line, and not south of it, except the corners of townships or fractional townships.

DIAGRAM, exhibiting the exterior boundaries of Townships.

No. I
DIAGRAM, exhibiting the exterior boundaries of Townships.



The names of all bearing trees are to be fully written out; not abbreviated or expressed by initial letters. And you will, at the beginning of each of your field-books, and at the beginning of each day's work, when starting a sectional line, write out in full the name of the section, the township, north or south of the base line, and east or west of the 5th principal meridian.

You will keep your field notes in the following form:

M.	*Ch's.*	
		Chain compared and found correct.
		North—along the east side of section 36, township 15 N, R. 12 W of the 5th principal meridian.
	20.10	A brook, 20 lks. wide, runs NW.
	32.25	A black-walnut, 15 ins. in dia.
	40.00	Set ¼ sec. corner post, from which a mulberry, 12 ins. dia. bears N 36 W, 54 links, and a hackberry, 24 ins. dia. bears S 45 E, 85 links.
	42.18	An ash, 15 ins. dia.
	50.00	The SW border of a lake, impassable.
		Thence offset N 45 W, 10.00
		north, 5.00
		east, 7.07 to the true line at
	62.07	The NE border of the lake, which is 11.07 chs. wide.
		On the course north of offsets crossed the lake, where it is marshy. The marsh extends north-westwardly about 10 chains, where it terminates at bluffs, and is generally about 5 chs. wide.
	80.00	Set post corner to sections 25 and 36, from which a black-walnut, 28 ins. dia. bears S 74 E, 70 links, and an ash, 33 ins. dia. bears N 87 W, 125 links.
		Land level and rich; timber walnut, ash, hackberry, &c.; undergrowth, spice, papaw, &c.
		Jan. 1st, 18 .

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M.	*Ch's.*	
		North—along the east side of sec. 25, township 15 N, R. 12 W.
1	5.42	The bank of_____ river, a navigable stream, course eastwardly whereat set post corner to fractional section 25, T. 15 N, R. 12 W, and of fractional section 30, T. 15 N, R. 11 W, from which a sycamore, 30 ins. dia. bears S 82 E, 20 links, and a box-elder, 12 ins. dia bears N 89 W, 15 links.
	15.42	The north or left bank of the river, it being 10 chains wide, (the distance obtained by calculation,) whereat set post corner to fractional sections 25, T. 15 N, R. 12 W, and 30, T. 15 N, R. 11 W, north of_____ river, from which an elm, 15 ins. dia. bears S 88 W, 22 links, and a hackberry, 17 ins. dia. bears N 72 E, 12 links.
	40.00	Set ¼ sec. corner post, from which a hickory, 10 ins. dia. bears N 20 W, 22 links, and an elm, 12 ins. dia. bears S 22 E, 40 links.
1	43.50	Bluffs or highland, they bear a little N of east and south of W.
	56.15	A black-oak, 20 ins. dia.
	80.00	Set post corner to sections 24 and 25, from which a black-oak, 20 ins. dia. bears S 42 W, 26 links, and a white-oak, 30 ins. dia. bears N 46 E, 25 links.
		Land south of the bluffs level, wet, low grounds, that part immediately north of the river five chains, is much cut by sloos, and generally liable to inundation. Timber, oak, hickory, elm, ash, &c. Undergrowth, cane, vines and briars. Residue on the bluffs, hilly, rocky and poor. Timber, post-oak and black-hickory. Undergrowth, same.

Proceed in this manner establishing quarter section and section corners, until you get six miles from the

beginning, where you would (in this case) establish the corner of townships 15 and 16 north of the base line, of ranges 11 and 12 west of the 5th principal meridian. We will suppose that the corner to townships 15 and 16 N, Ranges 12 and 13 W, had been previously established. You would, in that case, run from the township corner just established a random line west, between townships 15 and 16, and keep your field-notes as follows:

M.	*Ch's.*	
		West—on a random line along the south side of sec. 36, T. 16 N, R. 12 W.
	18.75	A brook, 12 links wide, runs SW.
	22.50	Entered a prairie, bears NE and SW.
	40.00	Set temporary ¼ section post.
	47.60	A brook, 15 links wide, runs south.
	73.00	Left prairie, bears north and south.
	80.00	Set post temporary corner, to secs. 35 and 36.
		Land uneven, mostly prairie, good soil; timber at the east and west part, oak, hickory, ash, &c.; undergrowth, hazle, vines, &c.

Proceed in this manner until you intersect the range line. Note in your field-book the distance you fall north or south of the township corner, for which you run, as well as the length of the south boundary of sec. 31. We will suppose that the line along the south boundary of sec. 31 measured 79 chains and 75 links. Then, in correcting the line between townships 15 and 16, proceed as follows:

M.	*Ch's.*	
		East—corrected the line along the south boundary of sec. 31, T. 16 N, R. 12 W of the 5th principal meridian.
2	4.75	A red-oak, 8 ins. dia.
	39.75	Set ¼ section corner post on the true line, from which a white-oak, 18 ins. dia. bears N 39 W, 132 links, and a black-oak, 28 ins. dia. bears S 48 E, 15 links.
	79.75	Raised a mound on true line, in which deposited a cylinder of charcoal, [or rock, glass, or cinder], corner to sections 31 and 32.

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Proceed in this manner, until you complete the correction of the township line, taking care to establish quarter section and section corners on the true line, and in all cases to throw the excess or deficiency of a township in the west tier of quarter sections.

Instructions for sub-dividing townships into sections and quarter sections.

When the township lines are completed, you must begin the survey of sections at the sectional corner nearest to the south-east corner of the township, and move on in continued progression, from east to west, and from south to north, (except in fractional township here it will in some cases be necessary to run from north to south), in order that the excess or defect of the township, as to complete sections, may fall on the west and north sides of the township, according to the provisions of the act of Congress of the 10th May, 1800.

Each side of a section must be made one mile in measure by the chain, and quarter section corners are to be established at

every half mile, except when in the closing of a section, if the measure of the closing side should vary from eighty chains, or one mile, you are in that case to place the quarter section corners equi-distant, or at an average distance, from the sectional corners between which they are placed. But in running the sectional lines on the west or north side of the township, you will establish quarter section posts at the distance of half a mile from the last corner, and leave the remaining excess or defect on the west or north tier of quarter sections, which balance or remainder you will carefully measure and put down in your field-notes, in order to calculate the remaining or fractional quarter sections on the north or west side of the township. Also, in running to the western or northern boundary, unless your sectional lines fall in with the posts established there for the corners of the sections in the adjacent townships, you must set posts, and take bearing trees at the points of intersection of your lines with the township boundary, and take the distance of your corners from the corners of the sections in the adjacent township, and note that and the side on which it varies in chains or links, or both.

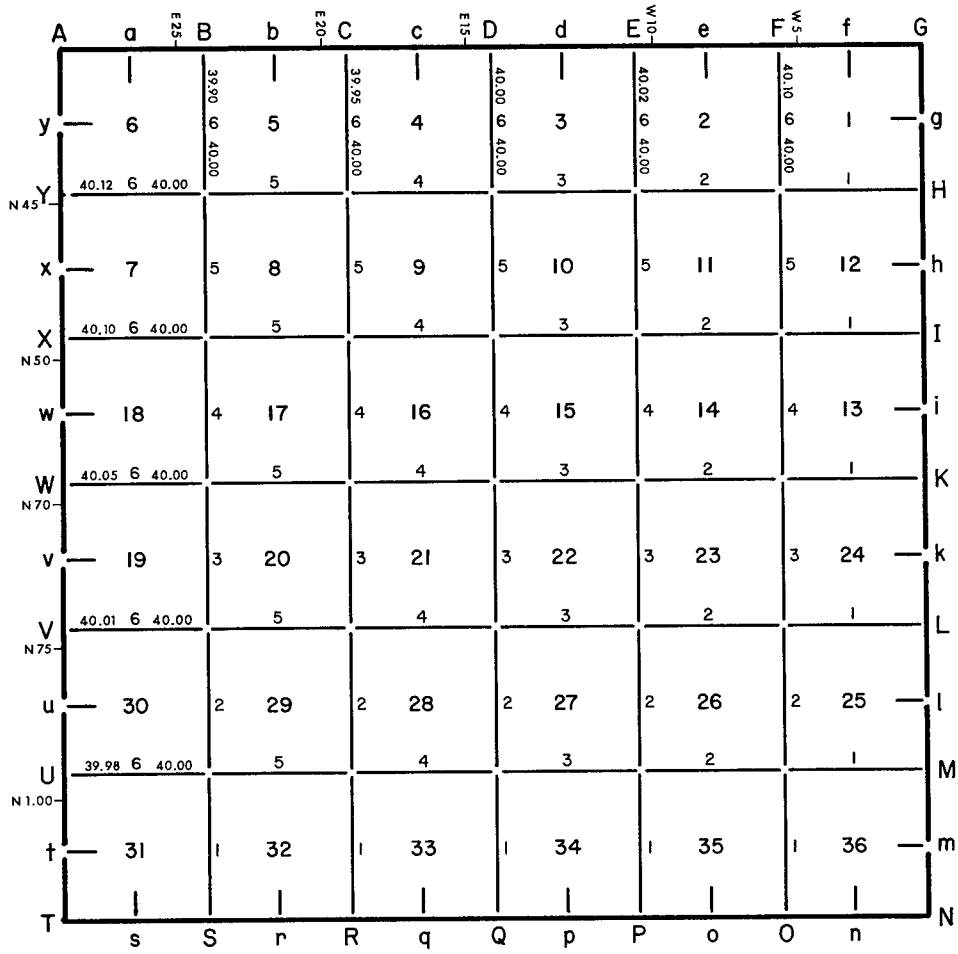
The sections must be made to close by running a random line, from one corner to another, except in the north and west ranges of sections, and a true line be established between them.

ILLUSTRATION—*[see the plat of a township herewith furnished, marked No. II.]*

No. II
Township 15 North of the base line, Range 12 West of the 5th P. M.

(No. II. – To front page 11.)

Township 15 North of the base line, Range 12 West of the 5th P. M.



Begin at O, the corner of sections 35 and 36; from thence run a true north course 40 chains, and mark the quarter section corner between sections 35 and 36; continue 40 chains farther on the north line, and establish the corner to sections 25, 26, 35 and 36. From this corner run a random line for the corner at M, without blazing; at the distance of every 20 chains on this line set up a stake or post, or make some other mark on your random line. If you strike the corner at M exactly, you have only to blaze the line back, and establish the quarter section corner at the average distance between the corner at M, and the corner of sections 25, 26, 35 and 36; but if, on running for the corner at M, you fall north or south of it, you must note the deviation or departure in your field-book, and return on the true line, observing to correct it, by means of offsets, from the marks on the random line. From the corner of sections 25, 26, 35 and 36, run due north one mile, setting the half mile post for quarter section corner as before at 2, on the line from O to F. You will then travel to P, in the south boundary of the township corner to sections 34 and 35, from whence you will run due north, and establish quarter section and section corners as before, and run a random line from the section corner on the line P E, to

the corresponding corner on the line O F. Proceed in this manner until you arrive at the last corner towards the western boundary of the township, from M to U, viz: the corner of sections 29, 30, 31 and 32; from this corner run west, and at the distance of 40 chains from it, establish the quarter section corner at 6, on the line from M to U. Continue west until you intersect the township boundary, suppose at U. Note the distance of the point of intersection from the last section or quarter section corner, and also the distance you fall north or south of the section corner of the adjacent township west of you. At the point of intersection at U, set the section post or corner, and take bearing trees.

In this manner you will proceed until your township is completed, observing always to move in a range of sections, from that at the SE corner of the township to the western boundary, or from that section to the northern boundary of the township. When you shall have completed the sections, as far north as the south boundary of the northern tier of sections, you will proceed north from the last section corners, and establish quarter section corners at 40 chains from them; and continue north until you intersect the township line in the same manner as on the western side of the township, observing the distance at which you intersect the north boundary from the section corner you left last. You will also note the distance you may fall east or west of the sectional corner, for the township north of the line.

In fractional townships, on navigable rivers, it will be necessary to vary from the foregoing rules, and the lines must be run from the sectional corners established in the rectilineal boundary of the township, whether north, south, east or west, as the case may be. The sections must be made complete, as far as it may be practicable to make them so, and the excess or defect of measure must be thrown into the fractional sections on the river.

Great care must be taken that the north and south

lines be run according to the true meridian, as required by law, and the east and west lines to be run at right angles to them, as far as is practicable in closing. But if, on running a line east and west, you find the post you are running for, lies very much to the north or south of the line, you are then to mistrust the measure of the chain, and the lines on which the posts are established must be re-measured.

Also, in running a meridian line by the compass, if you find, in the measurement of the closing lines of the sections, an uniform convergency or divergency of these lines, you may then mistrust the accuracy of the direction of your lines, by the needle; in such cases you will endeavor to run parallel to the meridian adjacent, on which the section closes, in order that it may contain the just or legal quantity of 640 acres, or one mile square.

You will keep your field-books in the following form:

M.	*Ch's.*	
		North—between sections 35 and 36, township 15 north of the base line, range 12 west of the 5th principal meridian.
	15.80	A black-oak, 24 ins. dia.
	32.75	A brook, 18 lks. wide, runs SW.
	40.00	Set ¼ sec. corner post, from which a white-oak, 18 ins. dia. bears N, 28 W, 32 links, and a hickory, 15 ins. dia. bears S, 75 E, 44 links.
	40.50	Entered a prairie, bears E and W.
	49.50	A brook, 12 links wide, runs SW.
	90.00	Raised a mound, in which deposited three rocks, corner to sec's. 25, 26, 35 and 36.
		Land, the south half uneven, good soil, timber oak, hickory, ash, &c. undergrowth hazle, vines, &c. The north half level, wet, prairie, thin soil
		January 1st, 1833.
M.	*Ch's.*	Chain compared and found correct.
		East—between sections 25 and 36, T. 15 N. R. 12 W.

M.	*Ch's.*	
	9.50	A creek, 80 links wide, runs NW., rapid current.
	10.00	Set temporary ¼ sec. corner post.
	73.00	Entered woods, bears NE and SW.
	79.90	Intersected the N and S line, G links north of the section corner.
		Land, west half level wet prairie; east half uneven, the prairie good soil, the woodland thin soil; timber oak and hickory, undergrowth vines, &c.
M.	*Ch's.*	West—between sections 25 and 36, on a true line.
1	2.17	A hickory, 7 ins. dia.
	39.95	Raised a mound, in which deposited as witness some glass.
	79.90	The corner of sec. 25, 26, 35 and 36.
M.	*Ch's.*	North—between sections 25 and 26, T. 15 N, R. 12 W.
	10.00	A black-oak, 14 ins. dia.
	20.00	Descended to low grounds or bottom land.
	35.00	The border of a lake, impassable, thence offset:
		east 5.00,
		north 7.00, to edge of the lake.
		east 4.00,
		north 3.00, over wet land, partially covered by water.
		west 9.00, or at

M.	Ch's.	
	45.00	The true line, 5.00 chs. north of the ¼ section corner, which is in the lake, and inaccessible, and 60 lks. north of the north border of the lake, in which marked the line south.
	50.00	Highland from bottom land.
	70.00	A brook, 15 links wide, course NE.
	75.00	The border of a lake, impassable, which I consider of sufficient magnitude to mean-

-18-

M.	Ch's.	
		der, whereat set post, from which a maple, 12 ins. dia. bears N 82 E, 10 lks., and an elm, 20 ins. dia. bears N 85 W, 20 lks. thence meandering N 60 W, 7.00 chs., N. 20 W, 8.00 chs., N 25 W, 6.00 chs. Along these courses the land is high and dry, soil 1st rate. Thence N 5 W, 5.00 chs., N 10 E, 6.00 ch. Along these courses the land is low and marshy. Thence N 45 E, 7.00 ch., N 60 E. 6.69 ch. to post corner to fractional sections 23 and 24, (the line to which is run south from the corner to sections 12, 13, 23 and 24.)

In this manner you will enter all courses and distances in your field-book, and the date must follow the close of each day's work; which field-book of each township, separately, written with a fair hand, or a true and fair copy, together with the original, you will return to the office of the Surveyor of the lands of the United States in the Territory of Arkansas.

WM. F. WOODRUFF, PRINTER,
Little Rock, A. T.

XVIII.

(These Instructions are copied from an original volume now in the possession of the National Archives The cover contains a hand-written notation, "Wash. Hoods Capt. Top'l Engineers, 1839.")

GENERAL INSTRUCTIONS TO HIS DEPUTIES; BY THE SURVEYOR GENERAL OF THE UNITED STATES, FOR THE STATES OF OHIO AND INDIANA, AND THE TERRITORY OF MICHIGAN.

CINCINNATI:

JOHN H. WOOD, PRINTER.

:::::

1833.

GENERAL INSTRUCTIONS

TO

DEPUTY SURVEYORS.

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1. The public Lands of the United States are surveyed in a uniform mode, established by law, by lines run by the cardinal points of the compass; the north and south lines coinciding with the true meridian, and the east and west lines intersecting them at right angles, giving to the tracts thus surveyed, the rectangular form.

2. The public lands are laid off and surveyed, primarily, into tracts of six miles square, called *Townships*, containing, each, 23,040 acres. The townships are subdivided into thirty-six tracts, called *Sections*, each of which are one mile square, and contains 640 acres. Any number, or series, of contiguous townships, situated north or south of each other, constitute a *Range*.

3. To obtain and preserve a convenient and uniform mode of numbering the ranges and townships, it is usual, in commencing the survey of an insulated body of public lands, to run, or assume, two *Standard Lines*, as the basis of the surveys to be made therein. One of these standard lines is run due north and south, and is called the *Principal Meridian*, to which the ranges are parallell, and from which they are numbered eastward and westward. The other standard line is run due east and west, and is called the *Base Line*, and from which the townships are numbered northward and southward.

4. To distinguish from each other, the systems or series of surveys thus formed, the several Principal Meridians are designated by progressive numbers. Thus, the Meridian running north from the mouth of the Great Miami river, is called the *First* Principal Meridian; the Meridian running north through the centre of the State of Indiana, is called the *Second* Principal Meridian; that running north from the mouth of the Ohio river through the state of Illinois, is called the *third* Principal Meridian; and that running North from the mouth of the Illinois river, through the State of Illinois and the Wisconsin Territory, is called the *Fourth* Principal Meridian.

5. This mode of executing the public surveys, conduces more, perhaps, than any other which could be devised, to the

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simplicity, regularity, and symmetry of the work; and to the ease and certainty with which any tract may be identified.

6. The public lands are surveyed under the direction of the Surveyor General, by Deputies appointed by himself. He selects for his deputies none other than skilful and experienced practical surveyors, men of good moral character, in whose integrity and fidelity and fullest confidence can be reposed.—Their duties are prescribed in the following code of General Instructions, a copy of which is furnished to every deputy, for his government.

7. Each deputy surveyor is required, before he enters upon the duties of his appointment, to take and subscribe an oath or affirmation for the faithful performance thereof; which oath or affirmation is to be filed in the office of the Surveyor General. The following form of this oath or affirmation (or the substance thereof) will be used:

"I. A_____ B_____ do solemnly swear (or affirm,) that I will well and faithfully perform the duties of a deputy surveyor of United States Lands, to the best of my skill and ability, and according to the laws of the United States, and the Instructions of the Surveyor General, as I shall answer to God at the Great Day. A_____ B_____

Sworn and subscribed before me, this _____ day of J_____ K_____

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8. Each deputy Surveyor appoints his own chain carriers, markers, and flag bearers, who must severally take and subscribe an oath, or affirmation, for the faithful performance of the trust reposed in them; which oath, or affirmation, may be administered by the deputy Surveyor himself, or by a Justice of the Peace, and must be filed in the Surveyor General's Office. The following is the oath to be taken by the chainmen.

"I, C_____ D_____ do solemnly swear [or affirm] that I will well and faithfully perform the duties of chain-carrier in all surveys of United States Lands in which I shall be employed as such: and that I will strictly attend to levelling the chain, and plumbing the tally pins, in measuring over hills or side-lying ground—to the best of my skill and ability, as I shall answer to God. C_____ D_____

sworn and subscribed before me, this _____ day of _____

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A _____ B_____

D. Surveyor.

9. The oaths of the markers and flag-bearers may be varied to apply to their duties respectively.

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OF CONTRACTS.

1. Before entering upon the execution of any surveys which may be allotted to a deputy Surveyor, he enters into a written contract with the Surveyor General, in which the surveys to be performed are described, and the period for their completion, and the compensation per mile, fixed; and wherein the deputy binds himself to a faithful performance of the work, according to the terms of the contract, and pursuant to the laws of the United Statesand the instructions of the Surveyor General. To the contract is annexed a bond, executed by the deputy with approved security, conditioned for the faithful performance of the work, in the penalty of double the estimated amount or value of the contract.

2. The surveys must be executed, in all cases, by the deputy contracting for the same, in his own person, or under his immediate personal superintendence and direction. All subcontracts are illegal.

3. In case of failure to comply with the terms of a contract, unless such failure arise from causes satisfactorily proven to be beyond the controul of the contractor, immediate measures are to be taken to recover the penalty of the bond, agreeably to law. And no deputy surveyor who shall improperly fail to fulfil his engagements, will afterwards be em-

ployed in the public surveys; and of every such failure, the Surveyor General is required to give immediate notice to the Commissioner of the General Land Office.

4. And where any portion of a survey is found or suspected to be erroneous, payment therefor will be suspended until the error is corrected, or the cause of suspicion done away to the full satisfaction of the Surveyor General.

OF SURVEYING INSTRUMENTS.

1. You will provide yourself with a good *Compass*, having a nonius and movable sights, which is to be compared with and regulated by the *Standard Compass* in the Surveyor General's Office.

2. You will likewise procure a *Surveying Chain*, two poles, or thirty-three feet, in length, and containing fifty-links; which is to be compared with and adjusted by the *Standard Chain* in the Surveyor General's Office. It should be made of good iron wire, of such size as to prevent the chain from stretching by use, and yet light enough to be readily straightened in mea-

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suring. The handles should be made of iron or brass, at least a fourth of an inch in diameter.

3. You must be provided likewise with the *measure* of the standard chain, which may be made similar to your surveying chain, of smaller wire. And by this your surveying chain must be compared and adjusted, at least every other day, or oftener.

4. *Tally-Rods*, are usually made of iron, about twelve inches in length, having a ring at the top, in which is fixed a piece of red cloth, or something else of a conspicuous colour, that they may be more readily seen when stuck in the ground. Eleven tally-rods is the number required to be used. They should be counted by both of the chain-men at the end of every *"out,"* to see that none have been lost.

5. Your compass and chain must be frequently examined in the field, in order to discover and rectify any error or irregularity which may arise in the use of them.

6. The aberrations of the needle, are a fruitful source of error in surveying. These may arise from a variety of causes. "Local attraction," owing to the presence of iron mineral, is generally assigned by surveyors as the principal cause of the disturbance of the needle. But it is believed that in many instances, the true source of the errors complained of, is to be found in the carelessness or inattention of the surveyor, in the use and management of his compass, or the erroneous measurement of his lines. All these must be constantly and vigilantly guarded against, by every means in your power.

OF THE VARIATION OF THE COMPASS.

There is a certain irregular curve line which passes around the earth towards the north and south poles, called the *"line of no variation."* On every part of this line the magnetic needle co-incides with the true meridian. But on each side of it, the needle declines from the true meridian towards it. This declination is usually called the *"variation of the compass;"* and increases gradually, but irregularly, in receding either eastward or westward from the line of no variation, until it reaches its maximum, beyond which it gradually descreases again to the line of no variation. This line is not stationary; but moves to the eastward for a series of years, and then to the westward through another series of years, but without any regular period, or any known proportion between the *time* of this movement and the *amount* thereof. Hence the variation

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of the compass, at any place, is continually changing, to an extent corresponding to the change of place in the line of no variation.

The line of no variation, at this time, passes through the western part of Pennsylvania and New York. West of this, the needle points to the east of the true meridian; and this variation increases in going westward across the states of Ohio and Indiana, and Michigan Territory; until, in the south western part of that territory, on the Mississippi river, it amounts to nine degrees or upwards.

The following method of determining the *Variation of the Compass,* extracted from Flints "Treatise on Surveying," is recommended to the deputy surveyors, as being perhaps, the most convenient and best adapted to the service in the field:

The star commonly called the North Star, is not directly north but revolves round the pole in a small circle, once in 24 hours.[1] It can therefore be due north only twice in that period; and that is within a very few minutes of the time, when a star, called *Alioth* in the constellation of Ursa major, or the great bear, is directly over or under it. There is also another star nearly in an opposite direction from the pole, called *Gamma,* in the constellation of Cassiopeia. When these three stars are vertical, the north star is very near the meridian; and when they are horizontal, it is at its greatest elongation, that is, at its greatest distance east or west of the pole, and on the same side as the star in Cassiopeia. The variation may be calculated when the star is on the meridian, or when at its greatest elongation; more accurately, however, at the latter period, because its motion being then nearly vertical for some time, gives the observer opportunity to complete his observation.[2]

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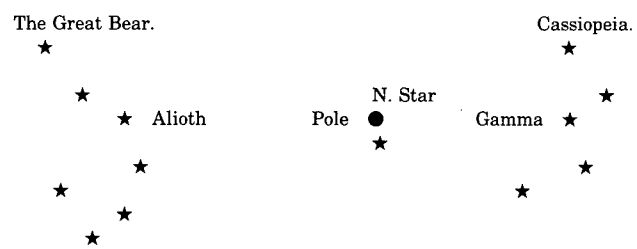
To find the elongation of this star in any latitude, its declination must be known; that is, its distance north of the equator. This being found, institute the following proportion: as co-sine of the latitude, is to radius; so is co-sine of the declination, to sine of the elongation.

The declination of the North Star, January 1, 1810, was 88° 17′ 28″, and increasing at the rate of about 19 seconds and one half annually.

In the following table, the elongation is calculated for ten

1. More exactly, 23 hours, 56 minutes and 4 seconds.—

2. The following figure exhibits a view of the relative situation of these stars, as they appear, when in a horizontal position; or when the north star is in its greatest eastern elongation.



successive years, ending with 1840, and for six different latitudes. The calculation is made for the first of July, and of course gives the mean angle for the year.

TABLE SHOWING THE ELONGATION OF THE NORTH STAR.

Years.	34°	36°	38°	40°	42°	44°
1831	1° 55′	1° 58½′	2° 1½′	2° 5′	2° 9′	2° 13′
1832	1 54½	1 58	2 1	2 4½	2 8½	2 12½
1833	1 54	1 57½	2 0½	2 4	2 8	2 12½
1834	1 53½	1 57	1 59½	2 4	2 7½	2 12
1835	1 53	1 56½	1 59	2 3	2 6½	2 11
1836	1 52½	1 56	1 58½	2 2½	2	2 10½
1837	1 52½	1 55½	1 58½	2 2	2 5½	2 10
1838	1 52½	1 55	1 58	2 1½	2	2 9½
1839	1 52	1 54½	1 57½	2 1	2 5½	2 9
1840	1 51½	1 54	1 57½	2 0½	2 4	2 8½

The elongation for the latitude of the observation being calculated, or taken from the above table, proceed to find its range, according to the following directions:

Take a pole 18 or 20 feet in length; to the end of it fasten a small line; raise it to an elevation of 45° or 50°; and support it by two crotches of suitable height to keep it firm in its place. At the end of the line near the ground, fasten a weight of half a pound or more, which should swim in water to prevent the air from moving the line. Southward of the line fix a compass sight, or other piece of metal or wood, with a narrow, perpendicular aperture at a convenient height from the ground, say about 1 or 2 1-2 feet; and let it be so fixed that

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it can be moved a small distance east or west at pleasure.—Let an assistant hold a light either N E or N W of the line, nearly as high as the range from the sight to the north star, in such a position that the line may be plainly seen; then, [three stars above mentioned being parallel or nearly so with the horizon,] move the sight-vane east or west, until through the aperture, the line is seen to cut the star; and continue to observe, at short intervals, till the star is seen at its greatest elongation. Let a lighted candle be placed in an exact range with the sight-vane and line at the distance of 20 rods or more, which should stand perpendicularly, be made fast, extinguished, and left till morning. Then the sight-vane, the line, and the candle, will be the range of elongation, which observe accurately with a compass; and if the elongation be east, and the variation west, the former must be subtracted from the latter; and if they are both west, they must be added, and their difference or sum will be the true variation."

OF RUNING AND MARKING LINES.

1. All lines, of whatever description, which you may survey, must be run by the true meridian. For which purpose the variation of the magnetic needle, at the place where you survey, must be taken, or previously known, and the sights of your compass adjusted to the true meridian, by means of the nonius, before you commence the survey.

2. All lines which you may survey, are to be marked in the following manner, viz: all those trees which your line cuts, must have two notches made on each side of the tree, where the line cuts it; but no spot or blaze is to be made thereon. These are indifferently called "station trees," "line trees," or "sight trees." And all those trees on each side of the line, and within ten or fifteen links thereof (or farther if the land should be thinly timbered) must be marked with two spots or blazes, diagonally or quartering towards the line; which blazing must be made so conspicuous, that the line may be readily found and traced.

3. Whenever, in running lines, your course may be obstructed by insuperable obstacles, as swamps, marshes, lakes, rivers, precipices, or other objects over which you cannot pass, you will take the necessary offsets, or work by traverse, or by trigonometry, in order to pass the obstacle, and to ascertain the exact distance on so much of the line as, by reason of such obstructions, may not be actually run. By whatever method you pass such inaccessible parts of the lines, the utmost accuracy is necessary to obtain the true measure thereof.

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4. No lines, of whatever description, embraced in your contract, are permitted in any case to be run or surveyed by any person but yourself, or some regularly accredited Deputy Surveyor, duly authorised by the Surveyor General. Nor are letters, numbers, or marks of any kind, to be made by any other person than yourself, except it be in your presence, and under your immediate and personal direction; in which case you are to inspect such letters, numbers, or marks, to see that that they are neatly and correctly made.

OF EXTERIOR TOWNSHIP LINES.

1. The Act of Congress of the 18th of May, 1796, requires that the public lands "shall be divided by north and south lines, run by the true meridian, and by others crossing them at right angles, so as to form townships of six miles square." In laying out and surveying the exterior boundaries of townships, in conformity to this provision of the Act, the greatest possible accuracy must be observed, both in the course and measurement of the lines. To run the lines by the true meridian, the variation of the magnetic needle must be frequently and with the utmost exactness, determined by celestial observation, and the sights of your compass adjusted accordingly.

2. Celestial observations, to find the variation of the compass, should be made at least every twelve miles on the east and west lines; and at the end of eighteen or twenty-four miles on the north and south lines. It is not material that these observations should be made at the township corners. They may be made at any part of the lines, so as to be, as nearly as practicable, at the intervals here directed. But no alteration must be made in the course of any township line, until you arrive at a township corner; for with whatever course you set out, in running a township line, that course must, in all cases, be continued to the end thereof.

3. The following is the order and method to be pursued in running exterior township lines: a base line, or a township line assumed as a base, is run due east and west, across the southern boundary of the tract of country to be surveyed. On this line the quarter-section, section, and township corners are established at the full measure. From each of the

township corners on this line, range lines are run due north, the section and quarter-section corners established thereon, and at the end of the sixth mile on each of those lines, tem-

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porary township corner posts are set. But at the end of the sixth mile on the most easterly line, a township corner is established. From this corner, a township line is run due west across the whole district, intersecting the range lines previously run; which, if the work be well done, will be at or near the temporary township corner posts placed at the end of them. Exactly at the points of intersection, whether at the temporary posts or north or south of them, the township corners are to be established. The distances from the points of intersection, to the temporary posts, must be accurately measured and noted, shewing whether it be north or south of those posts. On this west line, the intermediate section and quarter-section corners will be established, as the survey of the line advances.

4. The same process will be repeated, in running up due north, from the township corners on this last west line, another series or tier of range lines, to temporary six mile posts; establishing as before, the most easterly one, and from thence extending another due west township line across the whole district, in the manner before directed. The same method is pursued in each successive tier of townships, until the survey of the township lines is completed.

5. Variations from this order and mode of running township lines, will sometimes be necessary, to accommodate them to the situation and boundaries of the tract of country to be surveyed, or to connect with prior surveys. Such cases, as they occur, will be provided for in Special Instructions.

6. Whatever excess or deficiency may occur in the measurement of the exterior township lines, is to be carried to the north or west end of those lines. But by a vigilant and faithful attention to duty on the part of the skillful and experience surveyor, those excesses or deficiencies, except to a trifling extent, will be of rare occurrence. As the interior section lines must necessarily conform, both in their course and measure, to the township lines; any error committed in the latter will unavoidably be carried out into the former, and may mar the beauty and order of the entire sub-divisions of the township.

7. It will be seen, then, how very important it is, that the townships be, as nearly as possible, six miles square; that the exterior boundaries be run exactly by the true meridian; and that the measures thereof be truly and accurately made.

8. The bearing trees at the section and quarter section corners, on the exterior township lines, are to be taken only on the north and west sides of those lines, respectively, wherever it is practicable. And those sections only, which lie on the north and west sides of these lines, are to be marked and numbered.

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9. With the Field Notes of exterior township lines, the surveyor must return a map or diagram of the lines run, drawn on a scale of four miles to an inch; on which will be represented the length of each line, in miles, chains and links; the variation of the compass by which it is run; and also the water courses, lakes, prairies, swamps, roads, and such other objects as may be shown on a map.

OF MEASURING LINES.

1. In all measurements, the level or horizontal length is to be taken, and not that which arises from measuring along the surface of the ground, where it happens to be uneven, rolling, or hilly. For this purpose, in ascending or descending hills, the chainmen must let down one end of the chain to the ground, and raise the other end to a level therewith, as nearly as may be; from the end of which a tally rod should be plummed and let fall, to ascertain the spot for setting it. And where the surface of the ground is very steep, it may be found necessary to shorten the chain (by doubling it together) to one half its length, or even less, so as to obtain the true horizontal measure.

2. Though your lines be measured by a chain of two poles or perches in length, you are, notwithstanding, to keep your reckoning in chains of four perches of one hundred links; and all your entries in your Field Book, and all your calculations, plans, &c., must be made accordingly in four-pole chains, and decimal parts (or hundreths)thereof.

3. In measuring lines, every five chains are called an "out," because at that distance the last of the ten tally-rods, or pins, with which the forward chain-man set out, has been set. The other chain-man then comes up, counts and delivers to him the ten tally-rods which he has taken up in his last "out;" the forward chain-man likewise counting them as he receives them. At the end of every five chains, the forward chain-man, as he sets the tenth or last tally-rod, calls "out!" which is repeated by the other chainman, by the marker and by the surveyor, each of whom keeps a tally of the "outs," and marks the same as he calls them.

4. You are to pay the strictest attention to the frequent examination and correction of your surveying chain by the standard measure taken with you. The greatest attention must likewise be observed in obtaining, and entering in your Field Book, the exact measure on the lines, to every object which is noted therein. These measurements are very fre-

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quently found to be important, after many years, both in tracing the lines and in identifying the corners.

5. The principal source of error in surveying is in the measurement by the chain. And as the interest of the public service, the rights of purchasers of the public lands, as well as your own standing as a surveyor, are at stake, it is enjoined on you, in selecting your Chain-carriers, to have strict regard to their character and fitness for the trust; and to employ those only, in whose moral integrity, capacity, and faithfulness, you can repose the most implicit confidence. You are required to attend vigilantly to the manner in which your chainmen perform their duty, and to cause it to be faithfully and correctly executed; to see, especially, that they carry the chain horizontally on hilly ground; and that all the lines which you may run, be not only correctly measured by them, but the length thereof truly reported to you, for *immediate entry in the Field Book.*

6. In measuring across streams of water, you are to give the width directly across the channels thereof. The distances to the posts which you shall establish on the banks of rivers, lakes, or bayous which are to be meandered, are to be taken with great accuracy.

OF ESTABLISHING AND MARKING CORNERS.

1. The corners of townships, sections and quarter sections, are to be established and marked in the following manner:—

2. On the exterior township lines, corner posts must be erected at the distance of every mile and half mile from the township corner. The mile posts are for the corners of sections, and the half mile posts for the corners of quarter sections.—These posts are always to be made of the most durable wood that can be had, and should be very securely set or driven into the ground to the depth of fifteen or twenty inches at least; and the sides of the posts are to be neatly squared off at the top—the angles of the square to be set in the direction of the cardinal points of the compass. All mile posts, on the township lines, must have as many notches cut on them, on one of the angles thereof, as they are miles distant from the township corner where the line commenced. But the township corner posts, shall be notched with six notches on each of the four angles of the squared part. The mile posts on the section lines shall be notched, on the south and east angles of the square, respectively, with as many notches as those posts are miles distant from the south and east boundaries of the town-

ship. Wherever a tree may be so situated as to supply the place of a corner post, it is to be blazed on the four sides facing the sections to which it is the corner, and will be notched as the corner posts are.

3. At all posts thus established for section or township corners, there shall be cut with a marking iron, on a bearing tree or some other tree, within each section, and as near as may be to the corner therof, the number of such section: and over it the letter T, with the number of the township, and annexed thereto, the letter N or S as the township may be north or south of the Base Line; and above this, the letter R with the number of the Range, and annexed thereto, the letter E or W, as the range may lay east or west of the principal meridian; thus:

R 4 E
T 9 N
36

4. The letters and numbers thus marked should be made in a regular chop, cut into such tree, and neatly squared off and faced, so as to be always readily distinguished from a mere blaze.

5. But at the quarter-section corners there are no numbers to be made: the post is to be flattened on two opposite sides, and thus marked: "1-4 S," to indicate that it is a quarter section post: and the nearest adjoining tree on each side of the sectional line, must be similarly marked.

6. The place of all corner posts, of whatever description, which may be established, are to be perpetuated in the following manner, viz: from each post the courses shall be taken, and the distances measured, to two or more adjacent trees, in opposite directions as nearly as may be; which trees are called "Bearing trees," and shall be blazed on the side next to the post, and one notch made with an axe in the blaze. On each Bearing Tree, the letters B. T. to denote the fact of its being a Bearing Tree, must be distinctly cut into the wood some distance below the blaze.

7. In prairies and other places where bearing trees cannot be had, the places of the posts are to be perpetuated by quadrangular mounds of earth, to be raised around the posts, to the height of two and a half feet, and having a base of four feet square, the angles of which shall be in the direction of the cardinal points. Near the centre of each mound there must be placed a stone of at least three or four pounds weight, or a few handsful of charcoal. And to prevent as much as possible, the action of the rains and weather in wearing away the mounds, they must be covered over with sod. The posts should shew not less than two feet above the mounds, and are to be

squared and notched, as in other cases, and must be marked on each of the four square sides thereof, with the number of the section which it faces. Wherever stone can be conveniently obtained, a pile of stones of the same dimensions, will, in all cases, be made in place of a mound of earth.

8. Wherever the section or township lines intersect lakes, streams of water, or islands, which are to be meandered, posts are likewise to be established on the margin or banks thereof, at the points where the lines intersect or leave them. These posts are to be flattened on the two sides, co-inciding with the lines on which they are set; and on each of these sides is to be marked, the number of the section which it faces.

OF SUBDIVIDING TOWNSHIPS INTO SECTIONS.

1. Each Township is laid off and surveyed into thirty-six sections of one mile square, by lines running due north and south, crossed by others running due east and west. The sections are known and designated by progressive numbers, beginning at the north-east corner of the township, and numbering westward and eastward, alternately, as shewn in the followng diagram:

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

2. Each side of a section must be made one mile in measure by the chain. Quarter section corners are to be established at every half mile, except in closing a section, when the closing

line varies from eighty chains or one mile; in which case you are to place the quarter-section corner equi-distant, or at the average distance from the corners of the section. But in running out the last section lines, to the north and west boundaries of the township, the quarter-section corners are to be established at the distance of forty chains from the last section corner, and the excess or deficiency of measure (if any) carried out into the last half mile, and cast upon the north and west sides of the township, as required by law.

3. In closing out the section lines to the north boundary of the township, unless the section lines intersect that boundary at the section corners thereon established for the adjoining townships, you must set a post, and take bearing

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trees at each such intersection, and measure and note the distance to the posts previously set for the adjoining township, and on which side of such posts. But wherever the closing lines of the sections, intersect at the posts on the north boundary, such posts become common for the sections on both sides of the town boundary. Bearing trees are however to be taken, and the proper marks and numbers made, for and within the sections between which the closing lines are run. In establishing the corners on the north and west sides of the townships, where the section lines close thereon, the bearing trees, wherever it may be practicable, are to be taken on the south and eat sides, respectively, of those boundaries.

4. Having adjusted the sights of your compass to correspond with the course of the east boundary of the township, you will begin at the corner of sections 35 and 36, on the south boundary, and run a line due north forty chains, and establish the quarter-section corner between sections 35 and 36;—continue north forty chains farther, and establish the corner of sections 25, 26, 35, 36.

5. From the corner of sections 25, 26, 35, 36, run a random line, without blazing, due east for the corner of sections 25 and 36, on the east boundary, and at the distance of every five or ten chains on the random line, set up a stake, or make some other mark. If you intersect exactly at the post on the range line, you will blaze the random line back, as the true line. But if your random line falls north or south of the corner on the range line, you must measure and note such deviation in your field book; and from the said corner on the range line, return upon a true line back to the corner where you commenced the random, blazing and marking the true line, and observing to verify the correctness of its course, by means of offsets, from the stakes set or marks made on the random. The quarter-section post is to be established on the true line, at the average distance between the corner of sections 25, 26, 35, 36, and the corner on the range line.

6. From the corner of sections 25, 26, 35, 36, run due north, between sections 25 and 26, setting the quarter-section post, as before, at forty chains; and at eighty chains establish the corner of sections 23, 24, 25, 26. Then run a random line due east, for the corner of sections 24 and 25 on the range line; correcting back, and establishing the quarter-section corner, in the manner directed for running the line between sections 25 and 36.

7. In this manner proceed with the survey of each successive section in the first tier, until you arrive at the north boundary of the township, which you will reach in running up the line between sections 1 and 2. On this line, the distance

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at which the north boundary is intersected, is to be carefully noted. If you should not intersect at the post established for corner to sections 35 and 36 in the adjoining township, you must carefully measure and note in your Field Book, the distance of the point of intersection from said post, shewing whether you fell east or west thereof: and at that point, you will set a post and establish a corner for sections 1 and 2, taking your bearing trees, if practible, south of the township line, and making the proper marks and numbers for and within sections 1 and 2. Bearing trees are to be taken, and marks and numbers made, in the same manner, should your line intersect at the post for sections 35 and 36.

8. The first tier of sections being thus laid out and surveyed, you will return to the south boundary of the township, and from the corner of sections 34 and 35, commence and survey the second tier of sections, in the same manner that you pursued in the survey of the first; closing at the section corners on the first tier.

9. In like manner proceed with the survey of each successive tier of sections, until the fifth, or last entire tier is run up. From the section corners on this tier, you will run random lines for the corresponding corners established on the western boundary of the township, and correct back on true lines from these corners on the west boundary. But instead of setting the quarter section posts, on these true lines, at the average distance, you will establish them at the exact distance of forty chains from your last section corners; carrying out any excess or deficiency in the measure, into the last half mile, or that part of the line west of the quarter-section post. In closing thus on the west boundary, you will take bearing trees on the east side thereof, if practicable, and make the proper marks, and numbers for, and within each section, as on the north boundary.

10. Great care must be taken that the north and south lines be run according to the true meridian, as required by law. But if you find by the measurement of the closing lines of the sections, that there is an increasing convergency or divergency of the north lines, you may reasonably distrust the accuracy of the direction of your lines by the needle. In such case it will be necessary so to vary your course as to run parallel to the meridian (or north and south line) on which you are closing, in order that the sections may contain, as nearly as possible, the just and legal quantity of six hundred and forty acres, or one mile square.

11. The east and west lines are to be run at right angles with the north and south lines, as far as may be practicable in closing. But if; on running an east and west line, you find

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the post you are running for, lies much to the north or south of the point where you intersect, you are to mistrust the measurement of the north and south line last run by you. In such case, a re-measurement of the lines must be made, and the error, wherever found, corrected.

12. You are referred, here, to the accompanying specimen

of the Field Notes of a township, in which the whole process of the subdivision is illustrated at large, by example.

13. The foregoing mode of subdividing Townships into sections, it will be perceived, is intended for, and can be fully applied only, to *entire* townships. In the subdivision of *fractional* townships, however, the order of the survey will be varied no farther than may be necessary to adapt it to the situation and boundaries of such fractional township. As a general rule, from which there will be few exceptions, it will be found best to make entire sections on the township lines bounding a fractional township, and making the work to close on the *irregular* boundaries thereof.

14. An Act of Congress of the 24th of May, 1824, authorises a departure from the ordinary mode of surveying the public land on any river, lake, or bayou, whenever, in the opinion of the President of the United States, the public interest would be promoted thereby so as to survey such lands in tracts of two acres in width, fronting on such river, lake, or bayou, and running back to the depth of forty acres. But as no general rules could be framed to govern all such surveys, this branch of the service is left to be provided for in *Special Instructions*, as cases thereof may occur.

15. Should you find a manifest error in the measurement of any township line within, or bounding your district, (which will be readily detected by the closing of your lines thereon,) you are to correct such error, by remeasuring such township line, from where the error is found, to the north or west end thereof. The section and quarter-section corners thereon are to be removed to the proper distances and there established; and the marks and numbers at the cancelled corners are to be cut out or effaced, and the distances at which you pass those corners must be noted by you. Of such remeasurement and corrections you are to take full and complete Field Notes, in a separate book, to be returned to the Surveyor General's Office, with the Field Notes of your subdivisions. For such corrections, however, the Surveyor General is not authorized to make any compensation.

OF MEANDERING RIVERS, &c.

1. You will accurately meander, by course and distance, all navigable Rivers which may bound or pass through your

district; all navigable bayous flowing from or into such rivers; all Lakes or deep Ponds, of sufficient magnitude to justify such expense; and all Islands suitable for cultivation. At all those points where the township or section lines intersect the banks of such rivers, bayous, lakes or islands, posts are to be established, as before directed. In meadering, you are to intersect all these posts, closing at each post the course and distance on which it is intersected. You will likewise notice all streams of water falling into the river, lake, or bayou, which you are surveying, with their width at their mouth; all springs, noting the size thereof, and whether pure or mineral water; the head and mouth of all bayous, all rapids, falls, or cascades; all islands and bars, with intersections to their upper and lower points, to establish their exact situation. This must be done with the greatest accuracy, in relation to all islands which you shall meander, so as to determine and shew their precise location and bearing on the maps of the surveys.

2. Should any lake or pond which you shall meander, be situated within any one section, so as not to be intersected by any of the lines thereof, you will run and measure a line very exactly, but without marking, from one of the corners, or one of the half mile posts, or other given point on one of the lines of said section, to the point on the margin of the lake at which you shall commence the meanders thereof. The true location of such lakes is necessary, in order to calculate the contents of the subdivisions of such sections.

3. The width of streams of water and bayous binding on, or forming a boundary of your surveys, must be ascertained at every intersection of your lines therewith, by trigonometrical process, or otherwise; which can generally be most conveniently done in taking the meanders. This is necessary for the correct exhibition of such streams on the township plats.

4. Except in cases where navigable streams constitute the boundary line between two series or systems of surveys commencing from different standard lines, such streams are not to interrupt the regular survey of the townships through which it passes, the lines of which shall be continued across those streams to the complete measure. And where the surveys have been closed on a stream, as a boundary of a cession, or from other cause, and are afterward to be continued across such stream, the surveyor continuing the surveys on the opposite side, must extend the lines across the stream so as to make the sections thereon complete.

5. To establish a uniform and simple mode of designating and distinguishing the two sides of navigable streams, the terms "Right bank," or "Left bank," will be used, in all

cases, thus:—suppose yourself standing at the head of the river, looking down stream; then that bank of the stream on your right hand is to be called and referred to in your Field Notes, as the "Right bank," and that on your left hand as the "Left bank."—And these terms, thus applied to navigable rivers, are to be used in all cases, whether in running lines or taking meanders.

6. Great care must be taken to describe clearly the post at which any meanders of a river, bayou, lake, or island commence; and also all the posts, on township or section lines, which may be intersected in the progress of the meanders.

7. The Field Notes of meanders are to be written at the end of the subdivisions. The courses are to be inserted in a column on the left of the page; the distances, in chains and links, in a column next to this, and the notes or remarks on the right, opposite the proper course and distance. The column of "distances" must be added up at the foot thereof, on each page.

8. Errors in meandering are of very frequent occurrence, arising principally, it is believed, from bad chaining. Your special attention is called to the manner in which this part of the work is executed; and all possible accuracy is enjoined, both in the courses and measurement, and the entry thereof in your field book.

OF PRIVATE CLAIMS, INDIAN RESERVATIONS, &c.

1. In surveying Private Claims, Indian Reservations, or other tracts not conforming to section lines, the location thereof must be particularly described, and the place of beginning clearly stated in your Field Notes; also the name of the claimant in whose right the survey is made, with the number by which it is known; and if a reservation, the quantity contained in it, and the name of the reservee. The Field Notes of all the lines of each tract must be complete, and are to be entered in the Field Book separately from the notes of other tracts. The Field Notes of Private Claims and Indian Reservations, must be entered in separate books.

2. Wherever a section or township line intersects a line of a private claim, or Indian reservation, there a corner must be established. The particular line intersected, with its course, and the name of the claimant or reservee, with the number or other designation by which it is known, must be noted. And from such intersection, the private claim or reserve line must be carefully measured, each way along said line, to the

end thereof, unless it should be intersected by another section or township line before the end be reached.

3. The course of every line of the survey of a private claim or Indian reservation, with the length thereof, and the variation of the compass, and date of the survey, are to be inserted in the Field Notes, which are to be certified and signed by you.

OF FIELD NOTES.

1. The field books are all to be made of one uniform size, viz: foolscap octavo; or a sheet of common sized cap paper, folded into sixteen pages. The paper must be of good quality, and the books covered with morocco or other leather, and neatly stitched and trimmed, and containing space enough for all the field notes of a township. The pages are to be ruled with red ink, and feint lined.

2. On the first page of your field book of each township, insert in a plain and neat manner, by way of title, the number of the township and range, with the state or territory in which it lies, and by whom surveyed, with the date of the commencement, and the date of completing the subdivision of the same.

3. On the fourth page, draw a plan or diagram of the township, on a scale of one mile to an inch. On this diagram you will accurately delineate, as near as may be practicable by ocular observation on the spot, as you progress with the work, the crossing and courses of all streams of water, the intersection, situation, and boundaries of all prairies, marshes, swamps, lakes, and all other things mentioned in your field notes, the situation of which can be conveniently shewn on the diagram. You will also insert thereon, in small figures, the length of the section lines closing out to the north and west boundaries of the township.

4. At the head of each subsequent page, on which the field notes are written, you will insert a running title, designating the number of the township and range, which is to be separated from the field notes by a double red line.

5. The *Field Notes* of the surveys furnish primarily, the materials from which the plats and calculations of the public lands are made; and the source from whence the description and evidence of the location and boundaries of those surveys are drawn and perpetuated. It is evidently, then, of the utmost importance that the Field Notes should be, at once, an accurate, clear and minute record of every thing that is done by the Surveyor and his assistants, (in accordance with these

Instructions,) in relation to the running, measuring and marking lines, establishing corners, &c. as well as a full and complete topographical description of the country surveyed, as it regards every thing which may afford useful information, or gratify public curiosity.

6. For this purpose you are to enter in your Field Book, in a neat and distinct manner, notes or minutes of the following objects:—

1. The description, course and length of every line which you shall have run.
2. The name, and estimated diameters of all corner and bearing trees, and the courses and distance of the bearing trees from their respective corners.
3. The description of all mounds which you shall erect as corners in prairies, or places where there shall be no trees convenient for bearings.
4. The names and estimated diameters of all those trees which fall in your lines, called *station or line trees,* with their exact distances on the line.
5. The face of the country, whether level, rolling, broken, hilly, or mountainous.
6. The quality and character of the soil, and whether first, second, or third rate.
7. The several kinds of timber and undergrowth, with which the land may be covered, naming each kind of timber in the order in which it is most prevalent; and in prairie, the kind of grass or other herbage, which it produces.
8. All rivers, creeks and smaller streams of water, with their width, and the course they run where the lines of your survey intersect or cross them, and whether the current be rapid, sluggish, or otherwise.
9. All rapids, cataracts, cascades, or falls of water.
10. All springs of water, and whether fresh and pure, or mineral; shewing also on which side of the line situated, and the distance therefrom, and the course of the stream flowing from them.
11. All lakes and ponds, with the description of banks surrounding them, and whether the water be deep or shallow, pure or stagnant.
12. The meanders of all lakes, navigable rivers, bayous, islands and streams forming boundaries.
13. All prairies, swamps, and marshes.
14. All coal banks or beds, and peat or turf grounds.
15. All precipices, caves, stone quarries, and ledges of rock, with the kind of stone found in them.
16. All towns and villages, Indian towns and wigwams, houses or cabins, fields or other improvements, sugar-tree groves, and sugar camps.

17. All minerals and ores, with particular descriptions of the same, as to quality and extent.

18. All diggings for minerals, smelting or other furnaces, forges and factories.

19. The exact situation, and description of all mines, salt springs, salt licks and mill-seats, which you may discover, or that may come to your knowledge.

20. All fossils, petrifactions, and other natural curiosities, with descriptions thereof.

21. All travelled roads, and "trails," with their courses, and denoting the places from, or to which they lead.

22. The tracks of tornados or hurricanes, commonly called "windfall," or "fallen timber," shewing the direction of the wind, as indicated by the fallen trees.

23. All ancient works of art, as mounds, fortifications, embankments, ditches, or other similar objects.

24. All offsets, or methods of whatever kind, by which you shall obtain the measurement or distance on any line which cannot be actually measured.

25. The method and calculations by which you shall determine the variation of the compass, at each observation for that purpose.

7. In addition to the foregoing items, you will insert notes of any others as the occasions therefor may occur. The field notes are to be written out in your book, on the spot, as you proceed with the work. Nothing in your notes must be left to be supplied by memory.

8. Rivers, creeks, and smaller streams, lakes, swamps, prairies, hills, mountains, or other natural objects, are to be distinguished in your field notes by their received names only, where names have heretofore been given. To such you are not to give original names.

9. Beside the ordinary Field Notes taken on the lines, you will add at the end of your field book, such further description or information as you may be able to give, concerning any thing in the township, worthy of particular notice, or which you may judge necessary or useful to be known. And you will add also, a general notice or description of the township, in the aggregate, as it regards the face of the country, soil, timber, &c.

10. In your field book, the courses and distances must be placed in a column on the left hand side of the page, and your notes and remarks on the right. Each page is to contain the field notes of one section line only. The field notes of the subdivisions of each township and fractional township, are to be written in a separate field book. The field notes are to be written in a fair and legible hand; if otherwise, they must

be accompanied with true and fair copies. The *original* field notes must in all cases, be returned into the office of the Surveyor General.

11. The date of each day's work must be inserted at the close thereof, near the bottom of the page.

12. At the close of the original field notes of the subdivision of each township, and fractional township, the following certificate is to be written and signed by yourself, and also by your chainmen and marker:—

"I hereby certify, that in pursuance of a contract with Surveyor General of the United States, for the States of Ohio and Indiana, and the territory of Michigan, bearing date, the day of 18 , and in strict conformity to the laws of the United States and the Instructions of said Surveyor General, I have surveyed and subdivided into Sections, Township, *[or Fractional Township]* No. , in Range No. , in the State *[or Territory]* of . And I do further certify, that the foregoing are the true and *original* Feld Notes of the said Survey and subdivision, executed as aforesaid.

Certified this day of 18 .

A_____ B_____.
Deputy Surveyor.

C_____ D_____.
E_____ F_____. } Chainmen.
G_____. H_____. Marker."

13. A printed specimen of the Field Notes of the subdivision of a township into sections, accompanies these Instructions; which will serve to illustrate both the order and method of performing the surveys, and the most approved form of keeping the Field Notes; for which purposes, it is to be regarded as a part of these General Instructions.

14. Any material departure from these Instructions, or negligence in the observance thereof, will be considered as a violation of the conditions of your contract, and a forfeiture of all claim for payment. And loose, inaccurate, precipitate, or defective work, either as it respects the surveys in the field, or the notes and returns thereof on paper, *will not be admitted.*

Surveyor General.

To
Deputy Surveyor,
Surveyor General's Office,
Cincinnati.

XIX.

(This copy of General Instructions was made from an original volume now in the possession of the National Archives. Preceding the front cover is typewritten the following notation, "General Surveying Instructions to Deputy Surveyors in Illinois and Missouri Received with letter for U.S. Surveyor General dated January 9, 1834.)

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GENERAL INSTRUCTIONS TO DEPUTY SURVEYORS.

SURVEYOR'S OFFICE,

St. Louis, 183

[ILLINOIS AND MISSOURI]
[1834]

To

Deputy Surveyor.

SIR,

In the execution of surveys under the authority of this office, the following General Instructions have been prepared for the government of the Deputy Surveyors, and must be strictly adhered to in all cases not otherwise provided for by special instructions, which may be rendered necessary on account of any peculiar circumstances.

You will provide yourself with a compass of excellent quality and approved construction, having a *nonious division*, and moveable sights; also, with two two-pole chains, of 50 links (of equal length) each. One of said chains must be adjusted to the standard in this office, and by it you will compare and adjust that which is used, at least once in every two days, and note their difference, if

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any, your Field Book; and, if there is no difference, state in your Field Book the fact of your having compared and found them to agree. You must likewise be provided with a full set of tally rods, of iron or steel, or pointed therewith, and allow none others to be used but the precise number you shall have selected for that purpose.

Your chain-men, axe-men and flag-men, must be men of strict moral integrity; none must be employed, in whom *implicit* confidence cannot be reposed;—and you will be ever vigilant over their conduct.

Each of your Field Books will commence with a list of your chain-men, axe-men and flag-men then in your service, and intended to be employed in performing the surveys you are about to execute. The first book under your contract will contain an attested record of their oaths, and a statement of their compensation; and whenever you may employ any others, you will insert their names, together with their oaths and compensation, in your Field Book, before they are permitted to commence work. You will also, when a chain-man, axe-man or flag-man is dismissed, or quits work from any cause *whatever*, note it in your Field Book, together with the cause of his dismissal, or the reason for which he quits work, and refer thereto by a note in the front part of your book.

[Form of oath for Chain-men.]

I, A. B., do solemnly swear in the presence of Almighty God, that I will faithfully and impartially execute and fulfil the duties of a Chain Carrier; that I will level the chain, and plumb the pins, so as to obtain the true horizontal distance; and that I will make a true report of the

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length of all the lines that I may assist in measuring, to the best of my abilities, so help me God A. B.
Sworn to and subscribed,
before the undersigned,
this day of 183
C. D. *Deputy Surveyor.*

[Form of oath for Flag-men and Axe-men.]

I, E. F., do solemnly swear in the presence of Almighty God, that I will faithfully and truly perform the duties of a flag-man (or axe-man, as the case may require) to the best of my abilities, so help me God E. F.
Sworn to and subscribed
before the undersigned,
this day of 183
C. D. *Deputy Surveyor.*

All lines must be run with the assistance of a flag or fore vane-man; and Township boundary lines, with the compass adjusted to the true meridian, unless otherwise instructed by this office.

If by reason of mineral attraction, or any other cause whatever, any line or lines cannot be accurately surveyed with the use of the needle, other means must be adopted, so as to ensure the correct execution of the work; and the manner of operating must be carefully noted in the Field Book.

All trees which your lines (except random lines) strike, must be noted in your Field Book, and have two notches cut on each side thereof in the direction of the line; but no other spot or blaze, whatever, is to be made thereon.

All trees on each side of the lines, and near thereto, (except random lines) must be marked

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with two spots or blazes, diagonally or quartering towards the line. Range lines (N. & S. Township boundary lines) will be run North, and corners for Sections and quarter Sections will be established thereon at every half mile, and mile, for the Sections and quarter Sections to the West, and not for those to the East of the line, except at Township corners. East and West standard lines will be run East or West, as the case may require, and corners established thereon for the quarter Sections, Sections, and Townships, North of the line, and not for those to the South of it. East and West fractional Township lines, which close to a boundary line of this Surveying District, or to an Indian or State boundary will be run East or West, as may be required; and quarter Section and Section corners will be established thereon for the quarter Sections and Sections to the North of the line, and not for those South of it.

All other E. & W. Township lines will be run West on randoms, and corrected East from Township corner to Township corner; and the excess or deficiency must be added to, or deducted from, the South boundary of Section 31, West of the quarter Section corner.

Sub-division lines of a Township will be run with the compass adjusted to the East boundary thereof; but the true variation of the needle must be determined so as to shew the difference (if any) between the said true variation and the variation at which the surveys are executed.

Section, fractional Section, and Township corners, will be perpetuated by planting a post at the place of the corner, of the most durable wood that can be had in the vicinity thereof. The posts must be set in the earth by digging a hole

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to admit them two feet deep, and be very securely rammed in

with earth, and also with stone, if convenient—the Township corner posts must be at least 5, and the Section and fractional Section corner posts 4 inches diameter; they must be neatly squared off at top, and placed so, that the corners will correspond to the cardinal points. The posts at the corners of Sections in the interior of a Township must indicate, by a number of notches on each of the four corners directed to the cardinal points, the number of miles that it stands from the outlines of the Township; the four sides of the post will be numbered to correspond to the number of the Section they respectively face. If, however, a tree is at the place of any corner, it will be notched as aforesaid, and answer for the corner in lieu of a post.

Section corner posts on Range and Township lines, will indicate, by a number of notches on two corners directed to the proper cardinal points, the number of miles it stands from the nearest Township corner; and two sides of said posts will be numbered to correspond to the number of the Section they face.

Corner posts at Township corners, will have 6 notches on each of the four corners, directed to the cardinal points, and each of the four sides thereof will be numbered to correspond to the number of the Section they face.—Or in lieu of posts, you may insert endways into the ground, to the depth of 7 or 8 inches, a stone, which shall be not less than 12 inches wide, 14 inches long, and 3 inches thick.

You will ascertain and state in your field notes, the course and distance from the several Section and Township corner posts, trees and stones, to a tree in each Section for which they stand as

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a corner; each of said trees you will mark with a notch and blaze facing the post; the notch to be at the lower end of the blaze; and on the blaze, which must be neatly made, you will mark, with a marking iron, in a plain, distinct and permanent manner, the letter S., with the number of the Section, and over it the letter T., with the number of the Township; and above this, the letter R., with the number of the Range. And in all cases where there is no tree in any Section within a reasonable distance of a corner, on which to mark the number of Section, Township and Range, that fact must be stated in your field notes.

Township corners in a prairie, or other situation, where bearing or witness trees are not at hand, will be perpetuated by depositing in the ground, and at least 3 inches beneath the natural surface thereof, a portion of charcoal (the quantity to be specified in your field notes,) not less than two quarts, at the place of such corners, over which you will erect a mound of earth, three feet high, five feet square at the base, and two feet square at top; the sides whereof must be reveted or faced with sods laid horizontally and in successive layers on each other; each of said layers having an offset inwards, corresponding to the general slope of the face of the mound; and in the mound you will insert a post of the dimensions and marked as before directed; or you may deposite at the place of the corner, three stones, not less than five inches square, by three inches thick, all of which you will particularly describe in your field notes—the top of the uppermost stone to be three inches below the natural surface of the ground, and the other two succesively and immediately beneath the first—and over said stones you will

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erect a mound similar to that directed to be made over the deposited charcoal—or, in lieu of charcoal or stone, to be deposited as before stated, you may perpetuate the corner by inserting endways into the ground, and to the depth of 7 or 8 inches, a stone, which shall not be less than 12 inches wide, 14 inches long, and 3 inches thick; over which no mound need be erected; but the kind of stone used, together with its shape and dimensions, and the manner in which it is set, must be particularly described in your field notes.

If a Township corner, where bearing or witness trees are not to be found within a reasonable distance therefrom, shall fall within a ravine, or in any other situation where the nature of the ground or the circumstances of its locality shall be such as may prevent, or prove unfavorable to the erection of a mound, you will perpetuate such corner by selecting, in the immediate vicinity thereof, a suitable plot of ground as a site for a bearing or witness mound, and erect thereon a mound of earth in the same manner, & conditioned in every respect, with charcoal or stone deposited beneath, as before described for a Township corner; and measure, and state in your field notes, the distance and course from the position of the true corner of the bearing or witness mound so placed and erected.

Section corners in a prairie or other situation where bearing or witness trees cannot be had, will be perpetuated in the manner before directed for a Township corner, except that, where mounds are made they will be only two feet six inches high, by four feet square at the base, and two feet square at the top.

Quarter-Section corners will be perpetuated by a post (of durable wood) 3 inches diameter,

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placed in the ground and marked 1-4 S., from which you will state in your field notes the course and distance to two of the most suitable trees in two different quarter-Sections for which you are establishing the corner; which two trees you will mark with a blaze and notch facing the post; and on the blaze above the notch you will mark 1-4 S., with a marking iron. And where bearing or witness trees are not at hand, you will perpetuate quarter-Section corners by erecting a mound, beneath which no deposite need be made—the mound, to be of similar construction to those for Section and Township corners, except, that they will be only two feet high, three feet six inches square at the base, and 1 foot 6 inches square at top.

Whenever your course may be obstructed by insuperable obstacles, such as ponds, swamps, marshes, lakes, rivers, creeks, &c., you will prolong the line across such obstacles by taking the necessary right angled off-setts; or, if this is inconvenient, by a traverse or trigonometrical operation, until you regain the line on the opposite side; and in case a north and south, or a true east and west line is regained in advance of any obstacle, you will prolong and mark the line back to the obstacle so passed, and state all the particulars in relation

thereto in your field notes; and at the intersection of lines, with both margins of impassable obstacles, you will establish a witness point (for the purpose of perpetuating the intersections therewith,) by setting a post, and giving in your field notes the course and distance therefrom to two trees on opposite sides of the line, each of which trees you will mark with a blaze and notch facing the post, except on the margins of navigable water courses or navigable lakes; in

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these cases you will mark the trees with the proper number of the fractional Section, Township and Range.

The Townships are to be laid off as nearly six miles square as practicable, by lines running from south to north 6 miles, and the corresponding corners joined by lines running easterly and westerly; and they will be subdivided into 36 Sections, containing, as nearly as may be, 640 acres each. The Sections to be numbered by beginning with No. 1, in the north-east corner of the Township, and going west and east, alternately, through the Township, with progressive numbers ending with 36, which will be in the south-east corner thereof.

The courses of all navigable rivers which may bound or pass through your district, must be accurately surveyed, and their width taken at those points where they may be intersected by Section or Township lines. Those navigable rivers which may pass through your district, must be surveyed on each side. You will also meander all lakes or ponds of sufficient magnitude to justify such expense. In meandering, you will state particularly in your field notes, at what corner you commence the meanders of each fractional Section, and also the corner to which you close. You will likewise state on which side of the river you are meandering, whether on the right or left bank, (going downwards,) and, also whether on the *East, West, North, South, North-East, North, West, South-East or South-West* side of the river, or other water course, through or adjoining your district.

Any excess or deficiency in the length of any Township boundary line, or excess of error in the falling off from the corner to which any clos-

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ing Township line shall be run, that may exceed five chains; or any excess or deficiency exceeding one chain in the length of any Section line, or excess of error in the falling off from the corner to which any Section line shall be run, that shall exceed one chain in closing the lines of a whole Section; and at the same rate for the Section lines, and at the rate of one chain and fifty links per mile of the meanders, in closing the meanders of a navigable river or other water course with the line or lines of a fractional Section, must be corrected by you and reduced within those limits, before leaving the ground, by re-surveying the line or lines which may have occasioned the excess or deficiency in the length of such Township or Section line, or excess of error in closing the lines of a Township, or of a whole or fractional Section. All notes of corrections and re-surveys, must be entered *as such* in the proper place of the Field Book, according to the order in which they may be executed; and the former and erroneous survey must be referred to in the said entries. Also, in the margin of the pages containing erroneous surveys, that fact must be stated, and the page on which the notes of the re-survey or correction are entered, must also be referred to.

In subdividing Townships you will commence at the corner to Sections 35 and 36 on the south boundary of the Township, (one mile west of the south-east corner thereof,) and move on in continued progression from east to west, and from south to north, in order that the excess or deficiency of the Township, as to complete Sections, may be added to, or deducted from, the northern and western Ranges of quarter Sections.

Each north and south Section line must be

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made one mile in measure by the chain, except those which close to the north boundary of the Township, so that the excess or deficiency will be thrown in the northern Range of quarter Sections, viz:—In running north between Sections 1 and 2, at 40.00 chains, establish the quarter Section corner, and note the distance at which you intersect the north boundary of the Township; and also, the distance you fall east or west of the corresponding Section corner for the Township to the north; and, at said intersection, establish a corner for the Sections between which you are surveying.

The east and west Section lines, except those in the west Range of Sections and those which cross navigable water courses, will be run from the proper Section corners, east on random lines, (without blazing,) for the corresponding Section corners. Temporary quarter Section corner posts will be set at 40.00 chains, and the distance at which you intersect the Range or Section line, and your falling north or south of the corner run for, will be noted in your Field Book; from which corner you will correct the line west by means of off-sets from stakes, or some other marks set up or made on the random at convenient distances, and remove the temporary quarter Section post, and place it and establish the corner on the true line, equidistant, or at the average distance between the proper Section corners. If, however, you strike the corner run for, you have only to blaze the line back, and establish the quarter Section corner at the average distance.

The east and west lines, in the west Range of Sections, will be run west on true lines; the quarter Section corner will be established at 40.00 chains; the corners for the proper Sections will

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be established at the intersection with the Range line, and the distance which it intersects north or south of the corresponding Section corner west of the line, will be noted in the Field Book.

Whenever an east and west Section line, other than those in the west Range of Sections, crosses a navigable river, or other water course, you will not run a random line and correct it as in ordinary cases where there is no obstruction of the kind, but you will run east and west on a true line, (at right angles to the adjacent north and south lines,) from the proper Section corners, to the said river or other navigable water, and make an accurate connection between the corners established on the opposite banks thereof; and if the error, neither

in the length of the line, nor in the falling north and south of each other of the fractional corners on the opposite banks, exceed the limits before specified in these instructions for the closing of a whole Section, you will proceed with your operations. If, however, the error exceeds those limits, you will state the amount thereof in your field notes, and proceed forthwith to ascertain which line or lines may have occasioned the excess of error, and reduce it within the proper bounds, by re-surveying or correcting the line or lines so ascertained to be erroneous; and note in your Field Book the whole of your operations in determining what line was erroneous, and the correction thereof.

If, by reason of bends in a river, or other navigable water course, the whole of any East and West Section line would not be surveyed, if the parts which are run East and West respectively were to terminate at their first intersection with the said river or other navigable water course, that part of the line, which, by being prolonged,

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would give the survey the best form, must be continued to its last intersection with the said river or other navigable water; and from said last intersection of the line so continued, you will make the connection with the corresponding corner on the opposite bank, and if it is found that the error exceeds the limits before specified for the closing of a whole Section, you will make the required correction in the manner before pointed out in these instructions.

All rivers, creeks, springs and smaller streams of water, with their width and the course they run in crossing the lines of surveys, and whether navigable, rapid or otherwise; also, all swamps, ponds, stone quarries, coal beds, peat or turf grounds, mounds, precipices, caves, rapids, cascades or falls of water, minerals, ores, salt springs, salt licks and fossils, prairies, hills and mountains, towns, villages and settlements, forges, factories and cotton gins; also, all uncommon, natural or artificial productions, which may come to your knowledge, are to be particularly regarded and noted in your Field Book. You will likewise note when the lines enter and when they leave creek or river bottom.

At the end of every half mile, in running Section or Township lines, and at the end of the meanders of each fractional Section, you will give a particular description of the face of the country, whether level, hilly or mountainous; of the quality or rate of the soil, and whether it is fit or unfit for cultivation; and, particularly, whether the bottom land is liable to inundation or not; and, if it shall be liable to inundation, state, also, to what depth, so far as that circumstance may come to your knowledge, whether from observation of the water marks upon the trees, or any other

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source of information; and note the kinds and quality of timber and undergrowth, naming the different sorts in the order which they predominate.—The description of each half mile must be full, and not refer to any previous description. The names of all bearing or witness trees, and station or line trees, must be written out in full, and not abbreviated; nor must any word which relates to the course or length of a line, or any object noted thereon, or in the establishment of a corner, be abbreviated, except in stating the courses to the witness trees from the corners, the course of meanders, and the bearing or direction of small streams, mountains &c., when they are not to the cardinal points; in these cases, the capital letters N. S. E. & W., plainly and distinctly made, will be used.

The plots or sketches which you are to return, will exhibit, as accurately as practicable, from careful occular observation (in addition to the measurements on the line) to be made by you and noted in your Field Book, the true situation of all objects noted; including the courses and connections of all rivers and other water courses, and travelled roads or tracks, denoting the principal places to which they lead, and the enchainment and direction of remarkable hills or mountains.

Your Field Books for your original notes will be of such a size as you may deem most convenient; they will be of the best quality of foolscap paper; and the original field notes, which are to be returned to this office, together with a fair and correct copy thereof, must be kept in a plain and intelligible manner, according to the form hereafter prescribed in these instructions. Every entry must be so specific as not to admit of a doubt

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as to what is intended thereby, or a possibility of a misconstruction of your meaning. The said notes must be entered in the same order, from day to day, as the work is executed on the ground, including all re-surveys and corrections, and the date must follow each day's work.

Although your lines are to be measured with a chain of two poles, you are to keep your reckonings in chains of four poles, or one hundred links each; and all entries in your Field Book, and all plans and calculations are to be made according to the decimal measure of a chain.

The courses and distances on your lines must be placed in the margin of your Field Book, on the left hand, (for which purpose it should be large,) and your remarks on the right.

The Field Books in which you copy your notes, will be according to a form to be prescribed by this office.

In all measurements, the level or horizontal length is to be taken, and not that which arises from measuring over the surface of the ground, when it happens to be uneven or hilly.

Your Field Books, containing your original notes, will be signed by each of your chain-men, axe-men and flag-men, and they and the copies thereof, will be certified by yourself, according to a form to be prescribed by this office, in conformity with the requirements of your contract and instructions. The certificate to each book will state as many of the following facts as are applicable to the notes of the surveys contained therein, viz:—That all the witness trees to Township and Section corners, were marked with a blaze and notch facing the several corner posts; that the notch on each tree was at the lower end of the blaze; that the blaze was neatly made; and that

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there was marked, in a plain, distinct, and permanent manner, with a marking iron, on the blaze of each witness tree,

and above the notch, the letter S., with the number of the Section; and over it the letter T., with the number of the Township; and over this, the letter R., with the number of the Range, in which the said trees respectively stand. That all the Section and Township corner posts were inserted two feet into a hole dug in the ground, and that they were securely rammed in with earth, and also with stone, when convenient; that the said posts were of the most durable wood that could be had in the vicinity; that the Township corner posts were 5, and the Section corner posts 4 inches diameter; that they were neatly squared at top and placed with the corners to the cardinal points, and that the several sides were marked with the number of the Section which they faced; also, that the corners of Township corner posts were marked with 6 notches each; that two of the corners of Section corner posts on Township boundary lines, were marked with as many notches facing the proper cardinal points as said posts are miles from the nearest Township corners; and that the corners of the Section posts, in the interior of a Township, were marked with as many notches as the posts stand miles from the Township boundaries; that the witness trees to quarter Section corners were marked with a blaze and notch facing the post; and that 1-4 S. was marked on the blaze above the notch; and also, that 1-4 S. was marked on each corner post, and that the posts were at least 3 inches diameter and placed firmly in the ground. That the mounds were reveted or faced with sod, laid horizontally and in successive layers on each other, each layer having an

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offset inwards, corresponding to the general slope of the face of the mound; and that the mounds at Township corners were 5 feet square at the base, 2 feet square at top, and 3 feet high; that the mounds at Section corners were 4 feet square at the base, 2 feet square at the top, and 2 feet 6 inches high; and that the mounds at quarter Section corners, were 3 feet 6 inches square at the base, 1 foot 6 inches square at the top, and 2 feet high.

[Form of keeping field notes of exterior boundary lines of Townships, viz:]

Suppose the line to be surveyed, is the East boundary of Township 21 North, Range 6 East of the 4th principal meridian, and that the corner to Sections 1, 6, 31 & 36, of Townships 20 & 20, 21 & 1 North, Ranges 6 & 7 East, had been established by another surveyor, and that you was furnished with a description thereof from this office. You will commence your field notes as follows, viz:

If first book, oaths of chain-men, axe-men and flag-men, and a statement of their compensation.

A. B., *hind chain-man,*
C. D., *fore chain-man,*
E. F., *flag-man,*
G. H., *axe-man,*
each at a compensation of twenty dollars per month.

Measuring chain compared with the standard chain and found to be of the right length.

Took the variation of the needle last night, (27th of September, 1832,) about 5 chains South West of the corner to Townships 20 & 20, 21 & 21 North, Ranges 6 & 7 East of the 4th principal meridian, and found it to be 8′ 20 min. East—I therefore adjust my compass to that va-

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riation, and commence at the corner to Sections 1, 6, 31 & 36, of Townships 20 & 20, 21 & 21 North, of Ranges 6 & 7 East of the 4th principal meridian, which agrees with the description furnished me by the Surveyor's Office, viz:—A post, from which a white oak, 6 inches diameter, bears S. 67′ East, 372 links; a hickory, 14 inches diameter, bears North 25′ East, 13 links; and a white oak, 13 inches diameter, (stated to be 11 in the description furnished me) bears North 62′ West, 135 links. The other witness tree (an ash, 16 inches diameter) has fallen down; I therefore mark, with the proper number of Section, Township and Range, a black walnut, 24 inches diameter, which bears South 83′ West, 127 links distant, and run from said Township corner

North Chains	Along the east boundary of Section 36, Township 21, north of the base line, Range 6 east of the 4th principal meridian.
14.70	A brook, 25 links wide, with a rapid current, runs south westerly about 10 chains, then turns to the N. W.
27.60	Left the creek bottom, and entered hills.
29.40	A white oak, 15 inches diameter.
33.70	A hickory, 24 inches diameter.
40.00	Set a quarter Section corner post on the top of a ridge, bearing north easterly and south westerly; from which post, a white oak, 24 inches diameter, bears S 28′ W. 197 links, and a poplar, 18 inches diameter, bears N. 56′ W., 14 links distant. The S. 27.60 chains, level, creek bottom; subject to occasional inundation of about 4 feet, as appears from the water marks

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Chains	on the trees. The soil is good and fit for cultivation; timber, walnut, cherry and white oak; undergrowth, pawpaw and spice. The remainder of the line is too hilly and broken for cultivation, although the soil is good. Timber, hickory, white oak and walnut; undergrowth, redbud and dogwood.
49.07	A white oak, 8 inches diameter.
64.08	A walnut, 36 inches diameter.
80.00	Set a post, corner to Sections 25 and 36, Township 21 north, Range 6 East of the 4th principal meridian, from which a hickory, 17 inches diameter, bears South 57′ West, 127 links; and a white oak, 13 inches diameter, bears North 23′ West, 72 links distant. Land, too hilly and broken for cultivation, although the soil is rich; timber, hickory, white oak and walnut; undergrowth, pawpaw and spice.
North Chains	Along the East boundary of Section 25, Township 21 North, Range 6 East of the 4th principal meridian.
13.80	Left the hills, and entered river bottom.
14.90	A burr oak, 36 inches diameter.
40.00	Set a quarter-Section corner post, from which an elm, 13 inches diameter, bears North 85′ West, 18 links, and a pin oak, 12 inches diameter, bears South 74′ West, 39 links distant. The South 13.80 chains, rolling land; the remainder, river bottom. The soil on the half mile, is rich and fit for cultivation; imber white oak, poplar and hickory; undergrowth, sassafrass and dogwood.
49.50	An impassable swamp. Set a post, from

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Chains

which a hickory, 12 inches diameter, bears South 76′ West, 18 links; and a white oak, 13 inches diameter, bears South 85′ East, 14 links. This swamp lies mostly West of the line; it extends in a South Westerly direction about 25.00 chains. Offset around said swamp, as follows, viz:

East 4.50 chains,
North 7.60 chains,
East 6.70 chains,
North 8.50 chains,
West 7.50 chains,
North 3.20 chains,
West 3.70 chains—regained the line on the East boundary of Section 25, Township 21 North, Range 6 East, in advance of the swamp; I therefore run South 3.72 chains and intersected the North-west margin of the swamp, where set a post, from which an ash, 12 inches diameter, bears North 17′ West, 18 links, and an elm, 13 inches diameter, bears North 12′ East, 45 links distant. Thence continued the line North, along the East boundary of Section 25, Township 21 North, Range 6 East; counting the distances from the corner of Sections 25 & 36; the distance across the swamp, on the line, being 15.58 chains.

72.54 A white oak, 18 inches diameter.

80.00 Set a post, corner to Sections 24 & 25, Township 21 North, Range 6 East, from which a white oak, 18 inches diameter, bears South 18° West, 32 links; and a gum, 24 inches diameter, bears North

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Chains

27° West, 34 links distant. Except the swamp, the land is low, wet bottom, unfit for cultivation; generally subject to overflow from 7 to 10 feet, as appears by the water marks on the trees; and, as I am informed by H_____ J_____, who lives in the vicinity thereof. Timber, gum, swamp maple and pin oak; no undergrowth. The swamp is covered with bushes of various sorts.

September 28, 1832.

Proceed in a similar manner along the East boundary of Sections 24, 13 & 12; then along the East boundary of Section 1, as follows, viz:

North Chains

Along the East boundary of Section 1, Township 21 North, Range 6 East of the 4th pricipal meridian.

17.52 A road between Holmin's Ferry to the South West, and Princeton to the North East.

18.76 A white oak, 16 inches diameter.

19.75 A creek, generally called White Water, but by some Crooked Creek, 200 links wide, runs North East—gentle current, not navigable. This creek is crossed by the road, noted above, at about 5 chains to the South West.

32.50 A hickory, 15 inches diameter.

33.00 Left the timber and entered Prairie—bears South East and North West.

40.00 Raised a mound, in which set a post for quarter Section corner. The timbered land is gently rolling; the soil is good, and fit for cultivation. Timber, white oak, hickory and walnut; undergrowth, dogwood and sumach. The prairie is

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Chains

level; soil rich and fit for cultivation.

59.32 Left the prairie and entered timber—bears North East and South West.

63.73 A white walnut, 16 inches diameter.

80.00 Set a post, corner to Sections 1, 6, 31 & 36, of Townships 21 & 21, 22 & 22 North, Ranges 6 & 7 East of the 4th principal meridian, from which a hickory, 17 inches diameter, bears South 56° East, 18 links; a white oak, 24 inches diameter, bears North 77° East, 36 links; a white oak, 14 inches diameter, bears North 27 1-2° West, 35 links; and a black walnut, 24 inches diameter, bears South 75° West, 137 links distant.—Land, moderately rolling; soil, good and fit for cultivation; timber, white oak, black oak, hickory and walnut; undergrowth, sassafrass and hazel.

September 29, 1832.

Suppose that the corner to Townships 21 & 21, 22 & 22 North, of Ranges 5 & 6 East, had been established; you would then proceed as follows:

Chain compared with the standard chain and found to be correct.

West Chains

On a random line along the South boundary of Section 36, Township 22 North, Range 6 East of the 4th principal meridian.

40.00 Set a temporary quarter-Section corner post.

80.00 Set a post for temporary corner to Sections 35 & 36, Township 22 North, Range 6 East.

West

On a random line, along the South boundary of Section 35, Township 22 North,

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Chains

Range 6 East of the 4th principal meridian.

21.00 A remarkably fine spring, about 30 links to the North, runs North-easterly.

40.00 Set a temporary quarter-Section corner post.

69.00 A quarry of excellent lime stone.

80.00 Set a post for temporary corner to Sections 34 & 35, Township 22 North, Range 6 East.

September 30, 1832.

Continue in this manner along the south boundary of Sections 34, 33 & 32, and then run

West Chains

On a random line, along the South boundary of Section 31, Township 22 North, Range 6 east of the 4th principal meridian.

00.57 The South-east bank of a navigable lake, which lies mostly to the north of the line, it being about 2 miles in a north-eastern direction to the northern end thereof; I therefore off-set around the south end, as follows, viz:

South 10.00 chains.
West 15.00 chains.
South 11.00 chains.
West 12.00 chains.
North 21.00 chains, regained the random line along the south boundary of Section 31, in advance of the lake, and continue west, counting the distances from the temporary corner post to Sections 31 and 32.

40.00 Set a temporary quarter-Section corner post.

64.00 A coal bed, in the west bank of Bear Grass creek, which runs South

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Chains

82.75 Intersected the Range line 326 links south of the corner to Sections 1, 6, 31 and 36, of Townships 21 and 21, 22 and 22 north, Ranges 5 and 6 east.

Then, from said township corner, run

East Chains

On a true line along the s outh boundary of Section 31, Township 22 north, Range 6 east of the 4th principal meridian.

00.32 A branch, 7 links wide, runs south-east.

17.50 A white oak, 18 inches diameter.

18.00 Bear Grass creek runs south.

33.75 A hickory, 12 inches diameter.

42.75 Set a quarter-Section corner post, on the true line, from which a persimmon, 12 inches diameter, bears N. 26° W., 163 links, and a white oak, 24 inches diameter, bears N. 42° E., 18 links distant.
Land, rolling; soil, good and fit for cultivation; timber, white oak, black oak and hickory; undergrowth, pawpaw and spice.
57.60 Intersected the north-west bank of the navigable lake, (noted on the random line,) where set a post, corner to fractional Sections 6 & 31, of Townships 21 and 22 north, Range 6 east, from which post a hackberry, 18 inches diameter, bears N. 23° W., 18 links; and a white oak, 15 inches diameter, bears S. 65° W. 8 links.
Thence offset around the lake as follows, viz:
West 4.00 chains with the marked line on the south boundary of Section 31.
South 16.00
East 28.00

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Chains North 15.82 chains, regained the true line on the South boundary of Section 31, 25 links East of the south-east margin of the lake; I therefore blazed the line back, West 25 links to the south-east bank of the lake, where set a post for corner to fractional Sections 6 and 31, Townships 21 and 22 North, Range 6 East, 81.35 chains east of the corner to Townships 21 and 21, 22 and 22 North, Ranges 5 and 6 East. From said post, a hickory, 12 inches diameter, bears North 23° E., 13 links, and an elm, 14 inches diameter, bears South 27° East, 54 links distant.
Then continue the line east along the south boundary of Section 31, counting the distancesfrom the Township corner.
81.90 A burr oak, 48 inches diameter.
82.75 Set a post on the true line for corner to Sections 31 and 32, Township 22 North, Range 6 East, from which a sycamore, 18 inches diameter, bears North 25° East, 32 links; and a white oak, 18 inches diameter, bears North 28° West, 13 links distant. Land, level and wet; soil, poor, not fit for cultivation; timber, white oak, burr oak and sycamore.

31st of September, 1832.

Continue in this manner along the south boundaries of Sections 32, 33, 34 and 35, and then run
East Chains On a true line along the south boundary of Section 36, Township 22 North, Range 6 East of the 4th principal meridian.
14.50 Entered a field of about 40 acres, bear-

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Chains ing north-east and south-west: it lies mostly south of the line.
20.17 A spring branch runs south-east, and empties into a creek in about 10 chains. The spring is about 5 chains in a north-western direction, and is outside of the field.
30.00 Left the field, bearing north-east and south west.
33.09 A white oak, 28 inches diameter.
40.00 Set a post for quarter-Section corner on the true line, from which a hickory, 17 inches diameter, bears North 18° West, 14 links; and a white oak, 15 inches diameter, bears North 27° East, 42 links distant.
Land, rolling; soil, good and fit for cultivation; timber, white oak, hickory and black oak; undergrowth, hazel and vines.
42.10 A creek, 50 links wide, runs North 80° East;—the current is rapid. About 5 chains up stream, in a south-westerly direction, is a mill seat, there being rock on both banks, and a fall of about 50 feet in 20.00 chains.
47.20 Diggings for lead, called New Design.
59.60 A smelting furnace, owned by J_____ H_____
75.82 A wagon road, leading from Kingston and Holmes' Ferry to Galena, bears north-west and south-east.
80.00 The corner to Townships 21 and 21, 22 and 22 North, Ranges 6 and 7 East.
Land, rolling; soil, good, and fit for cultivation; timber, hickory, walnut & white oak; undergrowth, briers and hazel.

1st of October, 1832.

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Chains Form of field notes in sub-dividing a Township (say Township 21 North, Range 6 East of the 4th principal meridian,) after the outlines shall have been surveyed.
A. B. Hind chain-man.
C. D. Fore chain-man.
E. F. Flag or fore vane-man.
G. H. Axe-man.
Measuring chain compared with the standard chain, and adjusted thereto, it having been found 1-4 of an inch too long. Last night (14th of April, 1833) about 20.00 chains north-west of the corner to Townships 20 and 20, 21 and 21 North, Ranges 6 & 7 East, I ascertained the variation of the needle, by polar observations, to be 8° 35′ min. east; I, therefore, adjust my compass at that variation; and, to determine the course of the east boundary of the Township, commence at the corner, to Townships 20 and 20, 21 and 21 North, Ranges 6 and 7 East, and run—Thence, North on a blank line; at 40.04 chains, fell 15 links West of the quarter Section corner; at 79.96 chains, fell 36 links West of the corner to Sections 25 and 36, Township 21 North, Range 6 East; then from said corner to Sections 25 and 36, run North (on a blank line,) 39.97 chains, fell 18 links West of the quarter-Section corner; 80.05 chains fell 37 links West of the corner to Sections 24 & 25.—Therefore, to run parallel to said East boundary of Township 21 North, Range 6 East, my compass must be adjusted to an assumed variation of 8° 20

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Chains min. East; which is 15 minutes less than the true variation. I adjust it to that assumed variation, (viz: 8° 20 min. East) and commence at the corner to Sections 35 and 36, on the South boundary of the Township, and run—Thence
North Chains Between Sections 35 and 36, Township 21 North, Range 6 East of the 4th principal meridian.
17.62 A sugar maple, 18 inches diameter.
27.60 A creek, called white oak creek, 40 links wide, gentle current, runs north-west.
40.00 Set a post for quarter-Section corner, from which a walnut, 20 inches diameter, bears South 16° East, 18 links; and a white oak, 18 inches diameter, bears North 23° West, 184 links.
40.32 Entered river bottom; bears E. and W.
47.60 The right bank of White River, a naviga-stream, at an eastern bend thereof, runs North easterly. Set a post, corner to fractional Sections 35 and 36, from which a white oak, 18 inches diameter, bears South 25° W., 18 links; and a hickory, 17 inches diameter, bears south 15° east, 39 links distant. The line will run down the river, and leave it again on the right side, without crossing over to the left; I, therefore, meander down stream on the right bank of said river, along fractional Section 36, from the before described corner of fractional Sections 35 and 36, as follows, viz:
North 27, East 16.00 chains.
North 14, East 4.00 chains.
North 3, West 2.00 chains.
North 39, West 12.93, chains, re-

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Chains gained the line between Sections 35 and 36, on the right bank of White River, where set a post, corner to fractional Sections 35 and 36, of Township 21 North, Range 6 East of the 4th principal meridian, from which a burr oak, 10 inches diameter, bears South 85° East, 27 links, and a hickory, 18 inches diameter, bears North 27° W., 134 links distant. This corner is 30.17 chains North of the corner established at 47.60 chains, on same bank of the river; & is 77.77 chains North of the corner to Sections 35 and 36, on the south boundary of the Township. I continue the line north between Sections 35 and 36, counting the distances from the corner on the south boundary of the Township.

80.00 Set a post, corner, to Sections 25, 26, 35 and 36, Township 21 North, Range 6 East, from which a white oak, 14 inches diameter, bears North 17° E., 18 links; a white oak; 12 inches diameter, bears South 25° W.,13 links, and a walnut, 14 inches diameter, bears South 58° E., 32 links distant. There is no tree within a reasonable distance in Section 26.

East Chains On a random line between Sections 25 and 36, Township 21 North, Range 6 East of the 4th principal meridian.

40.00 Set a temporary quarter-Section corner post.

80.18 Intersected the east boundary of the Township 37 links south of the corner to Sections 25 & 36; from which corner I run

West On a true line, between Sections 25 and

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Chains 36, Township 21 north, Range 6 East of the 4th principal meridian.

17.60 A white oak, 15 inches diameter.

29.40 A branch, 26 links wide, runs south-west.

40.09 Set a quarter-Section corner post on the true line, at average distance; from which a pine, 17 inches diameter, bears South 32° East, 49 links; and a pine, 27 inches diameter, bears North 42° West, 132 links distant.

40.15 Left hills and entered bottom; bears north west and south-east.

65.17 A walnut, 36 inches diameter.

80.18 The corner to Sections 25, 26, 35 and 36.

15th of April, 1833.

North Chains Between Sections 25 and 26, Township 21 North Range 6 East of the 4th principal meridian.

27.62 A white oak, 12 inches diameter.

29.34 Intersected the right and southerly bank of White River, a navigable stream; runs easterly. Set a post, corner to fractional Sections 25 and 26, from which a burr oak, 17 inches diameter, bears South 17° East, 39 links, and a black oak, 13 inches diameter, bears South 25° West, 142 links distant. Sent my flag-man over the river, and caused the flag to be set on the left bank thereof, on the line between Sections 25 and 26; I then offset from the before described corner to fractional Sections 25 & 26, E. 5.00 chains, to a point from which the flag set as before said, on the left bank of the river, and on the line between Sections 25 and 26, bears North 24° West., making the

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Chains distance across the river 11.23 chains; therefore, at (29.34 more 11.23) equal to

40.57 Set a post on the left and north bank of White River, for corner to fractional Sections 25 and 26, Township 21 Eorth, Range 6 East, from which a hickory, 13 inches diameter, bears South 65° East, 125 links; and a white oak, 17 inches diameter, bears S. 72° West, 19 links distant.—The place of the quarter-Section corner is in the river; it cannot therefore be established.

56.42 A white oak, 13 inches diameter.

74.39 A black oak, 14 inches diameter.

79.16 A black oak, 14 inches diameter.

80.00 Set a post, corner of Sections 23, 24, 25 and 26, from which a white oak, 17 inches diameter, bears North 23° West, 27 links; a black oak, 14 inches diameter, bears North 62° East, 113 links; and a black oak, 14 inches diameter, bears South 36° East, 39 links. There is no tree within a reasonable distance in Section 26.

East Chains On a random line, between Sections 24 and 25, Township 21 North, Range 6 East of the 4th principal meridian.

21.32 Intersected the left bank of White River, a navigable water course, runs north-easterly; set a post, corner to fractional Sections 24 and 25, from which a hickory, 17 inches diameter, bears South 39° West, 18 links; and a white oak, 18 inches diameter, bears N. 85° W., 132 links distant. Not knowing that this line would intersect a navigable stream, when I com-

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Chains menced the survey thereof, I run it on a random line; I therefore, from this fractional Section corner, run and blazed

West Chains On a true line between Sections 24 and 25, Township 21 North, Range 6 East.

4.05 A black oak, 13 inches diameter.

21.32 The corner of Sections 23, 24, 25 and 26.

16th of April, 1833.

Measuring chain compared with the standard chain and found to be 1 inch too long; made it of the proper length and commenced at the corner of Sections 24 and 25, on the East boundary of Township 21 North, Range 6 East of the 4th principal meridian, and run—Thence

West On a true line, between said Sections 24 and 25, Township 21 North,

Chains Range 6 East of the 4th principal meridian.

17.60 A white oak, 8 inches diameter.

32.40 A brook, 15 links wide, runs South-West.

40.00 Set a post for quarter Section corner, from which a white oak, 13 inches diameter, bears North 32° West, 18 links; and a black oak, 15 inches diameter, bears S. 35° E., 14 links distant.

45.38 Intersected the right & south-easterly bank of White River, which runs north-easterly; set a post, corner to fractional Sections 24 and 25, Township 21 North, Range 6 East from which a white oak, 14 inches diameter, bears N. 80° E., 17 links; and an elm, 14 inches diameter, bears S. 17° E., 45 links distant. The post, corner to fractional Sections 24 and 25, established on the left bank of White River, at 21.32 chains East of the corner to

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Sections 23, 24, 25 and 26, (see page 31 of this book,) bears S. 87 1-4° W.; I then run south 65 links to a point from which the aforesaid post, corner to fractional Sections 24 and 25, on the left bank of White River, bears west.—The Section, therefore, closes within the limits specified in my instructions.

North Chains Between Sections 23 and 24, Township 21 North, Range 6 East of the 4th principal meridian.

0.62 Left bottom and entered upland.

3.20 Entered prairie, bears N. E. and S. W.

40.00 Raised a mound, in which set a quarter Section corner post.

62.00 A branch, 6 links wide, runs east.

80.00 Depoisted 2 quarts of charcoal, 3 inches below the natural surface of the earth, and over said charcoal erected a mound, in which set a post, corner to Sections 13, 14, 23 and 24, of Township 21 north Range 6 east.

East Chains
7.00 On a true line, between Sections 13 and 24, Township 21 North, Range 6 East of the 4th principal meridian.
29.35 Left the prairie and entered timbered land.
Intersected the left bank of White River, (runs north-easterly;) set a post, corner of fractional Sections 13 and 24, from which a white oak 18 inches diameter, bears S. 17° W., 183 links; and a hickory, 18 inches diameter, bears N. 74° W., 14 links distant.
I then go to the corner of Sections 13 and 24, on the East boundary of the Township, and run thence

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West Chains
17.84 On true line between said Sections 13 and 24, Township 21 North, Range 6 East of the 4th principal meridian.
Intersected the left bank of White River; runs south-east.
Set a post, corner to fractional Sections 13 and 24, from which an elm, 8 inches diameter, bears S. 42° E., 18 links, and a gum, 13 inches diameter, bears N. 46° 15 min. E., 73 links.—Determined the distance across the river by causing my flag to be set on the opposite or right bank thereof, west from this corner,on the line between Sections 13 and 24, and run south 3.76 chains to a point under the bank of the river; from which the flag, set as aforesaid on the opposite bank, bears N. 73 1-2° W., which gives 12.76 chains the distance across the river west from the post, corner of fractional Sections 13 and 24, on the right bank, 17.84 chains west of the corner on the east boundary of the Township; therefore, at 17.84 more 12.76 chains, equal to
30.60 West of the aforesaid corner to Sections 13 and 24, on the east boundary of the Township, set a post, corner to fractional Sections 13 and 24, Township 21 North, Range 6 East on the right bank of White River, from which a white oak, 16 inches diameter, bears N. 57° W., 19 links; and a hickory, 15 inches diameter bears S. 69° W., 13 links.
37.54 Intersected the right bank of White River, runs north-east, where set a post, corner to fractional Sections 13 and 24, from

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which a red elm, 18 inches diameter, bears S. 16° E., 79 links, and a pin oak, 15 inches diameter, bears N. 87°E., 19 links.—From this corner, the corner to fractional Sections 13 and 24, on the right bank of White River, 29.35 chains east of the corner to Sections 13, 14, 23 and 24, bears S. 87 3-4° W.—I run thence South links to a point from which the aforesaid corner of fractional Sections 13 and 24, on the left bank of the river, bears West.—The Section, therefore, closes within the prescribed limits.

North Chains
00.16 Between Sections 13 and 14, Township 21 North, Range 6 East of the 4th principal meridian.
Entered prairie.
40.00 Raised a mound, in which set a post for quarter Section corner.
80.00 Placed three lime stones in the ground, the top of the uppermost one 4 inches below the natural surface thereof; and the other two, successively and immediately below it—The upper stone is 8 inches long, 6 inches wide at one end, 5 inches wide at the other end, and 3 1-4 inches thick; the stone, next below it, is 5 inches square and 4 thick; and the lowermost stone is 6 inches square and 3 inches thick; over said stones raised a mound, in which set a post corner to Section 11, 12, 13 and 14, Township 21 North, Range 6 east.

17th of April, 1833.

A. B. Hind chain-man.
C. D. Fore chain-man.

Mr. A. B. quits work on account of

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sickness.—I have supplied his place with C. D., my former fore chain-man, and employed J. K. as fore chain-man, at a compensation of Twenty Dollars per month.

[J. K's. oath to be entered here.]

Proceed in this manner between Sections 12 and 13, 11 and 12, and 1 and 12;—Then run

North Chains
Between Sections 1 and 2, Township 21 north, Range 6 east of the 4th principal meridian.
40.00 Raised mound, in which set a post for quarter Section corner.
49.50 Left prairie and entered timber.
62.00 A creek 50 links wide, not navigable, runs north-east; rapid current.
80.76 Intersected the south boundary of Township 22 North, Range 6 East, 37 links West of the corner to Sections 35 and 36; and at said intersection set a post, corner to Sections 1 and 2, Township 21 North, Range 6 East, from which a white oak, 14 inches diameter, bears S. 26° E., 14 links, and a hickory, 13 inches diameter, bears S. 42° W., 18 links distant.

18th of April, 1833.

North Chains
Between Sections 34 and 35, Township 21 North, Range 6 East of the 4th principal meridian.
40.00 Raised a mound, in which set a post for quarter Section corner.
80.00 Set a lime stone, which is 16 inches long, 14 inches wide at one end, 12 inches wide at the other end, and 4 inches thick, with the widest end 10 inches in the ground, the edges facing north and south,

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for corner to Sections 26, 27, 34 and 35.

East Chains
40.00 On a true line between Sections 26 and 35, of Township 21 North, Range 6 East of the 4th principal meridian.
Raised a mound, in which set a post for quarter Section corner.
46.17 Left the prairie and upland, and entered timbered bottom land.
60.32 Intersected the left bank of White River, where set a post, for corner to fractional Sections 26 and 35, from which a hickory, 17 inches diameter, bears S. 65° W., 13 links, and a black walnut, 16 inches diameter, bears N. 72' W., 142 links distant.

Thence commence at the corner to Sections 25, 26, 35 and 36, and run

West Chains
5.61 On a true line, between Sections 26 and 35, Township 21 North, Range 6 East of the 4th principal meridian.
Intersected the right and easterly bank of White River, runs North-westerly; at said intersection set a post, corner to fractional Sections 26 and 35, Township 21 North, Range 6 East, from which an elm, 18 inches diameter, bears S. 85° E., 13 links; and a white oak, 14 inches diameter, bears N. 27° E., 14 links distant.—Search for the corner of fractional Sections 26 and 35, on the opposite bank of the river, and find it to be at least 5 chains further South than the before described corner to the fractions of said Sections 26 and 35 on the right bank. The Section does not, therefore, close within the limits specified in my instructions. I therefore proceed forthwith

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	to ascertain in what line or lines the error was committed, and to make the required correction:—As the line between Sections 25 and 36 closed within the proper limits, the presumption is that the error is in the line between Sections 34 & 35; I go to the corner to said Sections on the south boundary of the Township and run—Thence
North	With the line already surveyed between Sections 34 and 35,
Chains	Township 21 North, Range 6 East of the 4th principal meridian (see page 36 of this book.)
40.13	The quarter Section corner.—There is no error, therefore, in this half mile, the 13 links being not more than a reasonable difference in measurement; so I continue the line North, and count the distances from the corner on the South boundary of the Township, adopting 40.00 chains as the length of that part of the line which lies South of the quarter Section corner.
74.65	The corner established by me for Sections 26, 27, 34 and 35.—I therefore remove the stone, corner to said Sections, and at
80.00	Set it for the corner to Sections 26, 27, 34 and 35, said stone being as described on page 36, viz: 16 inches long, 14 inches wide at one end, 12 inches wide at the other end, and 4 inches thick, and is set with the widest end 10 inches in the ground, with the edges facing North and South.

	Then run
East	On a true line between Sections 26 and

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Chains	35, Township 21 North, Range 6 East of the 4th principal meridian.
40.00	Raised a mound, in which set a post for quarter Section corner; then go to the quarter Section corner established by me on the line erroneously surveyed between Sections 26 and 35, & described on page 37 of this book, and destroy it by levelling the mound & removing the post, & return to the above described quarter Section corner and continue the line East between Setions 26 and 35, counting the distances from the corner to Sections 26, 27, 34 and 35.
49.57	Entered timber.
61.17	Intersected the left and westerly bank of White River, *(establish the corner and make the connection with the opposite corner.)*—Then destroy the corner to fractional Sections 26 and 35, established by me on the left bank of White River, at the intersection therewith of the errroneous line between said Sections 26 and 35, described on page 37 of this book, by removing the post and defacing the marks on the witness trees.

North	Between Sections 26 and 27, Township 21 North, Range 6 East
Chains	of the 4th principal meridian.
40.00	Raised a mound in which set a post for quarter Section corner.
80.00	The middle of a ravine, which runs south-west.—I therefore select the most suitable plot of ground in the vicinity, and deposite 3 quarts of charcoal, 4 inches below the natural surface of the ground, and over it erect a mound, in which set a

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	post as a witness point to the corner of Sections 22, 23, 26 and 27; said witness point bears N. 26° W., 144 links from the true place of said corner to Sections 22, 23, 26 and 27, Township 21 North, Range 6 East.
	19th of April, 1833.

	Continue in this manner until you get to the Western Range of Sections, and after having established the corner to
	Sections 29, 30, 31 and 32, run
West	On a true line between Sections 30 and 31, Township 21
Chains	North, Range 6 East of the 4th principal meridian.
40.00	Raised a mound, in which set a post for quarter Section corner.
72.00	Entered timber—bears N. E. and S. W.
80.42	Intersected the East boundary of Township 2 North, Range 5 East, 62 links South of the corner to Sections 25 and 36, and at said intersection set a post, corner to Sections 30 and 31, Township 21 North, Range 6 East, from which a burr oak, 17 inches diameter, bears S. 25° E., 18 links, and a white oak, 17 inches diameter, bears N. 27° E., 184 links distant.
	27th of April, 1833.

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[Form of keeping field notes of the meanders of a navigable river, or other water course:]

Commence at the corner to fractional Sections 25 and 26, Township 21 North of the base line, Range 6 East of the 4th principal meridian, on the right and south-easterly bank of White River, and run thence down stream, with the meanders of the right bank of said river, along fractional Section 25, Township 21 North, Range 6 East, as follows:

Chains.

N. 36° E., 14.00—Thence

N. 25° E., 17.20 to the mouth of a spring branch, 6 links wide,
comes from the South-East
—Thence

N. 40° E., 30.00—Thence

N. 18° E., 00.40—To the corner of fractional Sections 24 & 25, Township 21 North, Range 6 East, on the right bank of White River.

Land, high, rich bottom, fit for cultivation; timber, walnut, cherry and white oak; undergrowth, spicewood and vines.

Thence from said corner to fractional Sections 24 and 25, down stream with the meanders of the right and south-easterly bank of White River, along fractional Section 24, Township 21 North, Range 6 East of the 4th principal meridian, as follows:

Chains.

N. 13° E., 5.00; Thence

N. 3° E., 48.00; Thence

N. 9° E., 27.53—To the corner of fractional Sections 13 and 24, on the right bank of White River, and 37.54 chains West of the corner on the East boundary of the Township.

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Land, high, rich bottom, fit for cultivation; timber, walnut, cherry and white oak; undergrowth, spicewood and vines.

In all cases where there are 2 or more fractional corners of like denomination on the same bank of a river, distinguish them in your meandering notes by stating their course and distance from the proper Section corner.

[Form of certificate for your original field notes.]

I certify, that the foregoing notes on pages 1 to 65 inclusive, are the original field notes of the survey of *[here state the surveys described on said pages,]* as executed by me in the

months of_____ 183 , under my contract with, and instructions from, Elias T. Langham, Surveyor of the Lands of the United States, in Illinois and Missouri, bearing date the _____ day of_____ 183 —And I do further certify, that the marks, descriptions, courses and distances specified in said notes, are correct; and also, that the said notes were all set down at the time when, and in the order which, the work was performed on the ground.

Then state such of the facts designated on pages 15, 16 and 17, as are applicable to the case.—And, if there are any exceptions on account of re-surveys, or corrections, or any other cause whatever, they must be intelligibly and accurately specified in the proper place of the certificate.

The certificate to the copy will be similar to that to the original, with the necessary variations; such

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as, I certify that the foregoing notes on pages 1 to 73 inclusive, are correctly transcribed from the original field notes, &c.

XX.

(The following extract from a letter to Erastus Farnum was almost surely written by Robert Lytle the (then) Surveyor General. Farnum was probably a private or county surveyor making inquiry on how to subdivide certain sections. The location of the original letter is unknown at this time.)

October 30, 1835

To: Erastus Farnham, Adrian, Lenawee County, Michigan Territory

Subject: Instructions for subdivision of quarter sections according to the way in which they were sold.

"In subdividing the quarter sections on the North and West boundaries of the townships, respect should be had by you to the division of those quarters made by the Register of the Land Office in which they are situate. For instance, in a quarter section adjoining the west boundary of a township, containing, say, 170 acres; if the Register has sold the East half of the quarter for *80* acres, and the *West* half as containing 90 acres; then of course you should set off *80 acres*, exact measure, for the East half, and the *remainder* of the quarter belongs to the *West* half-be it more or less than *90* acres.

So, likewise, if the Register has sold the *East* and *West* half of the same quarter as containing, each, eighty five acres; you should run the subdivisional line so as to give to each lot an *equal quantity* of land."

(This copy of General Instructions was made from an original volume now in the possession of the National Archives.)

GENERAL INSTRUCTIONS TO DEPUTY SURVEYORS.

LITTLE ROCK:
PRINTED BY WOODRUFF & PEW.

1837.

GENERAL INSTRUCTIONS

TO

DEPUTY SURVEYORS.

SURVEYOR'S OFFICE,

Little Rock, *18*

To

Deputy Surveyor.

SIR—In the execution of surveys under the authority of this office, the following general instructions have been prepared for the government of the Deputy Surveyors, and must be strictly adhered to in all cases not otherwise provided for by special instructions.

You will provide yourself with a compass of excellent quality and approved construction, having a *nonious division;* also, with two two-pole chains, of 50 links (of equal length) each. One of said chains must be adjusted to the standard in this office, and by it you will compare and adjust that which is used, at least once in every two days, and note their difference, if any, in your Field Book; and, if there is no difference, state in your Field Book the fact of your having compared and found

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them to agree. You must likewise be provided with a full set of tally rods, of iron or steel, or pointed therewith, and allow none others to be used but the precise number you shall have selected for that purpose.

It is enjoined on you, not to employ any person whose character is known or suspected for wanting correct principles, as chain-man, marker, or any other important business in executing the surveys which you are to perform; nor is any one to be employed in the capacity above stated, who is not a free white person, and who has not attained years of discretion sufficient to understand the nature and solemnity of an oath.

Each of your Field Books will commence with a list of your chain-men, axe-men, and flag-men, then in your service, and intended to be employed in performing the surveys you are about to execute. The first book under your contract will contain an attested record of their oaths; and whenever you may employ any others, you will insert their names, together with their oaths, in your Field Book, before they are permitted to commence work. You will also, when a chain-man, axe-man, or flag-man is dismissed, or quits work from any cause *whatever*, note it in your Field Book.

[Form of oath for assistants.]

State of Arkansas,
County of

I, A. B., do solemnly swear, (or affirm, as the case may be), in the presence of Almighty God, that, in measuring where the surface of the country is hilly or irregular, I will level the chain and plumb the pins, so as to obtain the true horizontal distance, and faithfully and impartially execute and fulfil, in all things, the duty which may be assigned me, as chain-man or marker, or any other

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service which may be required in executing the surveys of the public lands, to the best of my abilities, so help me God.

A. B.

Sworn to and subscribed before me, in the county and State above mentioned, this day of A.D. 18

E. F., *Justice of the Peace.*

All Township boundary lines must be run with the compass adjusted to the true meridian, unless otherwise instructed by this office.

If, by reason of mineral attraction, or any other cause whatever, any line or lines cannot be accurately surveyed with the use of the needle, the manner of operating must be carefully noted in the Field Book.

The variation of the needle should be taken, (by an observation of the pole star), at least once in every fourth range and township.

All trees which your lines (except random lines) strike, must be noted in your Field Book, and have two notches cut on each side thereof, in the direction of the line; but no other spot or blaze, whatever, is to be made thereon.

All trees on each side of the lines, and near thereto, (except random lines), must be marked with two spots or blazes, diagonally or quartering towards the line. Range lines will be run North or South, as the case may require, and corners for Sections and quarter Sections will be established thereon at every half mile and mile, for the *Sections* and *quarter Sections* to the *West*, and not for those to the *East* of the line, except at Township corners. East and West standard lines will be run East or West, as the case may require, and corners established thereon for the quarter Sections, Sections, and Townships *North* of the line, and not for those to the *South* of it.

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All other E. & W. Township lines will be run West on randoms, and corrected East from Township corner to Township corner; and the excess or deficiency must be added to, or deducted from, the South boundary of Section 31, West of the quarter Section corner.

Sub-division lines of a Township will be run with the compass adjusted to the East boundary thereof.

Section, fractional Section, quarter Section, and Township corners, will be perpetuated by planting a post at the place of the corner, of the most durable wood that can be had in the vicinity thereof. The posts must be set in the earth by digging a hole to admit them, one foot deep, and very securely rammed in with earth, and also with stone, if convenient—

the Township corner posts must beat least 5, and the Section and fractional Section corner posts 4 inches diameter; they must be neatly squared off at top, and placed so that the corners will correspond to the cardinal points. The posts at the corners of Sections in the interior of a Township must indicate, by a number of notches on each of the four corners directed to the cardinal points, the number of miles that it stands from the outlines of the Township; the four sides of the posts will be numbered to correspond to the number of the Section they respectively face. If, however, a tree is at the place of any corner, it will be notched as aforesaid, and answer for the corner in lieu of a post.

Section corner posts on Range and Township lines, will indicate, by a number of notches on two corners directed to the proper cardinal points, the number of miles it stands from the nearest Township corner; and two sides of said post will be numbered to correspod to the number of the Section they face.

Corner posts at Township corners, will have 6

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notches on each of the four corners, directed to the cardinal points, and each of the four sides thereof will be numbered to correspond to the number of the Section they face. Quarter Section posts should be 3 inches in diameter, and marked ¼S. Or in lieu of posts, you may insert, endways into the ground, to the depth of 7 or 8 inches, a stone, for Township, Section, or quarter-section corners, which shall be not less than 12 inches wide, 14 inches long, and 3 inches thick.

You will ascertain and state in your field notes, the course and distance from a Township corner post, tree, and stone, to a tree in each Section for which it stands as a corner; each of said trees you will mark with a notch and blaze facing the post, the notch to be on the blaze; and on the blaze, which must be neatly made, you will mark, with a marking iron, in a plain, distinct, and permanent manner, the letter S., with the number of the Section, and over it the letter T., with the number of the Township; and above this, the letter R., with the number of the Range.

In establishing a Section or fractional Section corner post, tree, or stone, you will mark a tree in each Section for which they stand as a corner, in the same manner as for a Township corner. You will ascertain and state in your field notes the course and distance from the corner to *two* of these trees.

Where there is no tree within a reasonable distance in any Section on which to mark the number of Section, Township, and Range, the fact should be stated in your field notes.

From quarter Section corners you will state in your field notes the course and distance to two trees in different quarter Sections, for which you are establishing the corner; which trees will be marked with a blaze and notch facing the post and ¼S, on the blaze.

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The Commissioner of the General Land-office requires that all *bearing* trees should be marked with the letters B. T. below the other marks.

No corner tree should be marked in any Section for which the corner is not established; nor should a bearing tree be taken in any Section for which the corner is not established, unless compelled by necessity, in which case the tree would only be marked B. T.

If, in sub-division, it becomes necessary to run the line between Sections 1 and 2, South from the corner to Sections 35 and 36 of the township above, you will mark a tree in each of Sections 1 and 2 in the usual manner, and state in your field notes their course and distance from the corner to Sections 35 and 36. In all such cases a similar course would be pursued.

In prairie countries, where bearing trees cannot be found within a reasonable distance of a corner which you are to establish, you must, in that case, and in all such cases, erect mounds of earth, covered with sod, to perpetuate such corners. The mounds must be, for quarter Section and Section corners, two feet six inches high, and two feet diameter at the base; for Township corners, three feet high, and two feet six inches diameter at the base. And at all corners where mounds are necessary, you will deposite a rock, or rocks, weighing not less than ten pounds; a cylinder of charcoal, not less than six inches long and two inches diameter; or a quantity of glass or cinder from a blacksmith's shop, not less than half a pint.

If a corner shall fall within a ravine, or in any other situation where the nature of the ground or the circumstances of its locality shall be such as may prevent or prove unfavorable to establishing a corner, you will perpetuate such corner by selecting, in the immediate vicinity thereof, a suitable plot of ground, and establish a witness corner; and

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measure and state in your field notes, the distance and course from the position of the true corner to the bearing or witness corner so placed.

Whenever your course may be obstructed by insuperable obstacles; such as ponds, swamps, marshes, lakes, rivers, creeks, &c., you will prolong the line across such obstacle by taking the necessary right-angled off-sets; or, if this is inconvenient, by a traverse or trigonometrical operation, until you regain the line on the opposite side; and in case a north and south, or a true east and west line is regained in advance of any obstacle, you will prolong and mark the line back to the obstacle so passed; and at the intersection of lines with navigable water courses, you will establish a post, and give in your field notes the course and distance therefrom to two trees on opposite sides of the line, each of which trees you will mark with a blaze and notch facing the post, and the proper number of the fractional Section, Township, and Range.

The Townships are to be laid off as nearly six miles square as practicable, by lines running North and South 6 miles, and the corresponding corners joined by lines running easterly and westerly; and they will be sub-divided into 36 Sections, containing, as nearly as may be, 640 acres each. The Sections to be numbered by beginning with No. 1, in the north-east corner of the Township, and going west and east, alternately, through the Township, with progressive numbers, ending with 36, which will be in the south-east corner thereof.

The courses of all navigable rivers which may bound or pass through your district, must be accurately surveyed, and their width taken at those points where they may be intersected by Section or Township lines. You will also mean-

der all lakes or ponds of sufficient magnitude to justify such expense. In meandering, you will state particularly in your field notes, at what corner you

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commence the meanders of each fractional Section, and also the corner to which you close. You will likewise state on which side of the river you are meandering, whether on the right or left bank, and, also, whether on the *East, West, North, South, North-east, North-west, South-east or South-west,* side of the river or other water course, through or adjoining your district.

All notes of corrections and re-surveys, and the cause thereof, must be entered *as such* in the proper place of the Field Book, according to the order in which they may be executed; and the former and erroneous survey must be referred to in the said entries.

In sub-dividing Townships, you will commence at the corner to Sections 35 and 36 on the south boundary of the Township, and move on in continued progression from east to west, and from south to north, in order that the excess or deficiency of the Township, as to complete Sections, may be added to, or deducted from, the northern and western Ranges of quarter Sections.

Each north and south section line must be made one mile in measure by the chain, except those which close to the north boundary of the Township, so that the excess or deficiency will be thrown on the northern Range of quarter Sections, viz:—In running north between Sections 1 and 2, at 40.00 chains, establish the quarter Section corner, and note the distance at which you intersect the north boundary of the Township; and also, the distance you fall east or west of the corresponding Section corner for the Township the north; and, at said intersection, establish a corner for the Sections between which you are surveying.

The east and west Section lines, except those in the west Range of Sections, and those which cross navigable water courses, will be run from the proper Section corners, on random lines, (without blaz-

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ing), for the corresponding Section corners. Temporary quarter Section corner posts will be set at 40.00 chains, and the distance at which you intersect the Range or Section line, and your falling north or south of the corner run for, will be noted in your Field Book; from which corner you will correct the line, and remove the temporary quarter Section post, and place it and establish the corner on the true line, equidistant, or at the average distance between the proper Section corners.

The east and west lines, in the west Range of Sections, will be run *west* on true lines; the quarter Section corner will be established at 40.00 chains; the corners for the proper Sections will be established at the intersection with the Range line; and the distance which it intersects north or south of the corresponding Section corner west of the line, will be noted in the Field Book.

Whenever an east and west Section line, other than those in the west range of Sections, crosses a navigable river, or other navigable water course, you will run east and west on a true line, from the proper Section corners, to the said river or other navigable water, and make an accurate connection between the corners established on the opposite banks thereof.

You will give the *received names* to all the rivers, creeks, lakes, and swamps, as also of prairies, hills, mountains, and other natural objects. You will never give *original names* to such objects, where names have heretofore been given.

You will note precisely the distance to, and the width of, all streams, not navigable, which your line may traverse; also, their general course, as accurately as you can conjecture.

All *mines, salt springs, salt licks,* and *mill seats;* also, *towns, villages,* and *settlements,* and the names of the same; also, *forges, factories, cotton-gins,* and all such items of information; also, the *general*

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course of traveled *roads* and tracks, denoting the place to which they may lead; are to be noted in your Field Book.

You will likewise note when the lines enter and when they leave creek or river bottom. At the end of every mile, in running Section or Township lines, and at the end of the meanders of each fractional Section, you will give a particular description of the face of the country, whether level, hilly, or mountainous; of the quality or rate of the soil; and, if liable to inundation, state to what depth, from observation of the water-marks upon the trees, or any other source of information; and note the kinds and quality of timber and undergrowth. The description of each mile must be full, and not refer to any previous description.

The names of all bearing trees are to be fully written out; not abbreviated or expressed by initial letters. And you will, at the beginning of each of your Field Books, and at the beginning of each day's work, when starting a sectional line, write out in full the name of the Section, the Township, north or south of the base line, and east or west of the 5th principal meridian.

In stating the courses to the witness trees from the corners, the course of meanders, and the bearing or direction of small streams, mountains, &c., when the are not to the cardinal points; the capital letters N. S. E. & W., plainly and distinctly made, will be used.

The plots or sketches which you are to return, will exhibit, as accurately as practicable, from careful occular observation (in addition to the measurement on the line) to be made by you and noted in your Field Book, the true situation of all objects noted; including the courses and connections of all rivers and other water courses, and traveled roads or tracks, denoting the principal places to which they lead; and it would be well to keep on a page

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of your field-book a plat of a Township or line, on which you may portray such, and other objects, as streams, prairies, &c.

Your Field Books for your original notes will be of such a size as you may deem most convenient; they will be of the best quality of foolscap paper; and the original field notes, which are to be returned to this office, together with a fair and

correct copy thereof, must be kept in a plain and intelligible manner, according to the form hereafter prescribed in these instructions. Every entry must be so specific as not to admit of a doubt as to what is intended thereby, or a possibility of a misconstruction of your meaning. The said notes must be entered in the same order, from day to day, as the work is executed on the ground, including all re-surveys and corrections; and the date must follow each day's work.

Although your lines are to be measured with a chain of two poles, you are to keep your reckonings in chains of four poles, or one hundred links each; and all entries in your Field Book, and all plans and calculations are to be made according to the decimal measure of a chain.

The Field Books in which you copy your notes, will be according to a form to be prescribed by this office.

As the measurement, by the chain, is the principal source of errors in surveying, you will be careful to attend to your chain-men, that they carry the chain horizontally and plumb the pins.

No lines of whatsoever description are to be run, or marks of any kind made, by any person but yourself, or persons under your immediate inspection. Sub-contracts are illegal.

The page of your Field Book containing notes of the first work performed by you, must be numbered 1, and progress in numerical order to the end of your book, or to the last page containing notes of your

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surveys. A blank page is to be left on the front part of your Field Book, preceding the oaths of your chain-men, marker, &c., on which you are required, after having filled your book with notes, to make an *index*, showing the page at which the notes of every line or part of a line may be found.

When closing meanders on an old surveyed line, where no corner has been established, or, if established, has fallen in the river, or cannot be found, from any cause, you will establish a corner to the proper fractional sections, and measure, and state in your field notes, the distance from said corner, so established, to the nearest known corner on the line.

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Form of keeping Field Notes of exterior boundary lines of Townships.—[See Map.]

[The "map" referred to here is deleted. It is simply a township diagram.]

Suppose the line to be surveyed is the east boundary of Township 1 North, Range 12 West, of the 5th principal meridian.

If first book, oaths of assistants. Chain compared with the standard and found to be correct.,

Adjusted my compass to the true variation of the needle, which is 8 East.

CHAINS. NORTH	
	along the east side of Sec. 36, Township 1 north, of the base line, Range 12 west of the 5th principal meridian.
20.10	A brook 20 links wide runs NW.
35.00	A red oak 15 inches dia.
40.00	Set a ¼ Sec. corner post, from which a red oak 10 inches dia. bears N. 30° W 16 links, and a hickory 18 inches dia. bears S 15½° W. 10 links.
55.25	An impassable lake bears NE and SW, thence off-set.
	East 10.00 chains
	North 5.00 "
	East 2.50 "
	North 3.75 " —across the lake.64.00
	West 12.50 " —to the true line in advance of the lake; blazed the line south to the lake 3.25 ch's; which is 5.50 ch's wide on the line; now continue the line.
71.10	A black walnut 8 inches dia.
80.00	Set a post corner to Sections 25 and 36, T. 1 N., R. 12 W., from which a hickory 6 inches dia. bears S. 18° W. 11 links, and a white oak 20 inches dia. bears N. 72° W. 36 links.
	Land level, and 2d rate soil; timber, oak, hickory, hackberry, walnut, &c.; undergrowth green briars.

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Proceed in this manner along the east boundary of Sections 25, 24, 13, and 12—then along the east side of Section 1, as follows:

CHAINS. NORTH	
	along the east side of Section 1, T. 1 N., R. 12 W.
8.00	A bayou 100 links wide, bears NW and SE.
12.16	Entered bottom of _____ river.
21.50	An ash 10 inches dia.
35.60	Intersected the right bank of _____ river, runs east; navigable; where set a post corner to fractional Sections 1, T. 1 N., R. 12 W., and 6, T. 1 N., R. 11 W., from which a hickory 12 inches dia. bears S. 41° W. 18 links, and a cottonwood 30 inches dia. bears S. 60° E. 28 links.
48.50	To the left bank of _____ river; distance across obtained by calculation; where set a post corner to fractional Sections 1, T. 1 N., R. 12 W., and 6, T. 1 N., R. 11 W., from which an elm 18 inches dia. bears N 69° E 18 links, and a sweet gum 15 inches dia. bears N. 19° W. 40 links.
63.11	A sweet gum 15 inches in dia.
71.81	Left bottom and entered upland.
80.00	Set a post corner to Sections 1, 6, 31, and 36, and to Townships 1 and 2 North, Ranges 11 and 12 West, from which a red oak 10 inches dia. bears S 10° E 10 links, an over-cup oak 24 inches in dia. bears S. 46½° W. 23 links; a hickory 14 inches dia. bears N. 18° W. 38 links and a hickory 6 inches dia. bears N. 35° E. 50 links.
	Land south of the bottom 2d rate soil; timber, oak and hickory—no under-

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	growth: the bottom 1st rate soil; timber, sweet gum, elm, cotton wood, &c., with heavy cane. North of the bottom 3d rate soil, and rocky; timber mostly oak and blackjack, some hickory. Undergrowth oak bushes.
	1st _____ 18

Suppose the corner to Townships 1 and 2 North, Ranges 12 and 13 West, had been established, proceed as follows:

Chain compared and adjusted to the standard.

CHAINS. WEST	
	on a random line along the south side of Section 36, Township 2 North of the base line, Range 12 West of the 5th principal meridian.
20.10	A creek 10 links wide runs SE.

40.00	Set a temporary ¼ Sec. corner post.
51.15	Road from _____ to _____ bears south.
63.25	Spring branch runs SE—spring 10 links to the north.
80.00	Set a post, temporary corner to Sections 35 and 36.

Proceed in this manner along the South boundary of Sections 35, 34, 33, and 32; then along Section 31, as follows:

CHAINS. WEST	
	on a random line along the south side of Section 31, T. 2 N., R. 12 W.
10.00	A creek 15 links wide runs SW.
16.00	A navigable lake bears north and south, about 10.00 chains wide.
40.00	Set a temporary ¼ Sec. corner post.
55.00	Entered A. B.'s field, bears NE and SW.
67.00	Left the field, bears NW and SE.
81.50	Intersected the Range line 250 links

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	South of the corner to Townships 1 and 2 North, Ranges 12 and 13 West. 2d _____ 18
	Chain compared, and found correct.

CHAINS. EAST	
	on a true line along the south side of Section 31, Township 2 North of the base line, Range 12 West of the 5th principal meridian.
25.80	An ash 10 inches dia.
41.50	Set a ¼ Section corner post, from which an ash 15 inches dia. bears N. 18° E. 19 links, and an elm 18 inches dia. bears N. 35° W. 25 links.
55.20	Set a post on the west side of the lake, corner to fractional Sections 6, T. 1 N., Range 12 W, and 31, T. 2 N., R. 12 W., from which a hackberry 6 inches dia. bears N. 60° W. 50 links, and a sweet gum 12 inches dia. bears S. 40° W. 25 links.
65.70	To the east bank of said lake; distance across obtained by calculation; where set a post corner to fractional Sections 6, T. 1 N., R. 12 W., and 31, T. 2 N., R. 12 W., from which a box-elder 10 inches dia. bears N. 20° E. 14 links, and a swamp oak 15 inches dia. bears S. 65° E. 18 links.
35.70	A hickory 10 inches dia.
81.50	Set a post corner to Sections 31 and 32, T. 2 N., R. 12 W, from which a hickory 15 inches dia. bears N. 31° E. 25 links, and a hickory 6 inches dia. bears S. 18° W. 20 links, and marked B. T. only, there being no tree convenient in Section 31.
	Land 2d rate soil, and inclined to be wet—subject to overflow from the lake, of about 2 feet. Timber, oak, hickory,

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	hackberry, sweet gum, &c. Undergrowth, small cane, green briars, &c.

Proceed in this manner along the south boundary of Sections 32, 33, 34, and 35—then along Section 36, as follows:

CHAINS. EAST	
	on a true line along the south side of Section 36, T. 2 N., R. 12 W.
26.18	A white oak 23 inches dia.
40.00	Set a ¼ Sec. corner post, from which a white oak 16 inches dia. bears N. 20° E 15 links, and a white oak 30 inches dia bears north 30° W. 15 links.
67.00	A hickory 8 inches dia.
80.00	The corner to Townships 1 and 2 N, Ranges 11 and 12 West. (Here describe the land, &c.) 3d _____ 18

Form of keeping Field Notes in sub-dividing a Township—say Township 1 N., Range 12 West of the 5th principal meridian.—[See map.]

4th _____ 18 , commenced the sub-division of Township 1 North of the base line, Range 12 West of the 5th principal meridian.

If first book of survey—oaths of assistants. Chain compared and adjusted to the standard.

Thence adjusted my compass to the east boundary of said Township, in the following manner:

With my compass adjusted to a variation of 7 30° East, I run north along the east side of Section 36—at 39.98 chains, a point 32 links east of the ¼ Sec. corner, on the east side of Section 36, at 80.03 chains, a point 67 links east of the corner to Sections 25 and 36. I therefore adjust my compass to a variation of 8° East.

If the east boundary of the Township had been surveyed by yourself immediately previous, you

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will adjust your compass for sub-dividing, as follows:

By reference to the notes of survey of the east boundary of the Township as surveyed by me in _____ 18 , I find the survey to have been made at a variation of 8° East, which is the true variation. I therefore adjust my compass to the same degree.

CHAINS. NORTH	
	between Sections 35 and 36, Township 1 North of the base line, Range 12 West of the 5th principal meridian.
10.50	A hickory 6 inches dia.
24.00	Entered cane.
31.50	To the south side of _____ lake, navigable, bears West and NE; where set a post corner to fractional Sections 35 and 36, from which a sweet gum 18 inches dia. bears S 30° E 17 links, and a hackberry 12 inches dia. bears S 45° W 10 links.
38.60	The north side of the lake—distance obtained by calculation; where set a post corner to fractional Sections 35 and 36, from which an elm 12 inches dia. bears N 10° E 16 links, and a cotton wood 30 inches dia. bears N 30° W 10 links.
40.00	Set a ¼ Sec. corner post, from which a sassafras 6 inches dia. bears N 18° E 16 links and an elm 20 inches dia bears S 28° W 40 links.
56.00	Left cane.
63.50	A hickory 10 inches dia.
80.00	Set a post corner to Sections 25, 26, 35, and 36, from which a hickory 8 inches dia. bears N 15° W 32 links, and a white oak 20 inches dia. bears S 56½° E 20 links.
	Land, the first and last ¼ mile, 2d rate

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	soil; timber mostly oak and hickory. Undergrowth oak bushes; the balance 1st rate soil; timber, sweet gum, cottonwood, and some hickory. Undergrowth cane.

CHAINS. EAST	
	on a random line between Sections 25 and 36, T 1 N, R 12 W.
10.00	A high bluff of rocks.
	Off-set south 10.00 chains
	east 20.00 "
30.00	north 10.00 " regained the line.
40.00	Set a temporary ¼ Sec. corner post.
50.00	Entered low wet land.
55.00	A creek 100 links wide runs SW.
63.00	Entered upland.
80.60	Intersected the Range line 55 links south of the corner to Sections 25 and 36.
West	on a true line between Sections 25 and 36.
15.60	A white oak 20 inches dia.
40.30	Set a ¼ Sec. corner post, from which a red oak 15 inches dia. bears S 18° E 25 links, and a white oak 24 inches dia. bears N 61° W 35 links.
66.10	A blackjack 10 inches dia.
80.60	The corner to Sections 25 26, 35, and 36.
	Land, except a few chains on each side of the creek is uneven and poor; timber mostly oak, some hickory. Undergrowth oak and blackjack bushes.
	4th _____ 18

Proceed in this manner until you arrive at the corner to Sections 1, 2, 11, and 12—then between Sections 1 and 2, as follows:

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CHAINS. NORTH	
	between Sections 1 and 2, Township 1 North of the base line, Range 12 West of the 5th principal meridian.
21.20	Intersected the right bank of _____ river, runs easterly; where set a post corner to fractional Sections 1 and 2, from which a box-elder 10 inches dia. bears S 35° E 10 links, and a hackberry 12 inches dia. bears S 41° W 18 links.
33.00	To the left bank of _____ river, distance across, obtained by calculation; where set a post corner to fractional Sections 1 and 2, from which a sweet gum 18 inches dia. bears N 20° east 10 links, and a sweet gum 12 inches dia. bears N 50° W 30 links.
40.00	Set a ¼ Sec. corner post, from which a hickory 12 inches dia. bears S 38° E 50 links, and a hackberry 14 inches dia. bears N 31° W 27 links.
51.10	A hackberry 8 inches dia. Left bottom and entered upland.
80.45	Intersected the south boundary of T 2 N, R 12 W, 25 links east of the corner to Sections 35 and 36; where set a post corner to Sections 1 and 2, T 1 N, R 12 W, from which a burr-oak 18 inches dia. bears S 46° E 33 links, and a white oak 20 inches dia. bears S 36½° W 21 links.
	(Here describe the land, timber, &c.)

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Form of keeping Field Notes of meanders.

Commenced at the corner to fractional Sections 1 and 2 on the right and south bank of _____ river, and meander along the right bank of said river, through Section 1, T 1 N, R 12 W.

	Chains.		
Thence	N 75°	E 20.00	
"	N 80½°	E 10.50	
"	N 65°	E 30.00	—at 15.00 chains on this course the mouth of a creek 50 links wide comes from the SE.
"	S 77°	E 24.10	—to the corner of fractional Sections 1, T 1 N, R 12 W, and 6, T 1 N, R 11 W.

(Here describe the land, &c.)

Commenced at the corner to fractional Sections 35 and 36, on the south side of _____ lake, and meander along the southerly side of said lake in Section 36, T 1 N, R 12 W

	Chains.		
Thence	N 60°	E 25.00	
"	N 71°	E 15.00	
"	N 50°	E 18.00	
"	N 20°	W 10.00	—At 50 Links on this course a bayou 50 links wide comes from the NE.
"	N 80°	W 15.00	
"	S 55°	W 30.00	
"	S 15°	W 24.50	—to the corner of fractional Sections 25 and 36, on the north side of the lake.

(Here describe the land, &c.)

5th _____ 18

Having progressed with the survey to the corner of Sections 29, 30, 31, and 32, run the line between Sections 30 and 31, as follows:

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CHAINS. WEST	
	(Re-surveyed—see page .)
	on a true line between Sections 30 and 31, Township one North of the base line, Range 12 West of the 5th principal meridian.
15.50	A path bears north and south.
23.50	A white oak 30 inches dia.
29.00	Entered prairie, bears NE and SW.
40.00	Raised a mound for ¼ Sec. corner, in which deposited two rocks.
65.00	Left prairie, and entered timber.
85.50	Intersected the east boundary of T 1 N, R 13 W. 25 links south of the corner to Sections 25 and 36.
	On examining my diagram, I find the line between Sections 30 and 31 should be nearly 80.00 chains in length.
	I therefore proceed to re-survey said line.

CHAINS. WEST	
	(Re-survey—see page .)
	on the line previously surveyed, between Sections 30 and 31, T 1 N, R 12 W—on a re-survey.
15.45	A path bears north and south.
23.40	A white oak 30 inches dia.
28.93	Entered prairie, bears NE and SW.
35.95	The ¼ Sec. corner mound, which I destroy.
40.00	Raised a mound for ¼ Sec. corner, in which deposited two rocks.
60.00	Left prairie, and entered timber.
80.51	Intersected the east boundary of T 1 N, R 13 W. 25 links south of the corner to Sections 25 and 36; where set a post corner to Sections 30 and 31, T 1 N, R 12 W, from which a white oak 15 inches dia. bears S 60, E 30 links, and a hickory 10 inches dia. bears N 40° E 20 links.
	(Here describe the land, &c.)

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Having established a corner to Sections 19, 20, 29, and 30 run.

CHAINS. WEST	
16.00	on a true line between Sections 19 and 30, T 1 N, R 12 W.
26.50	A hickory 18 inches dia.
	A lake, bears north and south, navigable; where set a post corner to fractional Sections 19 and 30, from which a hickory 10 inches dia. bears S 15¼° E 20 links, and a sweet gum 20 inches dia. bears N 18° E 30 links.
	(Here describe the land, &c.)
	Commenced at the corner to Sections 24 and 25, T 1 N, R 13 W, from which a hickory 8 inches dia. bears N 45° E 30 links, and a white oak 20 inches dia. bears S 36°, E 35 links, thence
East.	on a true line between Sections 19 and 30, T 1 N, R 12 W.
21.30	A hickory 10 inches dia.
35.20	A lake, navigable; where set a post corner to fractional Sections 19 and 30, from which a box-elder 10 inches dia. bears S 30° W 10 links, and a sycamore 30 inches dia. bears N 22° W 50 links.
	The corner to fractional Sections 19 and 30 on the opposite side of the lake, bears S 89° E.
	Thence south 31 links; from this point the corner on the opposite side of the lake bears east.
	(Here describe the land, &c.)
	6th _____ 18

In fractional Townships, on navigable rivers, it may be necessary to run the lines from the rectilineal boundary of the Township, whether north, south, east, or west, as the case may be, and throw the fractional Sections on the river.

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Where the exteriors of a Township are one continued line, it is preferable that the sub-division N and S lines should progress from south to north in the usual order, unless the barrier be insuperable.

Where a Township is not rectangular, it may be convenient to deviate fom the cardinal points, *in running random lines,* in order to intersect the corner run for. There are no objections to this mode; but the exact course at which you run must be stated in you field notes.

It is not thought advisable to prescribe any limit of measurement within which a survey shall close; but having made allowance for the inaccuracy or obliquity of adjoining surveys, an excess or deficiency of a close in course or distance of a Township line of more than 5 chains; of a Section line of more than 1 chain; of meanders of a Section of more than 1 chain, 50 links, would be sufficient to cause a distrust in the accuracy of the survey.

You will leave a margin of at least half an inch on each edge of every page of your Field Book, which will not only admit of binding, but prevent obliteration of the notes.

No memorandum, or writing, of any description should be made in the Field Book, except such as exclusively relates to the surveys.

Each book will be signed by yourself and close with a certificate in the following form:

I certify that the foregoing notes, on pages 1 to _____ inclusive, are the original field notes of the surveys therein specified; that the surveys were executed, and the field notes taken, by myself in person, (or by _____ _____, under my immediate and personal superintendence), at the dates therein written.

A. B.,
Dept. Sur.

The foregoing instructions have been draughted with a view to insure a correct execution of surveys, and uniformity of returns, and with a special

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reference to the laws of the United States in relation to the surveys of public lands.

It is expected they will be strictly adhered to in form and substance

do

hereby acknowledge the receipt of instructions from the Surveyor of public lands, in Arkansas, of which the foregoing, on pages 1 to 25 inclusive, is a true copy.

D. S.

XXII.

(These Florida Instructions of 1842 were printed in a newspaper type format, with the title similar to a headline and the body of the instructions in narrow columns. The original document is now in the possession of the National Archives.)

OFFICE OF THE SURVEYOR GENERAL
Tallahassee, Nov'r 3, 1842
GENERAL INSTRUCTIONS
to
DEPUTY SURVEYORS

1. You will provide yourself with a good *nonius compass,* which is to be compared with, and regulated by, the *standard compass* in the Surveyor General's office.

2. You will likewise procure a surveying chain two poles, or 33 feet, in length, and containing fifty links, which is to be compared with, and adjusted by, the *standard chain* in the Surveyor General's office. It should be made of good iron wire of such size as to prevent the chain from stretching by use, and yet light enough to be readily straigtened in measuring,—the handles should be made of iron or brass, at least a fourth of an inch in diameter.

3. You must likewise be provided with the measure of the standard chain, which may be made similar to your surveying chain, of smaller wire; and by this your surveying chain must be compared and adjusted at least every other day, or oftener.

4. *Tally rods* are usually made of iron about 12 inches in length, having a ring at the top in which is fixed a piece of red cloth, or something else of a conspicuous color, that they may be more readily seen when stuck in the ground. Eleven tally rods is the number required. They should be counted by both the chainmen at the end of every *"out"* to see that none have been lost.

5. Your compass and chain must be frequently examined in the field in order to discover and rectify any error or irregularity which may arise in the use of them.

6. The aberrations of the needle are a fruitful source of error in surveying. These may arise from a variety of causes. "Local attraction," owing to the presence of iron mineral, is generally assigned by surveyors as the principal cause of the disturbance of the needle; but it is believed that in many instances the true source of errors complained of is to be found in the carelessness or inattention of the surveyor in the use and management of his compass, or the erroneous measurement of his lines. All these must be constantly and vigilantly guarded against by every means in your power.

OF RUNNING AND MARKING LINES.

1. All lines of whatever description which you may survey, must be run by the true meridian. For which purpose the variation of the magnetic needle, at the place where you survey, must be taken or previously known, and the sights of your compass adjusted to the true meridian, by means of the nonius, before you commence your survey.

2. All lines which you may survey, are to be marked in the following manner, viz: All those trees which your line cuts, must have two notches made on each side of the tree where the line cuts it; but no spot or blaze is to be made thereon. These are indifferently called "station trees," "line trees," or "sight trees." And all those trees on each side of the line and within ten or fifteen links thereof, (or farther, if the land should be thinly timbered,) must be marked with two spots or blazes, diagonally or quartering towards the line, which blazing must be made so conspicuous that the line may be readily found and traced.

3. Whenever, in running lines, your course may be obstructed by insuperable obstacles, as swamps, marshes, lakes, rivers, precipices, or other objects, over which you cannot pass, you will take the necessary offsetts, or work by traverse or by trigonometry, in order to pass the obstacle, and to ascertain the exact distance on so much of the line as, by reason of such obstructions, may not be actually run. By whatever method you pass such inaccessible parts of the lines, the utmost accuracy is necessary to obtain the true measure thereof.

4. No lines, of whatever description, embraced in your contract, are permitted in any case to be run or surveyed by any person but yourself, or some regularly accredited deputy surveyor duly orthorized by the Surveyor General; or are letters, numbers, or marks of any kind, to be made by any other person than yourself, except it be in your presence and under your immediate and personal direction, in which case you are to inspect such letters, numbers, or marks, to see that they are neatly and correctly made.

OF EXTERIOR TOWNSHIP LINES.

1. The act of Congress of 18th of May, 1796, requires that the public lands "shall be divided by north and south lines run by the true meridian, and by others crossing them at right angles, so as to form townships of six miles square." In laying out and surveying the exterior boundaries of townships, in conformity to this provision of the act, the greatest possible accuracy must be observed both in the course and measurement of the lines. To run the lines by the true meridian, the variation of the magnetic needle must be frequently, and with the utmost exactness, determined by celestial observation, and the sights of your compass adjusted accordingly.

2. Celestial observations, to find the variation of the compass, should be made at least every twenty or twenty-four miles. It is not material that these observations should be made at the township corners. They may be made at any part of the lines, so as to be as nearly as practicable at the intervals here directed. But no alteration must be made in the course of any township line until you arrive at the township corner; for with whatever course you set out in running a township line that course must in all cases be continued to the end thereof.

3. The following is the order and method to be pursued in running exterior township lines: A base line, or a township line assumed as a base, is run due east and west across the southern boundary of the tract of country to be surveyed. On this line the quarter section, section, and township corners, are established at the full measure; from each of the township corners on this line, range lines are run due north, the section and quarter section corners established thereon, and at the end of the sixth mile on each of those lines, temporary township corner-posts are set. But at the end of the sixth mile on the most easterly line a township corner is established; from this corner a township line is run due west across the whole district, intersecting the range lines previously run, which, if the work be well done, will be at or near the temporary township corner-posts placed at the end of them. Exactly at the point of intersection, whether at the temporary posts or north or south of them, the township corners are to be established. The distance from the points of intersection to the

temporary posts, must be accurately measured and noted, shewing whether it be north or south of those posts. On this west line the intermediate section and quarter section corners will be established as the survey of the line advances.

4. The same process will be repeated in running up due north from the township corners on the last west line, another series or tier of range lines to temporary six mile posts, establishing as before the most easterly one, and from thence extending another, due west, township line across the whole district, in the manner before directed. The same method is pursued in each successive tier of townships until the survey of the township lines is completed.

5. Variations from this order and mode of running township lines, will sometimes be necessary, to accommodate them to the situation and boundaries of the tract of country to be surveyed, or to correct with prior surveys, such cases as they occur, will be provided for in special instructions.

6. Whatever excess or deficiency may occur in the measurement of the exterior township lines, is to be carried to the north or west end of those lines. But by a vigilant and faithful attention to duty on the part of the skilful and experienced surveyor, those excesses or deficiences, except to a trifling extent, will be of rare occurrence. As the interior section lines must necessarily conform, both in their course and measure, to the township lines, any error committed in the latter will unavoidably be carried into the former, and may mar the beauty and order of the entire subdivisions of the township.

7. It will be seen, then, how very important it is that the townships be as nearly as possible, six miles square; that the exterior boundaries be run exactly by the true meridian; and that the measures thereof be truly and accurately made.

8. The bearing trees at the section and quarter section corners, on the exterior township lines, are to be taken only on the north and west sides of those lines, respectively, wherever it is practicable. And those sections only which lie on the north and west sides, are to be marked and numbered.

With the field notes of exterior township lines the surveyor must return a map or diagram, drawn on a scale of 40 chains to an inch, on which will be represented the length of each line, in chains and links, the variation of the compass by which it was run, and, also, the water courses, lakes, prairies, swamps, roads, and such other objects as may be shewn on a map.

OF MEASURING LINES.

1. In all measurements, the level or horizontal length is to be taken, and not that which arises from measuring along the surface of the ground, when it happens to be uneven, rolling or hilly. For this purpose in ascending or decending hills, the chainmen must let down one end of the chain to the ground, and raise the other end to a level therewith, as nearly as may be; from the end of which a tally rod should be plummed and let fall to ascertain the spot for setting it. And when the surface of the ground is very steep it may be found necessary to shorten the chain, (by doubling it together,) to one half its length, or even less, so as to obtain the true horizontal measure.

2. Though your lines be measured by a chain of two poles or perches in length, you are notwithstanding, to keep your reckoning in chains of four perches or one hundred links, and all your entries in your field book, and all your calculations, plans &c., must be made accordingly in four pole chains, and decimal parts, (or hundredths) thereof.

3. In measuring lines, every five chains are called an "out" because at that distance the last of the ten tally rods or pins with which the forward chainman set out, has been set; the other chainman then comes up, counts and delivers to him the ten tally rods which he has taken up in the last "out," the forward chainman likewise counting them as he receives them. At the end of every five chains the forward chainman as he sets the tenth or last tally rod calls "out," which is repeated by the other chainman, by the marker and by the surveyor, each of whom keeps a tally of the "outs," and marks the same as he calls them.

4. You are to pay the strictest attention to the frequent examination, and correction of your surveying chain by the standard measure taken with you. The greatest attention must likewise be observed in obtaining, and entering in your field book, the exact measure on the lines, to every object which is noted therein. These measurements are very frequently found to be important, after many years, both in tracing the lines and in identifying the corners.

5. The principal source of error in surveying is the measurement by the chain. And as the interest of the public service, the rights of purchasers of public lands as well as your own standing as a surveyor, are at stake, it is enjoined on you in selecting your chain carriers, to have strict regard to their character and fitness for the trust; and to employ those only in whose moral integrity, and faithfulness, you can repose the most implicit confidence. You are required to attend vigilantly to the manner in which your chainmen perform their duty, and to cause it to be faithfully and correctly executed; to see especially that they carry the chain horrizontally on hilly ground, and that all the lines which you may run, be not only correctly measured by them but the length thereof truly reported to you for *immediate entry in the field book.*

6. In measuring across streams of water you are to give the width directly across the channel. The distances to the posts which you shall establish on the banks of rivers, lakes, or bayous which are to be meandered, are to be taken with great accuracy.

OF ESTABLISHING AND MARKING CORNERS.

1. The corners of Township sections and quarter sections, are to be established and marked in the following manner:—

2. On the exterior Township lines, corner posts must be erected at the distance of every mile and half mile from the township corners. The mile posts are for the corners of sections and the half mile posts for the corners of quarter sections. These posts are always to be made of the most durable wood that can be had, and should be very securely set or driven into the ground to the depth of fifteen or twenty inches at least, and the sides of the posts to be neatly squared off at the to—the angles of the squares to be set in the direction of

the cardinal points of the compass. Wherever a tree may be so situated as to supply the place of a corner post it is to be blazed on all four sides facing the sections to which it is the corner.

3. At all the posts thus established for section or township corners, there shall be cut with a marking iron, on a bearing tree or some other tree within each section and as near as may be to the corner thereof, the number of each section: and over it the letter T with the number of each Township, annexed thereto the letter N or S, as the Township may be north or south of the base line, and above this the letter R, with the number of the range, and annexed thereto the letter E or W, as the Range may lay east or west of the principle meridian; thus: R 4 E
T 9 N
36.

4. The letters and numbers thus marked should be in a regular chop, cut into such tree and neatly squared off and faced, so as to be always readily distinguished from a mere blaze.

5. At the quarter section corners, the post is to be flattened on two opposite sides and thus marked: "1-4 S." to indicate that it is a "quarter" section post, and the nearest adjoining tree on each side of the sectional line must be marked, to show the Township, Range and Section in which such tree may be situated.

6. The place of all corner posts of whatever description, which may be established, are to be perpetuated in the following manner, viz: from each post the courses are to be taken and distances measured, to two or more trees in opposite directions, as nearly as may be, which trees are called "bearing trees," and shall be blazed on the side next to the post, and one notch made with an axe in the blaze. On each bearing tree the letters B. T. to denote the fact of its being a bearing tree, must be distinctly cut in the wood, below the blaze.

7. In prairies and other places where bearing trees cannot be had, the places of the posts are to be perpetuated by quadrangular mounds of earth, to be raised around the posts to the height of two and a half feet, and having a base of four feet square, the angles of which shall be in the direction of the cardinal points. The earth to form the same must be taken from one place to form a pit, directly south of a section corner, and east of a quarter section corner; but when circumstances conflict with this arrangement the earth to form the pit may be taken from any point where most convenient; but in all cases, the course and distance to the centre of the pit must be noticed in your field notes; near the centre of each mound there must be placed a stone of at least three or four pounds weight, or a few handsful of charcoal, when convenient. And to prevent, as much as possible, the action of the rains and weather in wearing away the mounds, they must be covered over with sod. The posts should show not less than two feet above the mounds, and are to be squared and marked as in other cases, and must be marked on each of the four square sides thereof, with the number of the section which it faces. Wherever stone can be conveniently obtained, a pile of stones of the same dimensions, will in all cases be made, in the place of a mound of earth.

8. Wherever the section or Township lines intersect lakes, steams of water, or islands, which are to be meandered, posts are likewise to be established on the margin or banks thereof, at the points where the lines intersect or leave them. These posts are to be flattened on the two sides coinciding with the lines on which they are set, and on each of these sides is to be marked the number of the section which it faces.

OF SUBDIVIDING TOWNSHIPS INTO SECTIONS.

1. Each Township is subdivided into thirty-six sections of one mile square by lines running due north and south, crossed by others running due east and west. The sections are known and designated by progresive numbers beginning at the north east corner of the Township and numbering westward and eastward alternately, as shown in the following diagram:

2. Each side of a section must be made one mile in measure, by the chain, quarter section corners are to be established at every half mile except in closing, when the closing lines vary from eighty chains or one mile, in which case you are to place the quarter section corners equidistant, or at least at the average distance from the corners of the section, but in running out the last section lines to the north and west boundaries of the Township, the quarter section corners are to be established at the distance of forty chains from the last section corner and the excess or deficiency of measure (if any) carried out into the last half mile, and cast upon the north and west sides of the Township, as required by law.

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

3. In closing out the section lines to the north boundary of the township, unless the section lines intersect the boundary at the section corners thereon established for the adjoining Township, you must set a post and take bearing trees at such intersection, and measure and note the distance to the post previously set for the adjoining Township, and on which side of such post, but wherever the closing lines of the section intersect at the post on the north boundary, such post becomes common for the sections on both sides of the Township boundary; bearing trees are however to be taken and the proper marks and numbers made for and within the sections between which the closing lines are run. In establishing the corners on the north side of the Township, where the section lines close thereon, the bearing trees, wherever it may be practicable, are to be taken on the south side of that boundary. But in closing out to the west boundary you will first run a random line and correct back from the post already established thereon, and observe the instructions for establishing

the quarter section corner, given in the second section of this article.

4. Having adjusted the sights of your compass to correspond with the course of the east boundary of the Township, you will begin at the corners of sections 35 and 36, on the south boundary, and run a line due north forty chains, and establish the quarter section corner between sections 35 and 36, continue north forty chains further, and establish the corner of sections 25, 26, 35, 36.

5. From the corner of sections 25, 26, 35, 36 run a random line, without blazing, due east from the corner of 25 and 36 on the east boundary, at the distance of five or ten chains on the random line, set up a stake, or make some other mark; if you intersect exactly at the post on the range line, you will blaze the random line back as the true line, but if your random line falls north or south of the corner on the range line, you must measure and note such deviation in your field book; and from the said corner on the range line, return upon a true line back to the corner where you commence the random, blazing and marking the true line, and observing to verify the correctness of its course, by means of offsets, from the stake set or marks made on the random. The quarter section first is to be established on the true line, at the average distance between the corner of sections 25, 26, 35, 36, and the corner on the range line.

6. From the corner of sections 25, 26, 35, 36, run due north, between sections 25, 26, setting the quarter section post as before, at forty chains; and at eighty chains establish the corner of sections 23, 24, 25, 26. Then run a random line due east for the corner 24, 25 on the range line; correcting back and establishing the quarter section corner, in the manner directed for running the line between 25 and 36.

7. In this manner proceed with the survey of each successive section in the first tier, until you arrive at the north boundary of the Township, which you will reach by running up the line between sections 1 and 2. On this line, the distance at which the north boundary is intersected, is to be carefully noted. If you should not intersect at the post established for corner to sections 35, 36 in the adjoining Township, you must carefully measure and note in your field book, the distance of the point of intersection from said post, showing whether you fall east or west thereof; and at that point you will set a post and establish a corner for sections 1 and 2, taking your bearing trees, if practicable, south of the Township line, making the proper marks and numbers for and within sections 1 and 2. Bearing trees are to be taken, and marks and numbers made in the same manner, should your line intersect at the post for sections 35 and 36.

8. The first tier of sections being thus laid out and surveyed you will return to the south boundary of the Township, and from the corner sections 34 and 35, commence and survey the second tier of sections, in the same manner that you pursued in the survey of the first, closing at the section corners on the first tier.

9. In like manner proceed with the survey of each successive tier of sections, until the 5th, or last entire tier is run up. From the section corners on this tier you will run random lines for the corresponding corners established on the Western boundary of the Township and correct back on the true lines from these corners on the West boundary.—But instead of setting the quarter section post, on these true lines, at the average distance, you will establish them at the exact distance of 40 chains from your last section corners; carrying out any excess or deficiency in the measure, into the last half mile, or that part of the line West of the quarter section post. In closing thus on the West boundary, you will take bearing trees on the east side thereof, if practicable, and make the proper marks, and numbers for, and within each section as on the north boundary.

10. Great care must be taken that the north and south lines be run according to the true meridian, as required bylaw. But if you find by the measurement of the closing lines of the sections, that there is an increasing convergency or divergency of the north lines, you may reasonably distrust the accuracy of the direction of your lines by the needle. In such case it will be necessary, so to vary your course as to run parallel to the meridian (or north and south line) on which you are closing in order that the sections may contain, as nearly as possible the just and legal quantity of 640 acres or one mile square.

11. The east and west lines are to be run at right angles with the north and south lines as far as may be practicable in closing: But if on running an east and west line, you find the post you are running for, lies much to the north or south of the point where you intersect, you are to mistrust the measurement of the north and south line last run by you. In such case a re-measurement of the lines must be made, and the error, wherever found corrected.

12. You are referred here to the accompanying specimen of the field notes of a Township in which the whole process of the subdivison is illustrated at large, by example.

13. The foregoing mode of subdividing townships into sections, it will be perceived, is intended for, and can be fully applied only to entire Townships. In the subdivision of fractional Townships, however, the order of survey will be varied no further than may be necessary to adapt it to the situation and boundaries of such fractional Township. As a general rule, from which there will be few exceptions, it will be found best to make entire sections on the Township lines bounding a fractional Township, and making the work to close on the irregular boundaries thereof.

14. An act of Congress of the 24th of May 1842 authorizes a departure from the ordinary mode of surveying the public land on any river, lake, bayou whenever in the opinion of the President of the United States, the public interest would be promoted thereby; so as to survey such land in tracts of two acres in width, fronting on such river, lake or bayou and running back to the depth of forty acres. But as no general rules can be framed to govern all such surveys, this branch of the service is left to be provided for in special instructions, as cases thereof may occur.

15. Should you find a manifest error in the measurement of any Township line within, (or bounding your district) which will be readily detected by the closing of your lines thereon, you are to correct such error, by remeasuring such Township line, from where the error is found, to the north or west end thereof, the section and quarter section corners thereon, are to be removed to proper distances and there established; and the marks and numbers are to be cut off or effaced, and the distance at which you pass those corners must be noted by you. Of such re-measurement and corrections you are to take full and complete field notes, in a

separate book, to be returned to the surveyor General's Office, with the field notes of your subdivisions. For such corrections, however, the surveyor General is not authorized to make any compensation.

OF MEANDERING RIVERS.

1. You will accurately meander, by course and distance, all navigable rivers which may bound or pass through your district; all navigable bayous flowing from or into such rivers; all lakes or deep ponds of sufficient magnitude; and all islands suitable for cultivation.

At those points where the township or section lines intersect the banks of such rivers, bayous, lakes, or islands, posts are to be established, as before directed. In meandering, you are to intersect all these posts, closing at each post the course and distance on which it is intersected; you will likewise notice all streams of water falling into the river, lake, or bayou, which you are surveying, with their width at their mouth; all springs, noting the size thereof, and whether pure or mineral water; the head and mouth of all bayous, and all rapids, falls or cascades; all islands and bars, with intersections to their upper and lower points, to establish their exact situation; this must be done with great accuracy, in relation to all islands which you shall meander so as to determine and shew their precise location and bearing on the maps of the surveys; and at the close of the meanders within each section, you will give the estimated elevation of the banks; the shores, whether bold or shallow; the current, whether quick or sluggish; the quality of the soil, and kind of timber.

2. Should any lake or pond which you shall meander, be situated within any one section, so as not to be intersected with any of the lines thereof, you will run, and measure, a line very exactly; but without marking, from one of the corners, or one of the half mile posts, or other given point on one of the lines of said section, to the point on the margin of the lake at which you shall commence the meanders thereof. The true location of such lakes is necessary, in order to calculate the contents of the subdivisions of such sections.

3. The width of streams of water, and bayous binding on, or forming a boundary of your surveys, must be ascertained at every intersection of your lines therewith, by trigonometrical process, or otherwise; which can generally be most conveniently done in taking the meanders. This is necessary for the correct exhibition of such streams on the townships plats.

4. Except in cases where navigable streams constitute the boundary line between two series or systems of surveys, commencing from different standard lines, such streams are not to interrupt the regular survey of the townships through which it passes, the lines of which shall be continued across the streams to the complete measure; and where the surveys have been closed on a stream, as a boundary of a cession, or from other cause, and are afterwards to be continued across such stream, the surveyor continuing the surveys on the opposie side, must extend a line across the stream so as to make the sections thereon complete.

5. To establish a uniform and simple mode of designating and distinguishing the two sides of navigable streams, the terms "right bank," or "left bank," will be used in all cases, thus: Suppose yourself standing at the head of the river looking down stream; then that bank of the stream on your right hand is to be called and referred to in your field notes, as the right bank, and that on your left hand as the left bank; and these terms thus applied to navigable rivers, are to be used in all cases, whether in running lines or taking meanders.

6. Great care must be taken to describe clearly the post at which any meanders of a river, bayou, lake, or island, commence; and also, all the posts on township or section lines, which may be intersected in the progress of the meanders.

7. The field notes of meanders are to be written at the end of the subdivisions. The courses are to be inserted in a column on the left of the page; the distance in chains and links in a column next to this; at the extreme right of the page the notes and remarks.—Each section is to be tabled by latitude and departure before you leave it as finished, so as to correct any mistake that might occur while meandering such section. The column of distances must be added up at the foot thereof on each page.

8. Errors in meandering are of very frequent occurrence, arising principally it is believed from bad chaining. Your special attention is called to the manner in which this part of the work is executed; and all possible accuracy is enjoined, both in the courses and measurement, and the entry thereof in your field book, and in testing the same before you leave the field.

OF PRIVATE CLAIMS, INDIAN RESERVATIONS, &c.

1. In surveying private claims, Indian reservations, or other tracts not conforming to section lines, the location thereof must be particularly described and the place of beginning clearly stated in your field notes; also, the name of the claimant in whose right the survey is made, with the numbers by which it is known, and if a reservation the quantity contained in it, and the name of the reservee. The field notes of all the lines of each tract must be complete, and are to be entered in the field book separately from the notes of other tracts. The field notes of private claims and Indian reservations must be entered in separate books.

2. Wherever a section or Township line intersects a private claim or Indian reservation, there a corner must be established. The particular line intersected with its course and the name of the claimant or reservee with the number or other designation by which it is known must be noted. And from such intersection the private claim or reserved line must be carefully measured, each way along said line, to the end thereof, unless it should be intersected by another section or township line before the end be reached.

3. The course of every line of the survey of a private claim or Indian reservation, with the length thereof and the variation of the compass and the date of the survey are to be inserted in the field notes, which are to be certified to and signed by you.

OF FIELD NOTES.

1. The field books are to be made of one uniform size, the paper must be of good quality and the books covered with morocco or other leather, and neatly stitched and trimmed and containing space enough for all the field notes of a township. The pages are to be ruled with red ink and faint lined.

2. On the first page of your field book of each township, insert in a plain and neat manner, by way of title, the number of the Township and Range; by whom surveyed, with the date of the commencement, and the date of completing the subdivision of the same.

3. At the head of each subsequent page on which the field notes are written, you will insert a running title designating the number of the township and range which is to be separated from the field notes by a double red line.

4. The field notes of the surveys furnish primarily the materials from which the plats and calculations of the public lands are made; and the source from whence the description and evidence of the location and boundaries of those surveys are drawn and perpetuated. It is evidently then of the utmost importance that the field notes should be at once, an accurate, clear and minute record of every thing that is done by the Surveyor and his assistants (in accordance with these instructions) in relation to the running, measuring and marking lines, establishing corners, &c., as well as a full and complete topographical description of the country surveyed; as it regards every thing which may afford useful information, or gratify public curiosity.

5. Rivers, creeks, and smaller streams, lakes, swamps, prairies, hills, mountains, or other natural objects, are to be distinguished in your field notes by their received names only, where names have heretofore been given. To such you are not to give original names.

6. Besides the ordinary field notes taken on the lines you will add, at the end of your field book, such further description or information as you may be able to give, concerning any thing in the township worthy of particular notice, or which you may judge necessary, or useful, to be known; and you will add, also, a general notice or description of the township in the aggregate, as it regards the face of the country, soil, timber, &c.

7. In your field book the courses and distances must be placed in a column on the left hand side of the page, and your notes and remarks on the right. Each page is to contain the field notes of one section line only. The field notes of the subdivisions of each township, and fractional township, are to be written in a separate field book. The field notes are to be written in a fair and legible hand—if otherwise, they must be accompanied with true and fair copies. The original field notes must in all cases be returned into the office of the Surveyor General according to your contract.

8. With your field notes you are to return a plat of every township surveyed by you, protracted on a scale of 40 chains to an inch, exhibiting all ponds, lakes, rivers, and creeks, the contents of all sections and fractional sections will be ascertained by latitude and departure. The area of public lands and private claims must be exhibited in separate tables on your township plats, as is explained in the form furnished.

9. The plats are to be so constructed as to indicate, both by protraction and by figures, the courses and distances of all lines, viz—The exact distances between the posts planted at the corners of each section or fractional section; and the course of the lines where, from any cause, they vary from the cardinal points; also, the precise delineation by courses and distances of private claims, reservations, and other tracts of land not conforming to sectional lines, wherever the continuation of a surveyed line is interrupted by an impassible swamp, or from any other cause, the distance of the line actually run between the starting and finishing post is to be truly represented by the platting, and also by figures.

10. The distance of a surveyed line at the points where a stream crosses the same, is to be indicated by figures, and the general course of such streams, where they are not navigagable, between such different points of intersection, is to be delineated on the plat as nearly as the same can be conjectured.

11. The plat is to exhibit the received names of all rivers, creeks, lakes, swamps, prairies, hills, and other natural objects; original names are never to be given to objects which have heretofore been named, all ponds or lakes which are not actually meandered are to be represented as nearly as practicable on the plat by occular observation, swamps are to be represented by slightly shaded black lines, and dots and the outlines of the same should be distinctly exhibited.

12. The plat should also exhibit as far as practicable all mines, salt springs, salt licks, and mill seats, also towns villages and settlements with the names of the same, also forges, cotton gins and all other such items of information—also the general course of traveled roads and tracts denoting the places to which they may lead.

13. When any private claim, Indian or other reservation &c. is exhibited, the name of the confirmee or reservee must be given, all lines in the Township survey which have not been actually run must be represented on your plat of survey by dotted lines. The bearing and distance of each line of all private claims must be exhibited on the plats and noted in the field book, the length of all connective lines between private claims and public lands to be exhibited on the plats. A separate plat and certificate of each claim protracted to a scale of twenty chains to an inch to be made out.

14. The date of each days work must be inserted at the close thereof near the bottom of the page.

15. At the close of the original field notes of the subdivision of each Township and fractional Township, the following certificate is to be written and signed by yourself:

"I hereby certify that in pursuance of a contract entered into with V. Y. CONWAY, Surveyor General of the United States for the Territory of Florida, bearing date _____ day of _____ 18____, and in strict conformity to the laws of the United States and the instructions of said Surveyor General, I have surveyed and subdivided into sections, Township [fractional Township] in range _____ in the Territory of Florida. And I do further certify that the foregoing are the true and original field notes of the said survey and subdivision, executed as aforesaid. Certified this _____ day of _____."

16. Any material departure from these instructions, or negligence in the observance thereof, will be considered as a violation of the conditions of your contract, and a forfeiture of

all *claim for payment*: all loose, inaccurate, precipitate or defective work, either as it respects the surveys in the field or the notes and returns thereof on paper WILL BE REJECTED.

FORM OF FIELD NOTES.

Distance	*North Boundary of Township 9, Range 9, So. & East.*	
	Beginning at the N. E. C and ran N. 89° 40′ W.	
40,00	½ mile post Pine N. 34° E. 15 Lks. Pine S. 77° E. 15.	
45,00	To Bushy Cypress Pond.	
72,00	X Pond	
80,00	Set 1st mile post	Pine N. 37° W. 15 Lks.
	Mostly flat 3rd rate pine and Palmetto	Pine S. 58° W. 72″ Pine N. 56° E. 38″ Pine S. 50° E. 73″
	2nd Mile West on the North Boundary	
40,00	½ Mile posts. N. 61° W. 11 Links Pine S. 60° W. 10 Lks.	
40,50	To a miserable saw-grass, cypress and pine swamp.	
80,00	Set 2nd mile post—	Gum N. 83° W. 7 Links.
	First 40, 50 chs flat 3rd rate pine & palmetto-residue miserable cypress, pine & swamp.	Bay N. 57° E. 9″ Bay S. 50° W 7″ Gum S. 30° E 15″

FORM OF FIELD NOTES.

Distance	*3d Mile West on the North Boundary.*	
24,00	Leave Swamp—to flat 3d pine and palmetto	
40,00	½ mile post Cypress N. 5° E. 35 Lks S. 10° E. 59 Lks.	
80,00	Set 3rd mile post—	Pine N. 62° W. 23 Links.
	First 24.00 chains swamp	Pine S. 30° W. 81″
	Residue flat 3d pine	Cypress N. 57° E. 101″
	and palmetto	Pine S. 63° E. 34″
	4th Mile West on the North Boundary.	
3,00	To cypress and pine swamp (saw-grass, briers, &c.)	
40,00	½ mile post Cypress, N. 16° W. 25 Lks Pine S. 59° E. 23 Lks	
55,00	A skirt of 3rd rate flat pine land 18 Chains X	
68,50	through swamp, to flat 3rd rate pine and palmetto	
80,00	Set 4th mile post—	Pine N. 29° E. 70 Links
		Pine S. 70° E. 10″
		Bay N. 82° W. 21″
		Bay S. 76° W. 24″

(This copy of General Instructions was made from an original volume now in the possession of the National Archives.)

GENERAL INSTRUCTIONS TO DEPUTY SURVEYORS.

LITTLE ROCK.

PRINTED BY ELI COLBY:

Office of the Arkansas Times and Advocate.

1843.

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GENERAL INSTRUCTIONS

TO DEPUTY SURVEYORS.

SURVEYOR'S OFFICE,
Little Rock, 18

To

Deputy Surveyor.

SIR: In the execution of surveys under the authority of this office, the following general instructions have been prepared for the guidance of the Deputy Surveyors, and must be strictly adhered to in all cases not otherwise provided for by special instructions.

You will provide yourself with a compass of excellent quality and approved construction, having a *nonious division*; also, with two two-pole chains, of fifty links (of equal length) each, both of which must be adjusted to the standard measure in this Office, one to be kept for a standard and the other used in surveying. The chain you use in surveying must be compared and adjusted to your standard at least once in every two days,

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and their difference, if any, noted in your Field Book; and, if there is no difference, state in your Field Book the fact of your having compared and found them to agree.

You must likewise provide yourself with a full set of tally rods, of iron or steel, or pointed therewith, and allow none others to be used but the precise number you shall have selected for that purpose.

It is enjoined on you, not to employ any person whose principles are known or supposed to be corrupt, as chain-man, marker, or any other important business connected with the execution of Surveys which you may have to perform; nor is any one to be employed in the capacity above stated, who is not a free white person, and who has not attained years of discretion sufficient to understand the nature and solemnity of an oath.

Each of your Field Books will commence (on the third or fourth page from the beginning thereof) with a list of your chain-men, blazers, and flag-men, then in your service; and intended to be employed in performing the surveys you are about to execute. The first book under your contract will contain an attested record of their oaths; and whenever you may employ any others, you will insert their names, together with their oaths in your Field Book, before they are permitted to commence work. You will also, when a chain-man, blazer, or flag-man is dismissed, or quits work from any cause *whatever*, note it in your Field Book.

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FORM OF OATH FOR ASSISTANTS.

State of Arkansas,
County of _____.

I, A_____ B_____, do solemnly swear, (or affirm as the case may be.) in the presence of Almighty God, that, in measuring where the surface of the country is hilly or irregular, I will level the chain and plumb the pins, so as to obtain the true horizontal distance, and faithfully and impartially execute and fulfil in all things the duty which may be assigned me, as chain-man, or blazer, or any other service which may be required in executing the surveys of the public lands, to the best of my abilities, so help me God.

A. B.

Sworn to and subscribed before me, in the County and State above mentioned, this _____ day of _____, A. D. 18____.

E. F. *Deputy Surveyor.*

No lines of whatever description are to be run, or marks of any kind made, by any person but yourself, or persons under your immediate *personal inspection*. Sub-contracts are illegal.

The Townships are to be laid off as nearly six miles square as possible, by lines running North and South six miles (called Range lines,) and the corresponding corners joined by lines running East and West (called Township lines;) and they (i. e. the Townships) are to be sub-divided into 36 Sections, each to be one mile square as nearly as may be. The Sec-

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tions to be numbered by beginning with No. 1, in the North East of the Township, and going West and East alternately through the Township, with progressive numbers, ending with 36 in the South East corner thereof.

If by reason of local attraction, or any other cause whatever, any line or lines cannot be accurately run with the use of the needle, the manner of operating must be fully and explicitly noted in your Field Book.

TOWNSHIP BOUNDARY LINES, HOW RUN.

All township boundary lines must be run with the compass adjusted to the true meridian, unless otherwise instructed by this office. The variation of the needle should be taken by an astronomical observation, at least once in every Fourth Range and Township, and the result entered in your Field Book.

Range lines will be run North or South, as the case may require, and corners for quarter sections and sections will be established thereon, at every half mile and mile for the quar-

ter sections and sections to the *West*, and *not* for those to the East of the line, except at Township corners.

East and West *standard* lines will be run East or West, as the case may require, and corners established thereon, at every half mile and mile, for the quarter Sections, Sections and Townships *North* of the line, and *not* for those South of it.

All East and West Township boundary lines, others than standard lines, will be run West on

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randoms, and corrected East from Township corner to Township corner; and the excess or deficiency in the length of the boundary, must be added to, or deducted from, the south boundary of Section 31 West of the quarter Section corner. The Section and quarter section corners, East of the quarter section corner on the south side of Section 31, will be established on the corrected line, at every half mile, and mile therefrom.

At the intersection of all lines, *(randoms excepted,)* with navigable water courses, you will establish corners for fractional sections.

Whenever your course may be obstructed by impassable obstacles, you will state in your Field Book, the precise way you may adopt to prolong the line across.

SUB-DIVISIONAL LINES OF A TOWNSHIP, HOW RUN.

Sub-divisional lines of a Township will be run with the compass adjusted to the East boundary thereof, and the operation of ascertaining it, and the result, must be minutely stated in your Field Book.

In sub-dividing Townships, you will commence at the corner to sections 35 and 36, on the South boundary of the Township, and move on in continued progression, in order that the excess or deficiency of the Township, as to complete sections, may be thrown upon the lines between the northern and western tiers of Sections, North and West of the quarter section corners on those lines.

All *North* and *South* sub-division lines, except

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those between the northern tier of sections, must be one mile in measure by the chain, at the end of which distance, section corners; and at 40 chains on each Section line, quarter Section corners must be established. In running North between the northern tier of sections, establish the quarter section corners on the lines at 40 chains, so as to throw the excess or deficiency in the length of the lines, north of the quarter section corners; at the intersection of those lines with the north boundary of the Township, establish corners, (the bearing trees to be taken in the sections for which the corner stands,) from each of which ascertain the the distance to the nearest known corner on the boundary.

In Fractional Townships, on navigable rivers, it may be necessary to run the lines from the rectilineal boundary of the Township, whether North, South, East or West, as the case may be, and throw the Fractional Sections on the river; it is preferable however, where the exteriors of a Township are one continued line, that the sub-division *North* and *South lines*, should progress from South to North in their usual order, unless the barrier be inseparable.

If it should become necessary to run the lines between the northern tier of sections, South from the corners on the north boundary of the Township, you will take two bearing trees at each of those corners, which trees must be on the south side of the boundary, and in the Sections for which the corner stands.

The *East* and *West* section lines, except those

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in the west tier of sections, and those which cross navigable water courses, will be run from the proper section corners, on random lines, (without blazing,) for the corresponding section corners; temporary quarter section corner posts will be set at 40 chains, and the distance at which you intersect the Range or Section line, and your falling North or South of the corner run for, will be noted in your Field Book; from which corner you will correct back, by running in a direct line for the corner first run from, and remove the temporary quarter Section corner post, and place it, and establish the corner on the true line equidistant, or at the average distance between the section corners.

Where a Township is not rectangular, it may be convenient to deviate from the cardinal points *in running random lines*, in order to intersect near to the corner run for. There are no objections to this mode; *but the exact course at which you run, must in every instance be stated in your Field Notes.*

The East and West lines in the west tier of sections, will be run *West* on *true* lines, and the quarter section corners established at 40 chains, in order to throw the excess or deficiency in the length of the lines, west of the said quarter section corners; at the intersection of these lines with the west boundary of the Township, establish corners, (the bearing trees to be taken in the Sections for which the corner stands,) from each of which, measure the distance to the nearest corner on the boundary. If it should become necessary to survey the lines

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between the western tier of sections *East* on *true* lines, or you should be required by special instructions, to survey them west on *random* lines, and correct them back from the corners on the range line, you will in either of these instances, take two additional bearing trees, on the east side of the range line at each section corner thereon, for the sections in the Township East of such Range line, and make an entry of the same in your Field Book.

Whenever your East and West sub-division lines, other than those in the west tier of sections, cross a navigable river, (or other water course,) you will run from the proper section corners both East and West on true lines, to the said river,

and establish corners at each intersection, on opposite banks, and make an accurate correction between the corners thus established.

When from wide closes and the excess or deficiency in the length of the section lines of a Township which you may be sub-dividing, you are led to believe that error exists, say to the amount of 1 chain and 50 links, in any particular mile of an exterior line, you will *remeasure* the suspected line and make an entry of the fact in your Field Book. But when the error is found to exceed 1 chain and 50 links, or you find that each mile of an exterior line of a Township is uniformly 100 or more chains longer or shorter than a mile, you will in either of those cases, make a *resurvey* of such boundary, and obliterate the old or former corners; *provided, however, the*

sub-divisional lines of any adjacent Township have not been surveyed and closed upon said boundary; if the lines in any Township adjacent have been surveyed and closed thereupon, you are only required to *re-measure* the boundary from section corner to section corner as formerly established.

MEASUREMENT.

As measurement by the chain is the principal source of errors in surveying, you cannot be too particular in your attentions to your chain-men. Where the ground is uneven, make them in every instance, level the chain and plumb the pins, so as to obtain the true horizontal distance.

Although your lines are to be measured with a chain of two poles, you are to keep your reckonings in chains of four poles, or one hundred links each; and all entries in your Field Book, and all plans and calculations are to be made according to the decimal measure of a chain.

In the measurement of lines whether exterior or sub-divisional, the distances to objects, on each mile, must be counted from the particular Section corner started from, and the count to cease as soon as the next Section corner is reached.

All lines, both exterior and sub-divisional, which have been run on Randoms, must, when corrected back, be chained, so that the distances to all objects and offsets around impassable barriers shall appear in the notes of

the corrected instead of the Random lines.—The length of the line as found on running the Random, will be used, unless upon the measurement of the corrected line you find palpable error.

MEANDERING.

All rivers that may bound or pass through your district, which are navigable, and all lakes of sufficient magnitude to justify the expense, must be accurately meandered; the courses and distances of the meanders to be entered in your Field Book, of the sub-division of the Township, in the order the work is performed on the ground.

In meandering, you will state particularly, in your field notes, at what corner you commence the meanders of each fractional Section, and also the corner to which you close. You will likewise state on which side of the river you are meandering, whether on the right or left bank, and whether up or down stream; and also, which side of lakes, whether on the North, South, East, West, S. E., S. W., N. W., or N. E. sides. When closing meanders on a surveyed line where no corner has been established, or if established has been destroyed, you will establish a corner on said line for the proper fractional Sections, and measure therefrom, and state in your field notes the distance to the nearest corner on said line.

If you should be compelled to base lines upon meanders, the *Latitude* and *Departure*

made in arriving at the line to be established, must, in all such cases, be explicitly stated in your Field Book.

LIMITS WITHIN WHICH YOUR SURVEYS MUST CLOSE.

After having made allowance for inaccuracy or obliquity in adjoining Surveys, an excess or deficiency in the close or length of a Township boundary line, of more than 5 chains, of a Section line of more than 1 chain, and of one mile of meanders, of more than 1 chain and 50 links, will be sufficient to cause a distrust in the accurracy of the Survey, and will render a re-survey necessary, since no Survey will be received that does not close within those limits; it will therefore be necessary for you, whilst on the ground, and immediately after surveying each Township and Section line and the line of meanders through each Section, to test and satisfy yourself that they each close within the above prescribed limits; if they should not, a re-survey must necessarily be made. By pursuing this course—which is hereby enjoined—you will save the time of the office, and the consequent trouble and expense to yourself of returning to correct errors, which would otherwise be overlooked.

LINES, HOW MARKED.

All trees which your lines, both exterior and sub-divisional (Randoms excepted) strike, must have two notches cut on each side of

each tree, exactly where the line strikes and leaves them, which places you can indicate to your blazer by striking the point of your jacob staff into the tree at the spot for the notches; no other mark or blaze whatever is to be made thereon: at least one or two of these line trees on every half mile, with its name and diameter, and the distance thereto must be accurately noted in your Field Book. *All* trees on

each side of the line and near thereto (except Randoms) must be marked with two spots or blazes, diagonally, or quartering towards the line. *For the purpose of having the lines of Survey well blazed, you are required to have two good blazers constantly employed, blazing the same line at the same time.*

CORNERS, HOW MADE.

Township, Section, fractional Section and quarter Section corners will be perpetuated by setting a post of the most durable wood that can be procured in the vicinity thereof, firmly in the ground, at the exact point for the corner.

In lieu of posts you may use stones, which are to be, each, not less than equal to 6 inches square; the shape is not very material—an oblong, twelve or fourteen inches in length, set to the depth of seven or eight inches in the earth, would be the most preferable. Whether posts or stones are used, the fact must be stated in your Field Book. Posts used for Township, Section and fractional

Section corners, must be at least four inches, and those for the quarter Section corners, three inches in diameter; they must be neatly squared off from about half way to the top, and placed in the ground, so that the corners thereof will correspond to the cardinal points. If a tree should happen to be on the exact point for a corner, it must be well blazed on the sides towards the Sections for which it stands as a corner, and the fact, with the kind and diameter of the tree, stated in your Field Book. From a Township, Section, and fractional Section corner, you will ascertain and *state* in your *field notes*, the course and distance to a tree in *each* Section for which said corner is made or stands; each of said trees you will mark with a blaze facing the corner; on this blaze, which must be neatly made, you will mark with a marking iron, in a plain, distinct and permanent manner, the letter "R," with the number of the Range, and under this letter "T," with the number of the Township, and under this the letter "S," with the number of the Section; for instance, suppose a tree stood in Section 1 as a bearing tree to the corner of Sections 1, 2, 11 and 12, T. 1 N., R. 12 W., the marks on it would be as follows—"R. 12 W., T. 1 N., S. 1."

In no instance should a bearing tree be taken in a Section for which the corner is not established, unless compelled on account of the scarcity of trees, in which case the tree

will only be marked with the letters B. T., *and the fact stated in your field notes.* When at any corner there is not a tree within a reasonable distance, in each of the *Sections for which the corner stands*, which can be used as a bearing tree, the fact must be stated in your field notes. When there are but two trees within a reasonable distance of a corner, and those two should happen to be in the same section, you will take the bearing and distance to both, and mark one of them with the number of the Section, Township and Range, and the other with the letters B. T., and the fact of there being no other trees must also be stated in your field notes.

Two bearing trees must be taken at the quarter Section corners, which trees must be marked with blaze facing the corner, and this "1-4 S.," on the blaze.

You will select for bearing trees those which are the soundest and most thrifty in appearance, and of the size and kinds of trees which experience teaches will be the most permanent and lasting. In prairie or any other countries where bearing trees cannot be found within a reasonable distance, say 10 chains of a corner which you are to establish, you must in that case and in all similar ones, erect mounds of earth covered with sod, to perpetuate such corners.

The mounds must be for quarter Section and Section corners, two feet six inches high, and two feet in diameter at the base;

for Township corners, three feet high and three diameter at the base. At all corners where mounds are necessary, you will deposit therein, at or near the bottom, a rock or rocks weighing not less than ten pounds, a cylinder of charcoal not less than six inches long and two inches diameter, or a quantity of glass or cinder from a blacksmith's shop, not less than half a pint.

Whenever a corner, whether a quarter Section, Section, or Township corner, shall be inaccessible, a witness corner will be made on *each* margin of the obstacle, at the points where the surveyed lines intersect and leave it; for example, suppose the inaccessible corner is a corner for four Townships or Sections, four witness corners will, in that case, have to be established, one on each of the surveyed lines where they intersect the obstruction.

THE FIELD BOOK.

Entries to be made in the Field Book in addition to those already required to be made—to wit:

The distances from corner to corner; the name, diameter, course and distance to all bearing trees, (the name of the bearing tree to be fully written out, and never abreviated;) the courses and distances of the meanders of navigable water courses; the closes of your lines at their intersection with exterior or other lines; the fallings of random lines; offsets around obstacles; the name, size and precise distance to the line trees; the distance to and where you

leave all lakes, streams, swamps, fields, prairies, travelled roads and tracks, (denoting the places to which, and from where they lead,) creek and river bottoms, mountains, hills, bluffs, and other natural objects, with their course as well as you can conjecture; the distance to all mines, *Salt* and other mineral *Springs, Salt Licks, Forges,* factories, cotton gins and other houses; the distance to and where you leave towns and villages with their names. The location of other objects that are not on your lines which may come to your knowledge, such as *Salt Springs*, lead mines, houses, fields, &c., must

also be noted in your Field Book. You will never give *original* names to such objects as have already been named.

At the end of every mile in running either exterior or sud-divisional lines, and at the end of the meanders of each fractional section, you will give a particular description of the face of the country, whether level, hilly or mountainous; of the quality or rate of the soil, whether 1st, 2nd, or 3rd rate, or unfit for cultivation, and if liable to inundation state to what depth; of the kinds and quality of the timber and under-growth. The description of each mile, must be for that particular mile, and not refer to any previous description.

All notes of *corrections* and *re-survey* and the cause thereof, must be entered in your Field Book as such, and reference must be made from the erroneous to the page which contains the re-survey, by writing the word "re-surveyed," and the page upon which the

re-survey is to be found, across the notes of the erroneous survey; the re-survey must be headed as such.

The entries must be made in the order from day to day as the work is executed on the ground, including all re-surveys and corrections, and the date must follow each day's work.

If in the subdivision of a Township, the notes of the random and true line, (between the same sections,) are taken on different pages, and are separated by intervening notes of other lines, reference must be made from the random to the page containing the notes of the true line.

You must, at the beginning of each of your Field Books, and at the commencement of each day's work, when starting a section line, write out in full, the name of the Township, whether North or South of the base line and East or West of the 5th Principal Meridian.

No memorandum or writing of any description, should be made in the Field Book, except such as relates exclusively to the surveys.

Your books into which your original notes are to be taken in the field, will be of a size to be prescribed by this office; they must be of the best quality of paper, and the entries must be made in the plainest and fairest hand-writing, so plain and intelligible that a letter or figure cannot by possibility be taken for any thing else than what is intended, or your meaning in any way whatever misconstrued.

The notes of the sub-division of each Township, must be kept in separate books. The me-

anders in a Township are considered as sub-divisional work.

The notes of exterior lines, must be kept to themselves, in books of a convenient size.

The *two out side pages* of your Field Books, must be left blank, and kept as clean as possible by a cover of leather or paper; which cover can be taken off when the books are returned to this office.

Your Field Books must be paged, and a neat index made in the front of each, immediately preceding the page containing the oaths of your chain-men.

If an instance should occur from inclemency of weather, that you cannot write in your Field Book without obliterating and defacing your notes, you can, in that case, take the notes on a detatched piece of paper, which however, you must write off into your regular Field Book, in the proper place as soon as the weather will permit; and the scraps *must, in all such cases, be returned with your regular* original Field Book to this office, that they may be compared.

You will leave a margin of at least half an inch on each edge of every page of your Field Book, so as to admit of binding, and also to prevent the obliteration of the notes.

In taking your Field Notes, you will abreviate only those words which are abreviated in the form for keeping the Field Notes hereto appended.

You must make, or have made out, and return with your original Field Books, a fair and

correct copy thereof, to be of a form to be prescribed by this office. And you will also make out and return with your original Field Notes, an accurate plat or sketch of your surveys, which must exhibit the true situation of all objects noted in your Field Book; and it would be well to make on the temporary outside cover of each Field Book, a Plat, upon which you could portray, while on the ground, those objects.

[Page 22 is blank. Inserted between pages 21 and 23 is a township diagram, deleted here, which is referred to as a "map" in the sample field notes. These sample field notes differ slightly from those of 1837.]

FORM OF KEEPING FIELD NOTES OF EXTERIOR BOUNDARY LINES OF TOWNSHIPS.

If first book, give the oaths of assistants. Then say: "Chain compared with the standard and found to be correct—

Adjusted my compass to the true variation of the needle, which is _____ E."

Suppose the line to be surveyed in the East boundary of Township 1 North, Range 12 West.—See Map.

CHAINS.	
NORTH	along the east side of Section 36, Township 1 north of the base line, Range 12 west of the 5th principal meridian.
20.10	A brook 20 links wide runs NW.
35.00	A red oak 15 inches dia.
40.00	Set a ¼ Sec. corner post, from which a red oak 10 inches dia. bears N. 30d, W. 16 links, and a hickory 18 inches dia. bears S. 15½d, E. 10 links.
55.25	An impassible lake bears NE. and SW. thence offset, East 10.00 chains, North 5.00 ″ East 2.50 ″ North 3.75 ″ —across the lake, West 12.50 ″ —to the true line in advance of the
64.00	lake; blaze the line south to the lake 3.25 chains; which is 5.50 ch's wide on the line.
71.10	A black walnut 8 inches dia.
80.00	Set a post for corner to Sections 25

and 36, from which a hickory 6 inches dia. bears S. 18d, W. 11 links, and a white oak 20 inches dia. bears N. 72d, W. 36 links.

	Land level, and 1st rate soil; timber, oak, hickory, hackberry, walnut, &c.; undergrowth, green briars, vines, &c.

Proceed as in the foregoing manner, along the East boundary of Sections 25, 24, 13 and 12; then along the East side of Section 1, as follows:

CHAINS. NORTH	along the East side of Sec. 1, T. 1 N., R. 12 W.
8.00	A bayou 100 links wide, runs NE.
9.50	A road leading from _____ to _____ bears NE. and SW.
12.16	Entered bottom of _____ river, bears E. and W.
21.54	An ash 10 inches dia.
35.66	Intersected the right bank of _____ river, runs E.; navigable; where set a post for corner to fractional Sections 1, T. 1 N., R. 12 W., and 6, T. 1 N., R. 11 W., from which a cottonwood 30 inches dia. bears S. 41d, W. 18 links and a cottonwood 35 inches dia. bears S. 60d, E. 28 links.
48.52	To the left bank of _____ river; distance across obtained by calculation whereset a post for corner to fractional Sections 1, T. 1 N., R. 12 W., and 6, T. 1 N., R. 11 W., from which an

-25-

	elm 18 inches dia. bears N. 69d, E. 18 links, and a sweet gum 15 inches dia. bears N. 19d, W. 40 links.
63.11	A sweet gum 15 inches dia.
71.81	Left bottom which bears NE. and SW. and entered upland.
80.00	Set a post for corner to Sections 1, 6, 31 and 36, and to townships 1 and 2 N., Ranges 11 and 12 W., from which a red oak 10 inches dia. bears S. 10d, E. 11 links; a post oak 24 inches dia. bears S. 46½d, W. 23 links, a white oak 14 inches dia. bears N. 18d, W. 38 links, and a white oak 10 inches dia. bears N. 35d, E. 50 links.
	Land south of the bottom second rate soil; timber, oak and hickory; no undergrowth; the bottom first rate soil; timber, sweet gum, elm, cottonwood, &c. with heavy cane; north of the bottom, third rate soil and rocky; timber mostly oak, some hickory; undergrowth oak bushes.
	1st _____ 18

(Suppose the corner to Townships 1 and 2 North, Ranges 12 and 13 West, had been established, (see Diagram.) then proceed as follows:)

Chain compared with the standard, and found ½ an inch too long, which I adjusted.

CHAINS. WEST	on a random line along the South side of Section 36, Township 2 North of the base line, Range 12 West, of the 5th principal meridian.

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40.00	Set a temporary ¼ Section corner post.
80.00	Set a post for temporary corner to Sections 35 and 36.

(Proceed in this manner along the South side of sections 35, 34 33, and 32; then along Section 31, as follows:)

CHAINS. WEST	on a random line along the South side of Section 31, Township 2 North, Range 12 West.
16.00	A navigable Lake bears North and South 10.66 chains wide, distance obtained by calculation.
40.00	Set a post for temporary 1-4 Section corner.
81.50	Intersected the Range line 2.50 lks. South of the corner, to Townships 1 and 2 North, Ranges 12 and 13 West.
	2d _____ 18

Chain compared, and found correct.

CHAINS. EAST	corrected the line along the South side of Section 31, Township 2 North of the base line, Range 12 West of the 5th principal meridian.
13.10	Entered A. B's. field brs. N. W. and S. E.
25.00	Left the field, brs. N. E. and S. W.
25.86	An ash 10 ins. dia.
41.50	Set a ¼ Section corner post, from which an ash 15 ins. dia. brs. N. 18d,

-27-

	E. 19 lks. and an Elm 18 ins. dia. brs. N. 35d, W. 25 lks.
55.23	Set a post on the West side of the Lake, corner to fractional Sections 6, Township 1 North, Range 12 West, and 31, Township 2 North, Range 12 West, from which a hackberry 6 ins. dia. brs. N. 60d, W. 56 lks. and a sweet gum 12 ins. dia. brs. S. 42d, W. 47 lks.
65.79	To the East side of the Lake; distance across obtained by calculation; where set a post for corner to fractional Sections 6, Township 1 North, Range 12 West, and 31, Township 2 North, Range 12 West, from which a box elder 10 ins. dia. brs. N. 28d, E. 14 lks. and a willow oak 15 ins. dia. brs. S. 64d, E. 18 lks.
71.33	A white oak 15 ins. dia. on the bank of a bayou, 50 lks. wide, runs S. E. out of the Lake.
81.50	Set a post for corner to Sections 31 and 32, from which a hickory 15 ins. dia. brs. N. 31d, E. 25 lks. and a hackberry 6 ins. dia. brs. N. 18d, W. 20 lks. Land level, and 2nd rate, soil inclined to be wet, subject to overflow from the Lake, about 2 feet deep. Timber, oak, hickory, hackberry, sweet gum, &c. Undergrowth, small cane, green briers and vines.

(Proceed in this manner, along the South boundary of Sections 32, 33, 34 and 35, thence along Section 36, as follows:)

-28-

CHAINS EAST	on a true line along the South side of Section 36, Township 2 North, Range 12 West.
3.25	A spring branch runs S. E., the spring 10 lks. to the North.
23.18	A white oak 20 ins. dia.
25.30	Road leading from _____, to _____, brs. South.
40.00	Set a post for 1-4 Sec. corner, from which a white oak 16 ins. dia. brs. N. 27d, E. 15 lks. and a white oak 12 ins. dia. brs. N. 44d, W. 29 lks.
58.42	A white oak 12 ins. dia.
60.10	A Creek 10 lks. wide, runs S. E.
80.00	The corner to Townships 1 and 2 North, Ranges 11 and 12 West.
	(Here describe the land, &c.)
	3d _____ 18

FORM OF KEEPING FIELD NOTES IN SUB-DIVIDING A TOWNSHIP.

(Suppose Township 1 North Range 12 West, is the Township to be sub-divided—see diagram.)

4th, 18 , commenced the sub-division of Township 1

North of the base line, Range 12 West, of the 5th principal meridian.

(If first book of survey, give oaths of assistants.

Chain compared, and found to agree with) the standard measure.

Adjusted my compass to the East boundary said Township in the following manner:

With my compass set to a variation of 7d

-29-

30m East, I run North, along the East side of Section 36—at 39.98 chains, a point 52 links East of the 1-4 Section corner, at 80.03 chains, a point 107 lks. East of the corner to Sections 25 and 36. I therefore adjust my compass to a variation of 8d 15m East.

(If the East boundary of the Township had been surveyed by yourself immediately previous, you will adjust your compass for sub-dividing as follows:)

By reference to the notes of the survey of the East boundary of the Township as surveyed by me in _____, 18__. I find the said boundary to have been run at avariation of _____d East; I therefore adjust my compass to the same degree.

CHAINS. NORTH	
	between Sections 35 and 36, Township 1 North of the base line, Range 12 West of the 5th principal meridian.
11.53	A hickory 12 inches dia.
24.00	Entered cane, which brs. E. & W.
26.50	To the South side of _____ Lake, which I consider navigable, bears West and NE.; where set a post for corner to fractional Sections 35 and 36, from which a sweet gum 18 inches dia. bears S. 38d, E. 17 links, and a hackberry 12 inches dia. bears S. 45d, W. 12 links.
38.75	The North side of the Lake; distance obtained by calculation; where set a post for corner to fractional Sec-

-30-

	tions 35 and 36, from which an elm 12 inches dia. bears N. 14d, E. 16 links, and a cottonwood 30 inches dia. bears N. 33d, W. 9 links.
40.00	Set a ¼ Sec. corner post from which a sassafras 8 inches dia. bears N. 48d, E. 21 links, and an elm 18 inches dia. bears S. 28d, W. 39 links.
56.00	Left the cane which bears NE. and SW.
63.50	A hackbery 12 inches dia.
79.00	Entered a hurricane which bears NE. and SW.
80.00	Set a post corner to Sections 25, 26, 35 and 36, from which a hickory 12 inches dia. bears N. 63d, E. 42 links, an elm 16 inches dia. bears S. 41d, E. 102 links, and a white oak 20 inches dia. bears S. 37d, W. 168 links; there is no tree in Sec. 26, within a reasonable distance. Land, the first and last ¼ miles, 2nd rate soil; timber mostly oak and hickory; undergrowth oak bushes; the remainder, 1st rate soil; timber sweet gum cottonwood, &c.; undergrowth cane.

CHAINS. EAST	
	on a random line between Sections 25 and 36, Township 1 North, Range 12 West.
40.00	Set a post for temporary ¼ Section corner.
80.33	Intersected the Range line 42 links S. of the corner to Sections 25 and 36.

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CHAINS. WEST	
	corrected the line between Sections 25 and 36.
15.69	A white oak 20 inches dia.
17.00	Entered bottom land which bears NE. and W.
25.50	A creek 100 links wide runs NE.
30.00	Entered low, wet land.
40.16½	Set a post for ¼ Section corner, from which a red oak inches dia. bears S. 18d, E. 25 links, and a post oak 12 inches dia. bears N. 61d, W. 19 links.
50.30	A bluff of rocks insurmountable.
	Offset South 10.00 chains West 15.00 " North 10.00 " regained
65.30	the line at the West side of bluff.
66.14	A black jack 8 inches dia.
68.00	Entered bottom land.
80.33	The corner to Sections 25, 26, 35 and 36. Land, except a few chains at the West end, broken and poor, not fit for cultivation. Timber, oak and hickory. Undergrowth oak, and black jack bushes.
	4th _____ 18

CHAINS. NORTH	
	between Sections 25 and 26, Township 1 North of the base line, Range 12 West of the 5th principal meridian.
25.00	Left the hurricane, bears E. and SW.
26.89	An elm 15 inches dia.

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27.00	A house about 100 lks. west of the line.
28.93	To the South end of a navigable Lake, bears NE. and NW.; where set a post for corner to fractional Sections 25 and 26, from which a box elder 12 inches dia. bears S. 32d, E. 31 links, and a black gum 16 inches diameter, bears S. 75d, W. 15 links.
	From the above corner to fr. Secs. 25 and 26, I proceed to meander along the SW. bank of Lake, through Sec. 26.
	Thence N. 15d, W. 11.00 chains. N. 21d, W. 7.00 " North 10.00 " N. 9d, E. 8.00 " N. 29d, E. 5.00 " N. 40d, E. 2.63 "
70.38	here regained the line, having made 41.45 chains northing; where set a post for corner to fractional Sections 25 and 26, from which a sweet gum 15 inches dia. bears North 59d, East 13 links, and a sweet gum 12 inches dia. bears S. 53d, W. 26 links.
76.32	A sassafras 12 inches dia.
80.00	Set a post for corner to Sections 23, 24, 25 and 26, from which a hickory 16 inches dia. bears S. 35d, E. 27 links; a sweet gum 12 inches dia. bears N. 42d, E. 15 links, an elm 20 inches dia. bears N. 28d, W. 31 links, and a willow oak 12 inches dia. bears S. 51d, W. 12 links.
	(Here describe the land, &c.)

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EAST	on a true line between Sections 24 and 25, Township 1 North, Range 12 West.
5.06	A honey locust 10 inches diameter.
14.67	To the NW. side of a Lake; navigable; where set a post for corner to fractional Sections 24 and 25, from which a black walnut 15 inches dia. bears N. 56d, E. 13 links, and a black gum 18 inches dia. bears S. 73d, W. 25 links.
	From this corner, I measure East 50 links to the water's edge where set an object pole.
	(Here describe the land, &c.)
WEST	on a true line between Sections 24 and 25, Township 1 North, Range 12 West, from the corner on Range line.
15.00	Entered a Cypress Swamp, bears North and South.
22.71	A Cypress 24 inches dia.

30.50	Left the Swamp, bears North and South, and entered heavy cane, which bears North and South.
40.00	Set a post for ¼ Sect. corner, from which a black gum, 8 inches dia. bears S. 37d, E. 21 links, and a hackberry 12 inches dia. bears N. 51d, W. 17 links.
47.56	A black walnut 18 inches dia.
50.15	To the SE. bank of the lake, where set a post for corner to fractional Sections 24 and 25, from which a pecan, 18 inches dia. bears S. 32d, E. 12

-34-

	links, and a sweet gum 15 inches dia. bears N. 47d, E. 15 links. The object pole on the opposite bank of the Lake, bears from this corner S. 88¼d, W. thence due South 46 links, and it bears due West. (Here describe the land, &c.)

Commenced at the corner to fractional Sections 24 and 25, on the East side of Lake, and meander along the East side of said Lake, through Sec. 25, T. 1 N. R. 12 W.

		Chains.	
Thence	S.50½d, W.	4.00	
"	S. 28d, W.	7.00	
"	S. 55d, W.	12.00	
"	S. 9d, W.	10.00	
"	S. 9d, E.	20.00	—at 19.00 chains on this course the outlet of the lake 50 lks. wide, runs NE.
"	S. 23d, W.	5.50	
"	S. 70d, W.	5.50	
"	N. 87d, W.	7.68	—to the corner of fractional Sections 25 and 26. (Here describe the land, &c.)

(Proceed in this manner until you arrive at the corner to Sections 1, 2, 11 and 12, thence between Sections 1 and 2, as follows:)

CHAINS. NORTH	between Sections 1 and 2, T. 1 N. R. 12 W.
20.21	Intersected the right bank of _____

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	River, runs East; where set a post for corner to fractional Sections 1 and 2, from which a box elder 10 ins. dia. bears S. 35d, E. 11 lks., and a hackberry 12 ins. dia . brs. S. 41d, W. 18 lks.
33.86	To the left bank of _____ River, distance across obtained by calculation; where set a post for corner to fractional Sections 1 and 2, from which a sweet gum 18 ins. dia. brs. N. 20d, E. 11 lks., and a sweet gum 12 ins. dia. bears N. 52d, W. 33 lks.
40.00	Set a ¼ Section corner post, from which a hickory 12 ins. dia. brs. South 38d, E. 52 lks., and a hackberry 14 ins. dia. brs. N. 31d, W. 27 lks.
51.10	A hackberry 8 ins. dia.; (and left bottom and entered upland, which bears NE. and SW.)
80.45	Intersected the South boundary of T. 2 N. R. 12 W. 25 lks. East of the corner to Sections 35 and 36; where set a post for corner to Sections 1 and 2, T. 1 N. R. 12 W., from which a burr oak 18 ins. dia. brs. South 46d, E. 33 lks., and a white oak 20 ins. dia. brs. S. 36½d, W. 21 lks. (Here describe the land, &.)

Commenced at the corner to fractional Sections 1 and 2, on the right and South bank of _____ River, and meander downstream along the

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right bank of said River, through Section 1, Township 1 North, Range 12 West.

		Chains.	
Thence	N. 75d, E.	20.00	
"	N. 80½d, E.	10.50	
"	N. 65d, E.	30.00	—at 15.00 chains on this course the mouth of a creek 50 links wide comes from the SE.
"	S. 77d, E.	20.00	
"	S. 85d, E.	4.11	—to the corner of fractional Section 1, T. 1 N., R. 12 W., and 6, T. 1 N. R. 11 W. (Here describe the land, &c.,)

5th _____ 18

(Having progressed with the survey to the corner of Sections 29, 30, 31 and 32, run the line between Sections 30 and 31, as follows:)

CHAINS. WEST	**RE-SURVEYED**—see page 37.
	on a true line between Sections 30 and 31, Township 1 North of the base line, Range 12 West of the 5th principal meridian.
15.50	A path bears N. and S.
23.50	A white oak 30 ins. dia.
29.00	Entered a prairie, bears N. E. and S. W.
40.00	Raised a mound for ¼ Section corner in which deposited two rocks, weighing together about 20 lbs.
65.00	Left the prairie bears N.W. and S.E.

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85.50	Intersected the East boundary of T. 1 N. R. 13 W., 25 lks. South of the corner to S ections 25 and 36. On examining my sketch, I find that the line between Sections 30 and 31, should be about 80.00 chains long; I therefore proceed to re-survey said line.
WEST	on the line previously surveyed, (see page 36,) between Sections 30 and 31, T. 1 N. R. 12 W.; on a re-survey.
15.48	A path bears N. and S.
23.49	A white oak 30 ins. dia.
29.00	Entered prairie bears N.E. and S.W.
35.96	The former ¼ Section corner mound, which I destroy.
40.00	Raised a mound for ¼ Section corner, in which deposited two rocks, weighing together, about 20 lbs.
60.00	Left the prairie, bears N.W. and S E.
80.50	Intersected the East boundary of T. 1 N. R. 13 W., 25 lks. South of the corner to Sections 25 and 36; where set a post for corner to Sections 30 and 31, T. 1 N. R. 12 W., from which a white oak 15 ins. dia. brs. S. 62d, E. 35 lks., and a hickory 10 ins. dia. brs. N. 41d, E. 21 lks. (Here describe the land, &c.)

Each of your Field Books must be signed by yourself, and close with a certificate in the following form, to wit:

I certify that the foregoing notes on pages 1 to _____ inclusive, are the original Field Notes

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of the surveys therein specified; that the surveys were executed, and the Field Notes taken by myself in person, (or by _____ _____, under my immediate and personal inspection,) at the dates therein written.

A. B.,

Deputy Surveyor.

The foregoing instructions have been draughted with a view to insure the correct execution of surveys, and uniformity of returns, and with a special reference to the laws of the United States, in relation to the surveys of the public land. They must be strictly adhered to in form and substance.

(This copy of General Instructions was made from an original volume now in the possession of the National Archives.)

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GENERAL INSTRUCTIONS.

OFFICE OF THE SURVEYOR GENERAL OF WISCONSIN AND IOWA, Dubuque, May 28, 1846.

To

Deputy Surveyor,

SIR:—You are to survey in person, or by the assistance of some duly authorized Deputy Surveyor acting under your immediate direction and supervision, the district assigned you under contract of

18 , conformably to such parts of the following instructions as apply to the character of the work for which you have contracted, except so much thereof as is modified or countermanded by manuscript special instructions, hereinafter written.

SYSTEM OF SURVEY.

1. The United States lands are surveyed into rectangular tracts, bounded by north and south, east and west lines. They are first surveyed into townships or tracts of six miles square, which

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are subdivided into thirty-six equal parts, called sections.

2. Townships and ranges number from base and meridian lines—the former bearing due east and west and the latter intersecting them at right angles, and bearing due north and south.

3. The base line of the surveys in Wisconsin is the south boundary of so much thereof as borders the State of Illinois; that of Iowa, is located near the geographical centre of the State of Arkansas.

4. The fourth principal meridian, to which the surveys in Wisconsin relate, starts from the mouth of the Illinois river. The fifth principal meridian, to which the surveys in Iowa relate, starts from the mouth of the Arkansas river.

5. The townships, both in Wisconsin and Iowa, number from their respective base lines, northward; the ranges, in each, number from their respective meridians, both east and west.

6. Sections are numbered from east to west and from west to east progressively, commencing with the north east corner section.

7. Correction lines provide for the error that would otherwise arise from the convergency of meridians, and arrest that arising from the inaccuracies of measurement. They are run due east and west, at stated distances, forming a base to the townships north of them. This base, for each township, is extended sufficiently to meet the convergency for a given distance.

INSTRUMENTS.

Base, meridian, correction and township lines are to be run with an instrument that operates independently of the magnetic needle, which is to be employed only to show the true magnetic variation.

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Section, meander and all other lines interior of a township, may be run either with the same instrument, or with the Plain Compass, provided it is of approved construction and furnished with a vernier or nonius.

ASSISTANTS—THEIR OATHS.

You are to employ no other assistants than men of reputable character, each of whom must, before performing any duty as such, take and subscribe an oath (or affirmation) of the following form, which must be forwarded to or depsited in this office, prior to or upon the return of your field notes:

For Chainmen.

I, A. B., do solemnly swear (or affirm,) that I will impartially and faithfully execute the duties of Chain carrier, that I will level the chain upon uneven ground, and plumb the tally-pins whether sticking or dropping the same; that I will report the true distance to all notable objects, and the true length of all lines that I assist in measuring, to the best of my skill and ability.

Sworn and subscribed before
me at this
18
Justice of the Peace
(or other officer authorized to administer oaths)
of , County
of , State or Territory of

For Flagman or Axeman.

I, C. D., do solemnly swear (or affirm) that I will well and truly perform the duties of axeman or flagman, according to instructions given me, and to the best of my skill and ability.

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MARKING LINES, ESTABLISHING AND MARKING CORNERS.

1. All lines which you actually establish are to be marked as follows: Those trees which intercept your line are to have two notches upon the side where your line intersects and leaves them, without any other mark whatever.

2. A sufficient number of those trees which approach nearest your line, to render the same conspicuous, are to be blazed upon two sides, diagonally or quartering towards the line; the blazes to approach nearer each other the farther the line passes from the blazed trees, and to be as nearly opposite—coinciding with the line—as possible, in cases where they are barely passed.

3. Corner posts are to be made only of the most durable wood found in the vicinity of your lines. Township corner posts must not be less than five, section and meander corner posts four, and quarter section posts three inches in diameter. These posts must be set or driven firmly into the ground, above which they are to appear, at township corners three feet, at section and meander corners two and a half feet, and at quarter section corners two feet.

4. All township and section corner posts are to be squared upon their upper ends and the angles of the square set with the cardinal points of the compass. Township corner posts

must have six notches upon each of the said angles; section corner posts, upon towhship lines, as many notches upon one of the said angles as they are miles distant from the township corner where the line commenced, and interior section corner posts as many notches both upon their south and east angles as they are

-5-

miles distant from the south and east boundaries of the township, respectively.

5. Quarter section and meander corner posts are to be blazed upon two opposite sides, and set with those blazes facing the sections between which they occur.

6. A tree supplying the place of a corner post is to be squared and marked as directed for posts.

7. All posts established at corner of sections are to be mrked upon each side of their squared part with the number of the four sections which those sides respectively face; at meander corners with the number of the sections between which such posts are set and at quarter section corners with ¼ S. upon the two blazed sides.

8. Bearing trees are those of which you take the course and distance from a corner. They are distinguished by a large smooth blaze or chop, fronting the corner, upon which is marked, with an iron made for that purpose, the number of the range, township and section, except at quarter section corners where ¼ S. will supply the number of the section, thus;

R -------- E. or W.
T -------- N.
S -------- or ¼ S.

The letters B. T. are also to be marked upon a smaller chop, directly under the large one and as near the ground as is practicable.

9. Witness trees are signalized and marked as above, but the course and distance to them, as well as the small chop, are omitted.

10. Trees, employed either for the purpose of bearing or witness trees, are to be alive and healthy and not less than five inches diameter.

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11. From all posts established for township corners, or for section corners upon township lines, four bearing trees, if within a reasonable distance, must be taken; one to stand within each of the four sections.

12. At interior section corners four trees, one to stand within each of the four sections, are to be marked; two of them as bearing and two as witness trees.

13. From quarter section and meander corners two bearing trees are marked, one within each of the adjoining sections.

14. Wherever bearing trees cannot be had, quadrangular mounds of earth or stone are to be raised around the corner posts, the four angles of which must coincide with the cardinal points of the compass.

15. Mounds, at township corners are to have a base of five feet, a top of two feet, and a height of three feet; at section, meander and quarter section corners, they are to have a base of four feet, a top of one and a half feet, a height of two and a half feet.

16. Where mounds are made of earth the place from which it is taken is styled the *Pit*, which is to be a uniform and stated distance from the mound in all instances where the same is practicable, viz: at township corners there are to be two pits, one ten links due north, and the other ten links due south; at section corners one pit, eight links due south; at quarter section corners one pit eight links due east, and at meander corners one pit eight links either due north, south, east or west. The distance of the mound and pit to be obtained by measuring from centre to centre. The mounds

-7-

are to be neatly covered with sod in all cases where the same can be had.

17. Posts established in mounds for township corners are to be marked upon each side of the square, with the appropriate number of the range and township; at section corners upon township lines with the appropriate number of the range and township upon two sides thereof, and at interior section corners with the range and township within which such post stands.

18. Whenever the true place of establishing a corner is inaccessible, except it occurs in a body of water that is to be meandered, you are to establish a witness corner as near thereto as is practicable and either due north, south, east or west of it.—Such corner is to be constructed in all respects like the one for which it stands as a witness, with the addition of the letters W. C., immediately over the numbering, both upon the post and trees.

19. When a section or quarter section corner happens at the point for establishing a meander corner, the posts and trees are to be marked with the appropriate numbers for such section or quarter section corner.

MEASUREMENTS AND WHERE TO ESTABLISH MEANDER CORNERS.

1. Your distances are all to be noted and returned in chains and links and to be taken with a half or two pole chain of fifty parts, each measuring seven inches and ninety-two hundredths. The length of your chain should be adjusted by means of a screw attached to the handle of the hind end; every tenth link should compose a swivel, and all the rings and loops should be welded or brazed.—The accuracy of your chain is to be preserved by

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comparing it with a standard adjusted at this office.

2. Your tally-pins, eleven in number, must not exceed fourteen inches in length, must be of sufficient weight to drop plumb, and are to be made of iron or seasoned wood pointed with steel.

3. The length of every line you run is to be ascertained by horizontal measurement.

4. Whenever your line is obstructed by an object over which you cannot measure with the chain, you are to pass the same by offsets, traverse or trigonometry; observing that the

distance thus obtained, extends no farther than is necessary to actually pass the interposing object.

5. Whenever your course is so obstructed by navigable streams, or other bodies of water which are to be meandered, you are to establish a meander corner at the intersection of your lines with both margins thereof, and of all islands therein.

TOWNSHIP LINES.

1. North and south lines are termed range lines; east and west, township lines. The former are styled, in the field notes, the line between certain ranges; the latter, the line between certain townships. Each mile both of a range and township line, is particularized by the number of the sections between which it is run, thus; north between sections 31 and 36, west between section 1 and 36.

2. Upon the base or township line forming the southern boundary of your district, township corners are established at intervals of six miles. From each of these corners you are to run range lines due north, six miles; establishing a quarter section corner at the end of the first forty, and a section corner at the end of the first eighty chains, and observing the same order and intervals of establish-

ing quarter section and section corners to the end of the sixth mile, where you will temporarily set a township corner post.

3. You will then commence at a township corner upon the first range line east of your district, and immediately east of the township corner posts temporarily set by you, and from thence run due west across your whole district, intersecting your range lines at or within three chains and fifty links, due north or south, of your said six mile posts. At the point of intersection, if within the above limits, you will establish a township corner. Upon this township or last mentioned line, quarter section and section corners are to be established at the same distances and intervals as directed for range lines; observing that the length of each and every township line which you are to establish, is in no case to exceed or fall short of the length of the corresponding township boundary upon the south, more than three chains and fifty links. If, however, in closing your first tier of townships, and all others closing to or upon old work, you find it impossible to preserve the true course of your lines and close within the above limits, you are to re-survey and examine until you detect the real cause of discrepancy, which if not in your own work, you will report to this office, and for which you will provide in the field, in all instances where the same is practicable, by adding to, or deducting from the length of your first range line or lines. And where, in order to close a township to or upon old work, you are compelled to employ a variation greater or less than the true magnetic variation, both must be stated.

4. After closing your first tier of townships, you

are to run up and close successive tiers, to the completion of your district, by the same method of survey as directed for the first tier.

5. You are to observe and note the true magnetic variation, at least once upon every mile or section line, and as much oftener as there is a change therein.

6. The bearing trees, standing upon the west side of range, and upon the north side of township lines, are to be entered first in your field notes.

7. After at ownship corner is established as before directed, you are to complete the notes of the corresponding range line, by inserting the said corner, with the true distance thereto, and adding or erasing the notes of any topography or other minutes, that may be included or excluded by thus adding to or deducting from the length of the range line as temporarily established.

8. With your field notes you must return a diagram, drawn upon a scale of one and a half inches to six miles, on which you are to represent each boundary you have run with the length and variation thereof, and with all the topography thereupon that can be properly expressed upon that scale.

SUBDIVISION.

Length of North and South and East and West lines, and where to establish quarter section posts.

1. Every north and south section line, except those terminating in the north boundary, are to be one mile in length. The east and west section lines, except those terminating in the west boundary, are to be within one hundred links of eighty chains in length; and the north and south boundaries of any one section, except in the extreme west-

ern tier, are to be within one hundred links of equal length.

2. The length of the section lines closing to the north and west boundaries, are to be governed by the length of the sixth or closing miles, both of the range and township lines, and must be as nearly of the same length, or of an average thereof, as is practicable.

3. Quarter section corners, both upon north and south and upon east and west lines, are to be set equidistantly from the corresponding section corners; except upon those closing to the north and west boundaries, where the quarter section corners will be established precisely forty chains north or west of the respective section corners from which those lines start.

Method of subdividing; Random, Corrected and True lines, and Diagram..

1. The first mile, both of the south and east boundaries of each township you are to subdivide, is to be carefully traced and measured, before you enter upon the subdivision thereof. This will enable you to observe any change that may have taken place in the magnetic variation, as it existed at the running of the township lines, and will also enable you to compare your chaining with that upon the township lines.

2. Any discrepancy, arising either from a change in the magnetic variation of a difference in measurement, is to be stated as directed under the head of field notes.

3. After adjusting your compass to a variation which you

have thus found will retrace the eastern boundary of the township, you will commence at the corner to sections 35 and 36, on the south

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boundary, and run a line due north, forty chains, to the quarter section corner which you are to establish between sections 35 and 36; continuing due north forty chains farther, you will establish the corner to sections 25, 26, 35 and 36.

4. From the section corner last named, run a random line, without blazing, due east for corner of section 25 and 36, in east boundary. If you intersect exactly at the corner, you will blaze your random line back and establish it as the true line. But if your random line intersects the said range line, either north or south of the said corner, you will measure the distance of such intersection, from which you will calculate a course that will run a true line back to the corner from which your random started.

5. From the corner of sections 25, 26, 35, 36, run due north between sections 25 and 26, setting the quarter section post, as before at forty chains, and at eighty chains establishing the corner of sections, 23, 24, 25, 26. Then run a random line due east for the corner of sections 24 and 25 in east boundary; correcting back in the manner directed for running the line between sections 25 and 36.

6. In this manner proceed with the survey of each successive section in the first tier, until you arrive at the north boundary of the township, which you will reach in running up a random line between sections 1 and 2. If this line should not intersect at the post established for corner to sections 1, 2, 35 and 36 upon the township line, you will note the distance that you fall east or west of the same, from which distance you will calculate a course that will run a true line south to the corner from which your random started.

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7. The first tier of sections being thus laid out and surveyed, you will return to the south boundary of the township, and from the corner of sections 34 and 35, commence and survey the second tier of sections, in the same manner that you pursued in the survey of the first; closing at the section corners on the first tier.

8. In like manner proceed with the survey of each successive tier of sections, until you arrive at the fifth or last tier. From each section corner which you establish upon this tier, you are to run random lines for the corresponding corners established upon the range line forming the western boundary of your township, and in returning, establish the true line as before directed.

9. All section lines are to be right lines, regardless of the number or nature of intervening obstacles; except in the event of their intersecting a lake or pond of such diameter, at the points of intersection, as forbids their continuance by means of a trigonometrical calculation, in which case, and in cases also where a river, lake, correction line, or reservation, form a portion of the boundary of a township, when the closing lines thereupon, will be *true lines,* the courses of which will have a strict reference to the variation and closing of the adjacent lines; the quarter section posts upon which are to be set forty chains from the section corner at which such true lines commenced.

10. In closing upon a correction line, you are to establish a section corner at the point of your intersection therewith, stating the true distance of such intersection from the nearest corner thereon.

11. Field notes of random lines are to embrace

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nothing but the variation, length andlosing thereof.

12. Topography of every description, line trees and corners, are to be taken upon the corrected lines and included in the notes thereof, following which, is to be written the description of the land and timber.

13. With these instructions you are furnished a diagram, drawn upon a scale of one mile to an inch, upon which is represented the magnetic variation or variations and length of each township boundary of the district you are to subdivide, also the topography and corners upon the same, as returned by the township line surveyor. On this diagram you are to represent, as you progress with your survey, the crossing and courses of all streams of water and of the bottom land through which they meander; the intersecton, situation and boundaries of all lakes, ponds, prairies, marshes, swamps, windfalls and all other objects, *mentioned in your field notes,* that can be shown upon said diagram. All the topography thus noted upon your diagrams must be joined or connected, so as to form a complete map of the townships of your district. These diagrams form an essential part of, and must be returned with your field notes.

14. Should you find a manifest error in the measurement of any of the township lines of your district, you are to correct the same, by re-surveying and re-establishing such line or lines, from the point where the error was detected, to the north or west end thereof; noting your intersection with each one of the erroneous corners as you progress, which you are to demolish and deface with all evidences thereof. Of such remeasurement and cor-

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rections you are to take full and complete field notes, in a separate book, to be returned to the Surveyor General's Office, with the field notes of your subdivision. For such corrections, however, the Surveyor General is not authorized to make any compensation.

HOW AND WHAT TO MEANDER.

1. In subdividing any one township, you are to meander as hereinafter directed, any lake or lakes, pond or ponds, lying entirely within the boundaries thereof, of the area of forty acres and upwards, and which cannot be drained and are not likely to fill up, or from any cause to become dry.

2. Whenever required by special instructions, to meander any stream or body of water, passing through or lying within your district, you are also to meander all islands situated therein, which are valuable for their soil or timber.

3. Standing with your face towards the mouth of a stream, the bank on your left hand, is termed the *left bank*, and that

upon your *right hand*, the right bank. These terms are to be universally used to distinguish the two banks of a river, both in running lines and in meandering.

4. In meandering rivers, you are to commence at a meander corner in the township boundary, and take the course and distance of the bank upon which you commence, to a meander corner upon the same or another boundary of the same township, carefully noting your intersection with all intermediate meander corners. By the same method you are to meander the opposite bank of the same river.

5. In meandering lakes, ponds or bayous, you are to commence at a meander corner upon the township line and proceed as above directed for the

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banks of a navigable stream; except where a lake, pond or bayou lies entirely within the township boundaries, when you will commence at a meander corner established in subdividing, and from thence take the course and distance of the entire margin thereof.

6. To meander a pond, lying entirely within the boundaries of a section, you will run a random line thereto from the nearest section or quarter section corner. At the point where this random line intersects the margin of such pond, you will establish a witness point, by fixing a post in the ground and raising a mound or taking bearings, as at a meander corner; except that the post and the large face upon the bearing trees, will be marked with the letter W., only.

7. In meandering islands, you are to proceed as directed in sections, 5 and 6 of this chapter, except that where there are no meander corners established upon an island, you are to take the course and distance of your starting point from the nearest meander corner, instead of section or quarter section corner.

8. The meanders of each fractional section, or between any two meander posts, or of a pond or island interior of a section, must close within one chain and fifty links.

9. Your field notes of meanders in any one township, are to follow immediately after the notes of the subdivision thereof. They are to state and describe, particularly, the meander corner from which they commenced, each one with which they close, and are to exhibit the meanders of each fractional section separately; following and composing a part of which, will be given a description of the

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land, timber, depth of inundation to which the bottom is subject, and the banks, current and bottom of the stream or body of water you are meandering.

10. To furnish data that will enable this office to fix the exact location of all islands, whether to be meandered or not, you will take the bearing of the upper and lower points thereof, from both ends of one or more of your meander courses which form a base line of sufficient length for that purpose.—You will repeat the same process in meandering the opposite bank or margin of the same stream, lake, pond or bayou. You will also note, in the proper place in the meanders of each fractional section, the exact position and extent of all falls and rapids; fords, portages and mill sites existing in, or connected with the river or other body of water which you are meandering.

11. No blazes or marks of any description are to be made upon your meander lines, though the utmost care must be taken to pass no object of topography, *or change therein,* without giving a particular description thereof in its proper place in your meander notes.

FIELD NOTES.

1. Your field notes are to form a full and perfect history of your operations in the field.

2. The field notes of the subdivision of every township, whether fractional or not, are to be written in a separate book.

3. No one page, either of the notes of township lines or subdivision, is to embrace the field notes of more than one section line.

4. Descripton of the timber, undergrowth, surface, soil and minerals, upon each section line, is to

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follow the notes thereof, and not to be mixed with them.

5. The language of your field notes must be so concise and clear, the hand in which they are written so plain and legible, that no doubt can exist as to your figures, letters, words or meaning.

6. No abreviations are to be made in your field notes, except such as relate to course, to express which, the proper combinations of the capital letters, N. S. E. and W. are to be used; except when a course is exactly to a cardinal point, in which case it is to be written full.

7. The description of each mile must be independent, *and not refer to a preceding description.*

8. The date of each days work must follow immediately after the notes thereof.

9. The variation is invariably to occupy a separate line.

10. The first page of a field book of subdivision—a sample of which will be shown or furnished you by this office,—is to embrace only the township and range, State or Territory, name of the deputy, with the dates at which the survey was commenced and finished. The head of each subsequent page will express the township, range and meridian.

11. The second page will contain the notes of your resurvey of the first mile, both of the south and east boundaries of your township; stating the corner at which you commence, the variation you assume, and each corner with which you close.

12. All rivers, creeks and other streams, lakes, ponds, prairies, swamps, marshes, groves, hills, bluffs, windfalls, roads and trails, are to be distinguished in your field notes by their original and re-

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ceived names, only; and where such names cannot be ascertained or do not exist, your imagination is not to supply them.

13. Immediately following your field notes, you will give a general description of the township.

Objects and data to be embraced by your field notes.

You are to enter in their proper places in the field notes of your survey, a particular description and the exact location of the following objects.

1. The length and variation or variations of every line you run.
2. The name and diameter of all bearing trees, with the course and distance of the same from their respective corners.
3. The name of the material of which you construct mounds, with the course and distance to the pits.
4. The name, diameter and exact distance to all those trees which your lines intersect.
5. At what distance you enter, and at what distance you leave every river, creek or other "bottom," prairie, swamp, marsh, grove or windfall, with the course of the same at both points of intersection.
6. The surface, whether level, rolling, broken or hilly.
7. The soil, whether first, second or third rate.
8. The several kinds of timber and undergrowth; naming the timber in the order of its prevalency.
9. All rivers, creeks and smaller streams of water, with their actual or right angled widths, course, banks, current and bed, at the points where your lines cross.
10. A description of all bottom lands—whether

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wet or dry, and if subject to inundation, state to what depth.

11. All springs of water, and whether fresh, saline or mineral, with the course and width of the stream flowing from them.
12. All lakes and ponds, describing their banks and the depth and quality of their water.
13. All coal banks, precipices, caves, sink-holes, quarries and ledges with the character and quality of the same.
14. All water-falls and mill sites.
15. All towns and villages, houses, cabins, fields and sugar camps, factories, furnaces and other improvements.
16. All metalliferous minerals or ores, and all diggings therefor, with particular descriptions of both, that may come to your knowledge, whether intersected by your lines or not.
17. All roads and trails with the courses they bear.
18. All offsets or calculations by which you obtain the length of such parts of your lines as cannot be measured with the chain.
19. The precise course and distance of all witness corners from the true corners which they represent.

AFFIDAVIT.

1. Following the field notes and general description, in each of your field books, an affidavit of the followin form is to be written, and to be signed by yourself and each of your assistants in the field:

I, A. B., Deputy Surveyor, do solemnly swear (or affirm) that, in pursuance of a contract with C. D., Surveyor General of the United States for Wisconsin and Iowa, bearing date the

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day of , 18 , and in strict conformity to the laws of the United States, and the instructions of the said Surveyor General, I have regularly surveyed

principal meridian (State or Territory) of

and I do further solemnly swear (or affirm,) that the foregoing are the true and original field notes of the said survey, executed as aforesaid.

A. B., Deputy Surveyor.

G. H. }
J. K. } Chainmen.
L. M., Marker.
N. O., Flagman.

Subscribed by said A. B., Deputy Surveyor, and sworn before me at

this day of , 18 , P. Q., Justice of the Peace (or other officer authorized to administer oaths) of

in the county of State (or Territory) of

2. Your attention is directed to the following section of an act of Congress, approved, August 8th, 1846, entitled "An Act to equalize the compensation of the Surveyors General of the public lands of the United States, and for other purposes:"

3. "That the Surveyors General of the public lands of the United States, in addition to the oath now authorized by law to be administered to deputies on their appointment to office, shall require each of their deputies, on the return of his sur-

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veys, to take and subscribe an oath or affirmation that those surveys have been faithfully and correctly executed, according to law and the instructions of the Surveyor General; and, on satisfactory evidence being presented to any court of competent jurisdiction that such surveys, or any part thereof, had not been thus executed, the deputy making such false oath or affirmation shall be deemed guilty of perjury, and shall suffer all the pains and penalties attached to that offence; and the district attorney of the United States for the time being, in whose district any such false, erroneous, or fraudulent surveys shall have been executed, shall, upon the application of the proper Surveyor General, immediately institute suit upon the bond of such deputy; and the institution of such suit shall act as a lien upon any property owned or held by such deputy, or his sureties, at the time such suit was instituted."

The above section of the said law, applies to the foregoing affidavit, and will be in all particulars and in every instance, rigidly enforced.

FIELD NOTES OF TOWNSHIP LINES, SUBDIVISION AND MEANDERS, WITH A DIAGRAM.

The following illustration of the manner of arranging and style of entering field notes; is to be regarded by you as a part of your instructions. A single page has been made to embrace

the notes of more than one mile, in order to preserve a convenient size for this book; in this particular, therefore, you will be governed by section 3 under head of field notes. The diagram attached to forepart of this book was platted from the following field notes, and shows the importance of carefully noting all

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the topography your lines intersect; otherwise your diagram, upon which nothing is to appear that is not mentioned in your field notes, will be but a partial and disconnected representation of the topography of the township.

Suveryor General.

TOWNSHIP LINES.

Between Townships 58 and 59 North, Range 36 West, 4th Meridian.

CHAINS.	
	West, between section 1 and 36. Variation 7° 45′ East,
1.89	Bur Oak, 14 inches in diameter.
40.00	Set post for quarter section corner, White Oak, 10 N. 36 E. 34 links, Jack Oak, 12 S. 54½ W. 96 links,
62.81	Jack Oak, 30 inches in diameter,
72.77	Hickory, 12 inches in diameter,
80.00	Set post for corner to sections 1, 2, 35 and 36, Bearings { Bur Oak, 10 N. 22 E. 18 links, Black Oak, 16 N. 84½ W. 92 links, White Oak, 14 S. 62 E. 114 links, Maple, 10 S. 10 W. 55 links, Hilly, 2d rate land—Timber, Black, White and Bur oak; very little undergrowth.
	West, between sections 2 and 35, Variation 7° 47′ East,
26.21	Foot of hill and enter bottom, bears north,
30.10	Harrison's creek 40 links wide, runs north,
40.00	Set post for quarter section corner, Black Oak, 12 N. 42 W. 122 links, Bur Oak, 14 S. 54½ E. 187 links.
60.00	Leave bottom, bears north,
70.10	White Oak, 10 inches in diameter,
80.00	Set post for corner to sections, 2, 3, 34 and 35. Maple, 10 N. 48 E. 114 links, Maple, 12 N. 36 W. 68 links, White Ash, 6 S. 60 E. 25 links, Bur Oak, 9 S. 75 1/2 W. 12 links. Land 2d rate—Timber, Maple, White ash, Bur & Black oak—undergrowth Hazel and Spice.

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Between Townships 58 and 59 N., R. 36 W., 4th Meridian.

CHAINS.	
	West between sections 3 and 34. Variation 8° East.
17.50	Enter marsh, bears N. E.
28.50	Leave marsh, bears north,
40.00	Set post for quarter section corner, White Oak, 12 S. 31 E. 47 links, Bur Oak, 16 N. 64 W. 16 links.
42.50	Parker's run, 12 links wide, runs W. of N.
56.40	Sugar, 20 inches in diameter,
80.00	Set post for corner to sections 3, 4, 33 and 34, Sugar 12 N. 36 E. 100 links, White Oak, 12 N. 75 W. 114 links, Maple, 8 S. 44 E. 56 links, Beech, 14 S. 35½ W. 96 links. Land, except marsh, 1st rate—timber, Sugar, Beech, Maple and Oak.
	West, between sections 4 and 33, Variation 8° East,
17.12	Aspen, 9 inches in diameter,
29.40	Hickory, 14 inches in diameter,
40.00	Set post for quarter section corner, Aspen, 10 N. 52 W. 12 links, Hickory, 6 S. 38½ E. 150 links,
46.19	Red Oak, 20 inches in diameter,
60.00	Enter wind-fall, bears E. S. E.
80.00	Set post for corner sections 4, 5, 32 and 33. Aspen, 6 N. 23 E. 75 links, Red Oak, 10 N. 46 W. 140 links, Hickory, 14 S. 33 E. 200 links, White Oak, 8 S. 25 W. 86 links, Land, rolling and broken, 2d rate—timber, Aspen, Hickory, Red oak—undergrowth, greenbriar and hazel.
	West, between sections 5 and 32, Variation 8° 7′ East,
17.50	Leave wind-fall, bears S. E.
40.00	Set post for quarter section corner, Beech, 12 N. 75 E. 84 links, Maple, 10 S. 14 W. 115 links, Variation 8 degs. 10 m. east.
59.30	Maple, 10 inches in diameter,

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TOWNSHIP 59 NORTH,

Between Ranges 36 and 37 West, 4th Meridian.

CHAINS.	
80.00	Set post for corner to sections 5 and 32. Maple, 24 N. 22 E. 10 links, Bur Oak, 9 N. 32 W. 14 links, Beech, 18 S 46 E. 4 links, Sugar, 16 S. 36½ W. 6 links, Land level, 3d rate—Timber, Beech, Maple, Sugar and Bur oak.
	West, between sections 6 and 31, Variation 8 degs 10 m. East.
21.91	Hickory, 10 inches in diameter,
40.00	Set post for quarter section corner, Hickory, 15 S. 34 E. 13 links, Ironwood, 6 N. 25 W. 10 links,
79.90	Intersect Range line 85 links North of temporary post and set post, Corner to Townships 58 and 59 North, Range 36 and 37 West, 4th Meridian. Hickory, 10 N. 84 E. 100 links, Ironwood, 20 N. 16 W. 96 links, Jack Oak, 12 S. 14 E. 12 links, White Oak, 14 S. 10 W. 104 links. Land level 2d rate—Timber, White and Jack oak, Hickory, Ironwood; undergrowth hazel. JANUARY 10, 1846.
	North between sections 31 and 36, Variation 8 degs. East.
37.50	Enter windfall, bears S. E.
40.00	Set post for quarter section corner,

	Hickory, 12 S. 34 E. 16 links,
	Ironwood, 8 N. 25 W . 20 links,
51.50	Leave windfall, bears S. E.
63.90	Dogwood, 12 inches in diameter,
80.00	Set post for corner to sections 25, 30, 31 and 36.
	Dogwood, 6 N. 46 W. 100 links,
	Ironwood, 4 S. 54 W. 196 links,
	Maple, 10 S. 64 E. 4 links,
	Sugar, 8 N. 19 E. 50 links.
	Land, rolling 2d rate—Timber, Maple, Sugar, Ironwood and Dogwood.

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TOWNSHIP 59 NORTH,

Between Ranges 36 and 37 West, 4th Meridian.

CHAINS.	
	North, between sectios 25 and 30, Variation 7° 50′ East.
17.80	Hickory, 12 inches in diameter,
40.00	Set post for quarter section corner,
	Hickory, 12 N. 64½ E. 12 links,
	Beech, 8 S. 54 W. 4 links,
45.90	Beech, 8 inches in diameter,
80.00	Set post for corner to sections 19, 24, 25 and 30.
	Beech 6 N. 62 W. 24 links,
	Sugar, 4 S. 13 W. 14 links,
	Maple, 10 S. 13 E. 6 links,
	Ash, 8 N. 25 E. 10 links.
	Land, level 1st rate—Timber, Beech, Sugar, Maple and Ash.
	North, between sections 19 and 24, Variation 7° 30′ East.
25.36	White Oak, 12 inches in diameter,
30.56	Bur Oak, 8 inches in diameter,
40.00	Set post for quarter section corner,
	Black Oak, 10 N. 62 E. 100 links,
	Bur Oak, 8 S. 19 W. 6 links,
56.40	Hickory, 11 inches in diameter,
80.00	Set post for corner to sections 13, 18, 19 and 24,
	White Oak, 10 N. 62 W. 14 links,
	Hickory, 14 S. 19 W. 10 links,
	Bur Oak, 4 S. 14 E. 100 links,
	Red Oak, 8 N. 12 E. 96 links,
	Land, good 2d rate—Timber, Rod, Bur and White oak and Hickory.
	JANUARY 11, 1846.
	North, between sections 13 and 18, Variation 7° 55′ East.
5.00	Road from acre to Arpent. bears N. E.
16.72	Enter bottom, bears N. 80 E.
27.50	Left bank of Compass river, runs S. 68 W. and set meander post,
	Sycamore, 24 East 150 links,
	Cottonwood, 12 S. 35 W. 50 links,
39.16	Over river and set meander post on right bank,

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TOWNSHIP 59 NORTH,

Between Ranges 36 and 37 West, 4th Meridian.

CHAINS.	
	Hickory, 8 N. 32 E. 64 links,
	Buckeye, 10 West 12 links.
40.00	Set post for quarter section corner.
	Maple 12 N. 24 E. 4 links.
	Sycamore, 48 S. 13 W. 6 links.
66.25	Leave bottom, bears N. 55 E.
80.00	Set post for corner to sections 7, 12, 13 & 18.
	Hickory, 6 N. 64 W. 4 links.
	Cottonwood, 10 S. 34 W. 10 links,
	Buckeye, 14 S. 42 E. 6 links,
	B. Walnut, 8 N. 13 E 24 links.
	Land, rich bottom—Timber, Hackberry. Buckeye and Sycamore; any quantity of Grapes in bottoms.
	North, between sections 7 and 12, Variation 7° 55′ East.
14.97	Buckeye, 8 inches in diameter,
36.17	Walnut, 36 inches in diameter
40.00	Set post for quarter section corner,
	Sugar, 9 N. 45 E. 14 links,
	Beech, 10 S. 75 W. 18 links,
57.40	Ash, 15 inches in diameter,
80.00	Set post for corner to sections 1, 6, 7 and 12.
	Buckeye, 24 N. 32 W. 114 links,
	Ash, 16 S. 14 W. 98 links,
	Walnut, 6 S. 23 E. 14 links,
	Beech, 12 N. 50 E. 20 links
	Land level and good—Timber, Walnut, Sugar, Beech and Buckeye.
	North, between sections 1 and 6, Variation 8° East.
32.14	Hickory, 16 inches in diameter,
40.00	Set post for quarter section corner,
	Hickory, 10 S. 51 W. 14 links,
	Sugar, 8 N. 64 E. 20 links,
49.13	Elm, 14 inches in diameter,

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TOWNSHIP 59 NORTH,

Between Ranges 35 and 36 West, 4th Meridian.

CHAINS.	
70.27	White oak, 2 inches in diameter,
80.30	Set post for corner to townships, 59 and 60 N., between ranges 36 and 37 W., of the 4th meridian.
	Hickory, 10 N. 62 W. 14 links,
	Sugar, 6 S. 49 W. 9 links,
	Beech, 8 S. 54 E. 11 links,
	Oak, 14 N. 43 E. 100 links.
	Land rolling, first rate—Timber, Hickory, Sugar, Beech and Lind.
	JANUARY 12, 1846.
	North, between sections 31 and 36, Variation 7° 45′ East.
40.00	Set post for quarter section corner,
	Pine, 10 S. 64 E. 114 links,
	Birch, 12 N. 84 W. 100 links.
45.59	White oak, 10 inches in diameter,
80.00	Set post for corner to sect's. 25, 30, 31 & 36.
	White oak, 10 N. 24 W. 24 links,
	Jack oak, 6 S. 15 W. 114 links,
	Bur oak, 14 N. 16 E. 16 links,
	Birch, 20 S. 14 E. 18 links.
	Land hilly, poor sandy soil—Timber, White and Bur oak.
	North, between sections 25 and 30, Variation 7° 40′ East.
37.50	Random creek, 80 links wide, runs N. W. clear, gentle current.
40.00	Set post for quarter section corner,
	Poplar, 12 N. 67 E. 10 links,
	White oak, 24 S. 15 W. 16 links,
52.13	Bur oak, 16 inches in diameter,

80.00	Set post for corner to sections 19, 24, 25 & 30. White oak, 10 N. 12 W. 46 links, Bur oak, 14 S. 34 W. 110 links,

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TOWNSHIP 59 NORTH,

Between Ranges 35 and 36 West, 4th Meridian.

CHAINS.	
	Poplar, 6 N. 4 E. 96 links, Bur oak, 9 S. 19 E. 14 links Land South of Creek, 3rd rate—North of Creek 2d rate—Timber White and Bur oak—undergrowth, Sassafras.
	North, between sections 19 and 24, Variation 7° 30′ East.
6.00	Creek, 16 links wide, runs S. of W.
7.00	Foot of Traverse Mountain bears S. W.
16.00	Summit of same.
37.50	Foot of same.
40.00	Set post for Quarter Section Corner. Lind, 6 N. 15 E. 4 links, Hickory, 8 S. 76 W. 64 links.
54.00	Sugar, 10 inches in diameter.
80.00	Set post for Corner to Sections 13, 18, 19, and 24. Sugar, 16 N. 64 W. 19 links. Lind, 24 S. 24 W. 14 links. Maple, 9 N. 19 E. 8 links. Hickory, 14 S. 47 E. 12 links. South half mile mountainous, third rate. North half mile level, and 1st rate, densely timbered with Sugar, Maple, and Hickory—undergrowth of spice and briars. JANUARY 13, 1846.
	North, between sections 13 and 18. Variation 7° 50′ East.
16.42	White Ash, 10 inches in diameter.
40.00	Set post for Quarter Section Corner. White Ash, 10 N. 13 W. 14 links. Hackberry, 8 S. 16 E. 6 links. About 5 chains west of this corner is a pond, of an area of about five acres.
54.14	Sugar, 10 inches in diameter.
71.81	Black Walnut, 26 inches in diameter.

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TOWNSHIP 59 NORTH,

Between Ranges 35 and 36 West, 4th Meridian.

CHAINS.	
80.00	Set post for corner to Sections 7, 12, 13 and 18. Black Walnut, 10 N. 84 W. 28 links. Sugar, 4 S. 64 W. 12 links. Hickory, 14 N. 84 E. 16 links. White Ash, 6 S. 14, E. 27 links. Land level and first-rate. Timber, White Ash, Sugar, Hickory, and Hackberry—under growth, spice.
	North, between Sections 7 and 12. Variation 7° 55′ East.
10.14	Sugar, 10 inches in diameter.
30.74	White Oak, 20 inches in diameter.
40.00	Set post for quarter section corner. White Oak, 10 N. 14 E. 144 links Hickory, 12 S. 41 W. 6 links.
57.75	Reeder's Run, 14 links wide, runs S. W. gentle current, rock channel.
80.00	Set post for corner to sections 1, 6, 7 and 12. White Oak, 6 N. 14 W. 6 links. Hickory, 10 S. 16 W. 11 links. Sugar, 28 N. 41 E. 10 links. Beech, 18 S. 28 E. 28 links. Land first-rate, Timber, White oak, Hickory, Sugar, and Beech.
	North, between sections 1 and 6. Variation 7° to 40′ East.
40.00	Set post for quarter section corner. Ash, 32 S. 75 E. 10 links. Walnut, 24 N. 14 W. 14 links.
70.11	White Ash, 10 inches in diameter.
80.50	Set post for corner to Townships 59 and 60 North, Ranges 35 and 36 West of the 4th Meridian. White Ash, 14 N. 14 W. 104 links

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Between Townships 59 and 60 N. R. 36 West, 4th Meridian.

CHAINS.	
	Beech, 9 S. 16 W. 94 links. Walnut, 6 N. 40 E. 14 links. Sugar, 14 S. 53½ E. 63 links. Land rolling, first-rate, Timber, of Ash, Walnut, Sugar, and Beech. JANUARY 14, 1846.
	West, between sections 1 and 36. Variation, 8° 25′ East.
23.40	Beech, 20 inches in diameter.
40.00	Set post for quarter section corner. Beech, 16 N. 13 E. 6 links. Maple, 12 S. 31 W. 10 links.
55.00	Road from Arpent to Rangeville, bears N. E.
80.00	Set post for corner to sections 1, 2, 35 & 36 Maple, 9 N. 14 E. 12 links. Sugar, 15 N. 25 W. 96 links. Beech, 12 S. 14 E. 100 links. Ash, 14 S. 12 W. 6 links. Land rolling, first-rate, Timber, Sugar, Beech, and Maple.
	West, between sections 2 and 35 Variation, 7° 30′ East.
12.50	Enter rich bottom, bears S. W.
15.49	Walnut, 36 inches in diameter.
40.00	Set post for quarter section corner. White Ash, 12 N. 46 E. 10 links. Beech, 16 S. 49 W. 14 links.
50.83	Left bank of Compass River, runs South, and set a meander post. Sycamore, 36 N. 25½ E. 16 links. Buckeye, 10 S. 50 E. 14 links. Set flag in line on opposite bank. Offset South 323 links, from which point to flag bears N. 69 W.—distance across river 8 chains and 40 links.
59.23	Over River and set meander post on right bank.

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Between Townships 59 and 60 N., R. 36 W., 4th Meridian.

CHAINS.	
	White Ash, 30 N. 15 W. 10 links. Soft Maple, 40 S. 20 W. 16 links.
61.12	Walnut, 36 inches in diameter.
72.50	Leave bottom bears S. W.
80.00	Set post for corner to sections 2, 3, 35 and 36. Walnut, 20 N. 16 E. 23 links.

	Buckeye, 12 N. 54 W. 16 links. Sugar, 28 S. 43 E. 4 links. Maple, 40 S. 22 W. 12 links. Land, rich level bottom, first-rate. Timber, Walnut, Sugar, Maple, and Buckeye.
	West, between sections 3 and 34. Variation 7° 40′ East.
24.16	Bur Oak, 24 inches in diameter.
40.00	Set post for quarter section corner. Elm, 24 N. 84 W. 40 links. Black Walnut, 40 S. 24 E. 16 links.
46.49	Maple, 24 inches in diameter.
73.12	Cottonwood, 36 inches in diameter.
80.00	Set post for corner to sections 3, 4 33, and 34. Cottonwood, 8 N. 36 E. 14 links. Black Walnut, 14 N. 40 W. 6 links. Maple, 20 S. 42½ E. 9 links. Sugar, 16 S. 39 W. 14 links. Land, level, 2d rate. Timber, of Cotton wood, Black Walnut, Elm, Sugar, and Maple.
	West, between sections 4 and 33. Variation, 8° East.
12.50	Enter bottom bears S. S. W.
15.75	Cottonwood, 15 inches in diameter.
28.75	Left bank Nonius River, runs S. S. W. and set meander post. Sycamore, 40 N. 45½ E. 14 links. Buckeye, 26 South, 16 links.

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Between Townships 59 and 60 N., R. 36 W., 4th Meridian.

CHAINS.	
33.30	Over river, and set meander post on right bank Maple, 12 N. 20 W. 19 links. Hickory, 9 S. 62½ W. 42 links.
40.00	Set post for quarter section corner. Elm, 20 N. 14 W. 64 links. Ash, 40 S. 24 E. 14 links.
50.19	Hickory, 14 inches in diameter.
60.83	Leave bottom bears S. W.
80.00	Set post for corners to sections 4, 5, 32 and 33. Beech, 15 N. 12 E. 14 links. Hickory, 20 N. 40 W. 10 links. Ironwood, 9 S. 20 E. 16 links. Red Elm, 14S. 54 W. 4 links. Land, level bottom, first-rate; Timber of Beech, Hickory, Ironwood, Red Elm, and Maple.
	West, between sections 5 and 32. Variation, 8° 10′ East.
14.46	Sugar, 10 inch es in diameter.
34.49	Ash, 10 inches in diameter.
40.00	Set post for quarter section corner. Pine Oak, 10 N. 77 E. 14 links. Plum, 6, S. 17, W. 5, links.
54.94	White Oak, 10 inches in diameter.
80.00	Set post for corner to sections 5, 6,31 and 36. Bur Oak, 10 N. 32 E. 4 links. Pin Oak, 12 N. 16 W. 10 links. Hickory, 16 S. 54 E. 6 links. Maple, 20 S. 32 1/4 W. 14 links. Land rolling, 2d rate; Timber, Bur and Pin Oak, Hickory, Maple, and Plum.
	West, between sections 6 and 31. Variation, 8° 10′ East.
32.50	Tally-Rod Creek, 14 links wide, runs South.
40.00	Set post for quarter section corner.

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Between Townships 59 and 60 N., R. 36 W., 4th Meridian.

CHAINS.	
	Bur Oak, 18 N. 51 E. 11 links. Hickory, 24 S. 24 W. 9 links.
49.39	Hickory, 12 inches in diameter.
50.47	White Ash, 14 inches in diameter.
80.94	Intersect Range line 30 links North of temporary post and set post, corner to Townships 59 and 60 North, Ranges 36 and 37 West, 4th Meridian. Hickory, 10 N. 62, E. 14 links. Sugar, 6 N. 49 W. 9 links. Beech, 8 S. 54 E. 11 links. Oak, 14 S. 45 W. 100 links. Land rolling first-rate, Timber, Bur Oak, Sugar, Hickory, and Beech; under-growth of vinez and spice. JANUARY 16, 1846.

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SUBDIVISION

OF
TOWNSHIPS 59 NORTH, RANGE 36 WEST
OF
4th PRINCIPAL MERIDIAN,

Wisconsin,

BY

A. B. *Deputy Surveyor.*

COMMENCED May 16, 1846.
COMPLETED May 28, 1846.

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CHAINS.	
	Beginning at corner to sections 25 and 36. retraced East side of section 36; running South. Variation 7° 45′ East.
40.07	Intersected 5 links west of quarter section corner.
80.13	Intersected 9 links west of Township corner. Thence retraced South side of section 36. Variation 7° 45′ East.
31.9	Intersected 5 links North of quarter section corner.
79.83	Intersected 10 links North of corner to sections 35 and 36. MAY 16, 1846.

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SUBDIVISIONS.

Township 59 North, Range 36 West, 4th Meridian.

CHAINS.	
	North, between sections 35 and 36. Variation, 7° 45′ East.
7.70	Pine, 18 inches diameter.
15.19	Brook 6 links wide, runs N. W. swift, rocky bed, low earth banks, clear water.

23.42	Chesnut Oak, 12 inches diameter.
30.95	Brook, 5 links wide, runs S. 70 W. swift, sandy bottom, low bank, clear water.
40.00	Set quarter section post. Bearings. { Pine, 30 N. 29 E. 17 links. Birch, 10 S. 19 W. 7 links.
51.16	Jack Oak, inches diameter.
80.00	Set post, corner to sections 25, 26, 35 and 36. Bearings. { White Oak, 12 S. 52 W. 9 links. Jack Oak, 5 N. 24 E 12 links. Surface hilly; soil sandy and poor; timber, Pine, White and Jack Oak, Birch and Chesnut Oak; under-growth, Whortleberry and Greenbriars. The hills are a part of the Magnet Range.
	East Random, between sections 25 and 36. Variation, 7° 45′ East.
79.49	Intersected Range line, 15 links south of post.
	West, corrected between sections 25 and 36. Variation, 7° 51′ East.
8.76	Pine, 20 inches diameter.
39.74½	Set quarter section post. Bearings. { Jack Oak, 6 S. 24 W. 18 links. Pine 12 N. 19 E. 10 links.

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Township 59 N., Range 36 W., 4th Meridian.

CHAINS.	
49.50	Brook. 5 links wide, runs N. W. rapid, rocky bed and banks.
58.85	Brook. 4 links wide, runs N. E. rapid, rocky bed and banks.
67.71	Chesnut Oak, 18 inches diameter.
79.49	Section corner. Surface hilly and broken; soil 3d rate; timber, Pine, White, Black, and Jack Oak, and Birch; under-growth, Greenbriar, Whortleberry and Hazel.
	North, between sections 25 and 26. Variation, 7° 40′ East.
15.16	Hickory, 15 inches diameter.
22.20	Enter Creek bottom, bears S. 75 W.
28.46	Random Creek, 95 links wide, runs West, gentle current, mud bottom, earth banks.
36.00	Leave bottom, bears S. W.
40.00	Set quarter section post. Bearings. { Poplar, 24 S. 29 W. 6 links. White Oak, 16 N. 57 E. 15 links.
52.13	Bur Oak, 18 inches in diameter.
53.50	Large chalybeate spring, 90 links East, runs S. E.
72.19	Hickory, 18 inches in diameter,
80.00	Set post, corner to sections 23, 24, 25 and 26. Spanish oak 18 S. 45 E. 13 links, Hickory 12 N. 71 W. 150 links, Surface south of creek bottom hilly; soil 3d rate; North of creek bottom broken, soil 2d rate; creek bottom, about 10 chains wide; soil first-rate; timber, Pine, Gum, White and Jack Oak, Hickory and Poplar, undergrowth, Hazel, Whartleberry, and Sassafras.
	East Random, between sections 24 and 25. Variation 7° 50′ East.
79.85	Intersected Range line, 60 links south of post

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Townships 59 North Range 36 West 4th Meridian.

CHAINS.	
	West, corrected between sections 24 and 25. Variation 8° 16′ East.
8.33	Gum, 8 inches in diameter on East bank of creek 18 links wide, runs South, swift sandy bottom and low sandy banks.
39.92½	Set quarter section post. Bearings { Pine, 15 S. 16 E. 189 links. Pine, 12 N. 22 W. 15 links.
49.74	Gum 16 inches in diameter.
79.85	Section corner. Surface mountainous; soil 3d rate—timber Pine, Bur oak and Gum; undergrowth, Greenbriars and Whortelberry. Iron ore in N. W. ¼ of section 25, and in W. ¼ of same section in creek there is a cascade and near it Clark's furnace.
	North, between sections 23 and 24, Variation 7° 30′ East.
7.96	Black oak, 20 inches in diameter.
40.00	Set quarter section post. Bearings { Lind, 18 N. 25 E. 7 links. Sycamore, 12 S. 14 W. 119 links
46.50	Enter willow swamp, heads N. E. about 20 chains.
61.00	Leaves swamp, bears S. W.
71.18	Poplar, 34 inches in diameter.
80.00	Set post, corner to sections 13, 14, 23 & 24. Bearings { Sugar, 20 S. 16 W. 90 links. B. walnut, 30 N. 31 E. 22 links. Surface South of swamp hilly; soil 2d rate; North of swamp level, 1st rate—timber White and Jack oak, Hickory, Sugar maple, Ash and Walnut; undergrowth Hazel, Pawpaw and Spice.
	East Random, between sections 13 and 24. Variation 8° 15′ East.

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Township 59 North, Range 36 West 4th Meridian.

CHAINS.	
79.60	Intersected range line 12 links South of post.
	West, corrected between sections 13 and 24. Variation 8° 20′ East.
9.20	White oak, 16 inches in diameter.
12.00	Cranberry marsh, impassable, bears S. 25 W. Offset S. 20 W. 12 chains. West 14 chains, N. 20 E. 12 chains to line.
26.00	Leave Marsh, bears N. 20 E.
28.54	Swamp Ash, 10 inches in diameter.
39.80	Set quarter section post. Bearings { Hickory, 16 N. 85½ W. 109 links. Sugar, 15 N. 76 E. 17 links.
47.80	Brook, 6 links wide, runs S. W. low banks, sluggish, mud bottom.
50.44	Black walnut, 36 inches in diameter.
79.60	Section corner. Surface level; soil on East ½ marshy, 3d rate; West ½ dry, 1st rate—timber Sugar maple, Poplar, Hickory and Black walnut; undergrowth Spice and Pawpaw.

	North, between sections 13 and 14. Variation 8° 10′ East.
6.72	White ash, 20 inches in diameter.
20.45	Small deep pond bears N. E. offsets N. 60 E 5.50 chains, N. 60 W. 5.50, chains to line.
25.95	Line leaves pond, bears S. E.
26.13	Lind 30 inches in diameter.
40.00	Set quarter section post.
	Bearings { Lind, 24 S. 52¾ W. 99. Hackberry, 9 N. 40 W 11.
49.22	Hickory, 18 inches in diameter.
80.00	Set post, corner to sections 11,12, 13 & 14.

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Township 59 North, Range 36 West, 4th Meridian.

CHAINS.	
	Bearings { Hickory, 12 N. 20 W. 4 links. White oak, 16 S. 14 E. 79 links
	Surface level; soil 1st rate; a few chains on the North of pond, rather low & wet—timber White ash, White and Black oak, Sugar, Maple, Walnut, Hickory and Lind; undergrowth Pawpaw and Spice. MAY 16, 1846.
	East random between sections 12 and 13. Variation 8° 20′ East.
79.94	Intersected Range line 6 links South of post.
	West, corrected between sections 12 & 13. Variation 8° 23′ East.
9.96	Blackwalnut, 50 inches in diameter.
39.97	Set quarter section post.
	Bearings { White ash, 30 N. 65 W. 10 links. Beech, 24 S. 46 E. 9 links.
56.78	White Oak, 20 inches diameter.
79.94	Section corner.
	Surface level; soil 1st rate—timber Lind, Beech, Sugar maple, White oak, Black walnut, White ash and hickory; undergrowth Pawpaw.
	North between sections 11 and 12. Variation 7° 55′ East.
8.40	Sugar maple, 15 inches in diameter.
21.62	Reeder's run 15 links wide, runs S. W. rapid; limestone bed and banks.
30.47	White oak, 20 inches in diameter.
31.00	Enter Mound prairie, bears N. E.
40.00	Set quarter section post in mound, pit 8 links East.
80.00	Set post, corner to sections 1, 2, 11 and 12 in mound, pit 8 links south.
	Surface generally level; soil 1st rate; timber on South ½ Sugar maple, Ash, Walnut,

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Township 59 North Range 36 West, 4th Meridian.

CHAINS.	
	Hickory and White oak; undergrowth Pawpaw. Prairie high and dry. In W. ½ of section 12 are two large artificial mounds of earth 25 feet high, near Reeder's run and in prairie, a circular embankment 10 feet high, with a ditch surrounding it.
	East random, between sections 1 and 12. Variation 8° 25′ East.
80.04	Intersected Range line 2 links South of post.
	West corrected between sections 1 and 12. Variation 8° 26′ East.
5.27	Black Walnut, 36 inches diameter.
37.00	Enter Mound prairie, bears S. 20 W.
40.02	Set quarter section post.
	Bearings { Black Walnut, 16 N. 73 E. 327 links. Sugar, 12 S. 81 E. 332 links.
80.04	Section corner.
	West ½ rich, dry, and level prairie; East ½ rolling; soil 1st rate—timber Beech, Sugar maple, Ash, Walnut; undergrowth Pawpaw and Spice.
	North random between sections 1 and 2. Variation 7° 40′ East.
80.41	Intersected north boundary 6 links West of post.
	South corrected between sections 1 and 2. Variation 7° 37′ East.
10.15	Hickory, 18 inches in diameter.
18.00	Road from Arpent to Rangeville, bears N E.
29.00	Enter Mound prairie, bears East.
40.41	Set quarter section post in mound, pit 8 links East.
57.00	Enter Walnut grove, beors S. 80 W.
67:00	Leave same, bear S. 80 W. lies mostly west

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Township 59 North Range 36 West, 4th Meridian.

CHAINS.	
	of line.
80.41	Section corner.
	South ½ rich and dry prairie; north ½ rolling; soil 1st rate; timber Beech, Ash, Sugar, Maple, Walnut, Hackberry, and Buckeye; undergrowth, Pawpaw, and Spice.
	North, between sections 34 and 35. Variation, 7° 50′ East.
10.71	White Oak, 18 inches diameter.
18.97	Enter swamp, bears S. W.
33.10	Maple, 15 inches diameter.
40.00	Set quarter section post.
	Bearings. { Maple, 9 S. 51 E. 10 links. Maple, 15, N. 75, W. 14 links.
51.90	Leave swamp, bears S. W.
53.04	Hickory, 10 inches diameter.
80.00	Set post, corner to sections 26, 27, 34 & 35.
	Bearings. { Black Oak, 16 N. 12 W. 6 links. Black Oak, 12 S. 16 E. 111 links.
	Surface level, soil 2d rate; timber Black Oak, Sugar Maple, Hickory, and Dogwood; but little undergrowth. MAY 17, 1846.
	East Random, between sections 26 and 35. Variation, 7° 50′ East.
80.17	Intersected North and South line 12 links North of corner.
	West, corrected between sections 26 and 35. Variation, 7° 45′ East
12.51	Pine, 12 inches diameter.
40.08½	Set quarter section post.
	Bearings. { White Oak, 15 S. 19 E. 24 links. Hickory, 12 N. 28 W. 16 links.
48.85	Harrison's Creek, 45 links, runs N. W. rapid; sand bottom.
49.35	Sugar Maple, 18 inches diameter.

[Pages 46 thru 59 deleted. The notes continue in the same format and style.]

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Township 59 North, Range 36 West, 4th Meridian.

CHAINS.	
58.42	Left bank of Compass River; set meander post. Bearings { Maple, 12 N. 56 E. 18 links. Box Elder, 8 S. 42 W. 81 links Thence offset South 6.83 chains; West 21, 64 chains to line between sections 16 and 17, 3 chains South of meander post. Upland rolling; soil 1st rate; timber Beech, Ash, Maple, Walnut and Hickory; undergrowth Hazle and Vines.
	North, between sections 8 and 9. Variation 7° 55′ East. From meander post on left bank of Compass River, between sections 16 and 17, offset West 395 links, from which flag in line on Right bank bears N. 26 E. therefore from section corner to Right bank is 426 links.
4.26	Right bank of Compass River, set meander post. Bearings. { Box Elder, 6 N. 27 E. 14 links. Ash, 10 N. 18 W. 18 links.
16.12	Hackberry, 20 inches diameter.
40.00	Set quarter section post. Bearings { Maple, 20 S. 14 E. 15 links. Hackberry, 12 N. 21 W. 18 links.
42.77	Right bank of Compass River; Set meander post. Bearings. { Locust, 15 N. 33 W. 12 links. Buckeye, 18 S. 15 E. 91 links. Thence offset N. 60 W. 19.57 chains; N. 60 E. 19.57 chains to line on Right bank of Compass River.
62.34	Line leaves river and enters upland; set meander post on Right bank.

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Township 59 North, Range 36 West 4th Meridian.

CHAINS.	
	Bearings { Hickory, 18 S. 60 W. 42 links. Sugar Maple, 12 N 10 E. 41 links
80.00	Set post, corner to sections 4, 5, 8 and 9. Bearings { Walnut, 12 S. 20 E. 100 links. Ash, 15 N. 51 W. 65 links. Surface in bend of River low bottom; North of River gently rolling; soil 1st rate; timber Ash, Walnut, Sugar Maple, Hickory and Hackberry; very little undergrowth.
	East Random, between sections 4 and 9. Variation 8° 10′ East.
80.07	Intersected N. & S. line 10 links North of post.
	West, corrected between sections 4 and 9. Variation 8° 6′ East.
10.15	White Oak 18 inches diameter.
34.00	Enter bottom bears S. E.
40.03½	Set quarter section post. Bearings { Cottonwood, 36 S. 21 E. 92 links. Sycamore, 24 N. 80 W. 115 links.
59.20	Left bank of Nonuis River, set meander post. Bearings { Buckeye, 14 N. 41½ E. 47 links. Maple 9 S. 27 E. 15 links. Thence offset South 4.85 chains, from which flag in line on Right bank bears N. 45 W.
64.05	Set post on Right bank of Nonius River. Bearings { Maple 9 S. 30 W. 44 links. Box Elder 5 N. 7 E. 6 links.
80.07	Section corner. Bottom dry, upland rolling; soil 1st rate; timber Cottonwood, Ash, Sycamore, Buckeye and Maple; undergrowth Vines and Briars.
	North Random, between sections 4 and 5. Variation 7° 35′ East.

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Township 59 North, Range 36 West 4th Meridian.

CHAINS.	
80.09	Intersected North boundary 2 links West of post.
	South, corrected between sections 4 and 5. Variation, 7° 34′ East.
22.00	Enter bottom bears N. E.
40.09	Set quarter section post. Bearings { Walnut, 8 S. 65 E. 33 links. Sugar maple, 12 N 49 W 14 links
49.00	Leave bottom bears S. E.
60.01	Sugar Maple 14 inches diameter.
80.09	Section corner. Surface nearly level; soil 1st rate; timber Hackberry, Walnut, Sugar Maple and Beech; undergrowth Hazel and Vines.
	North, between sections 31 and 32. Variation, 8° East.
19.20	Enter windfall, bears S. 60 E.
32.30	Leave same, bears S 60 E.
40.00	Set quarter section post. Bearings { Chestnut, 24 S. 49 E. 45 links. Ironwood, 6 N. 42½ W. 61 links.
65.40	Hackberry, 10 inches diameter.
80.00	Set post, corner to sections 29, 30, 31 & 32. Bearings { Beech, 14 N. 28 E. 117 links. White Oak, 16 S. 55 W 21 links. Surface partly broken and partly level; soil 3d rate, and sandy; timber Chesnut, Gum, Scrub and Jack Oak; under-growth Oak and Hickory.
	East Random, between sections 29 and 32. Variation 8° 10′ East.
80.07	Intersected N. and S. line at post.
	West, corrected between sections 29 & 32. Variation 8° 10′ East.
14.00	Road from lead-mines to Arpent, bears N. 20 E.

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Township 59 North Range 36 West 4th Meridian.

CHAINS.	
40.03½	Set quarter section post. Bearings { Ironwood, 8 S. 22 E. 7 links. Dogwood, 6 N 46¼ W 71 links.
61.11	Beech 18 inches diameter.
80.07	Section corner. Surface broken; soil sandy, 3d rate; timber Chesnut, Beech, Oak and Ironwood; under-growth Oak and Hickory brush. MAY 23, 1846.

	West Random, between sections 30 and 31. Variation, 8° 10′ East.
79.82	Intersected West boundary 4 links North of post.
	East, corrected between sections 29 and 32. Variation, 8° 12′ East.
6.38	Hickory, 14 inches diameter.
39.82	Set quarter section post.
	Bearings { Hickory, 12 S. 32 E. 49 links. Ironwood, 6 N. 40 W. 4 links.
55.00	Brook 4 links wide, runs N. E.
79.82	Section corner.
	Surface level; soil 2d rate; timber Oak, Ash and Elm; under-growth Spice.
	North, between sections 29 and 30. Variation, 8° 50′ East.
7.19	Elm, 14 inches diameter.
25.20	Intersected South bank of offset Lake, and set meander post.
	Bearings { Black Oak, 22 S. 51 E. 13 links. Hickory, 12 S. 30 W. 51 links.
	Offset West 12 chains; North 36 chains; East 12 chains to line.
61.20	North bank and set meander post.
	Bearings { Black Oak, 14 N. 40¾ E 18 links. Cherry, 12 N. 80 W. 20 links.
80.00	Set post, corner to sections 19, 20, 29 & 30.

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Township 59 North Range 36 West, 4th Meridian.

CHAINS.	
	Bearings { Hickory, 14 N. 87 E. 92 links. Ironwood, 8 S. 79 W. 19 links.
	Surface level; soil 2d rate; timber Hickory, Black Oak, Cherry and Ironwood; under-growth Whortleberry.
	East Random, between sections 20 and 29. Variation 8° 10′ East.
80.03	Intersected N. and S. line, 2 links South of post.
	West, corrected between sections 20 and 29. Variation 8° 11′ East.
12.00	Leave bottom, bears N. W.
40.01½	Set quarter section corner.
	Bearings { Sugar maple, 14 N 88 W 14 links. Hickory, 12, S. 1½ E. 9 links.
49.97	Bunch of Elms 40 inches diameter.
80.03	Section corner.
	Surface generally level; soil good 2d rate; timber Elm, Oak and Hickory; under-growth Dogwood and Alder.
	West Random, between sections 19 and 30. Variation, 8° 15′ East.
80.15	Intersected West boundary at post.
	East, corrected between sections 19 and 30. Variation, 8° 15′ East.
40.15	Set quarter section post.
	Bearings { Aspen, 10 N. 45½ W. 47 links. White Oak, 18 S. 10 E. 19 links.
45.07	White Oak, 18 inches diameter.
80.15	Section corner.
	Surface rolling; soil 2d rate; timber White Oak, Sugar Maple and Aspen; unper-growth Hickory and Oak.
	North, between sections 19 and 20. Variation, 7° 15′ East.
13.08	Set post on South boundary of Black Re-

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Township 59 North Range West, 4th Meridian.

CHAINS.	
	serve 35.25 chains
	East of S. W. corner
	Bearings { Sugar maple, 18 N 89 W 16 links Black Oak, 20 S. 42 E. 29 links
	Thence on same course without blazing.
80.00	Set temporary corner to sections 17, 18, 19 and 20.
	Land level; soil 2d rate; timber Oak, Sugar Maple Ash.
	West, on true line between sections 17 and 20, from corner to sections 16, 17, 20 and 21. Variation 8° 12′ East.
10.05	Set post on East boundary of Blackhawk's reserve 67.08 chains North of S. E. corner of the same.
	Bearings { Hackberry, 12 S. 14 E. 51 links. Ash, 10 S. 56 W. 20 links.
	Land level; soil 2d rate; timber Oak, Ash, and Hickory; undergrowth Hazel and Ironwood. MAY 24, 1846.
	West Random, between sections 18 and 19. Variation 8° 20′ East.
79.91	Intersected West boundary 12 links South of post.
	East, corrected between sections 18 and 19. Variation 8° 20′ East.
23.19	Honey Locust, 14 inches diameter.
39.91	Set quarter section post.
	Bearings { Walnut, 14 S. 38 W. 90 links. White Ash, 10 N. 7 E. 18 links.
43.84	Set post on West boundary of Blackhawk's reserve.

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Township 59 North Range 36 West, 4th Meridian.

CHAINS.	
	Bearings { White Oak, 8 N. 21 W. 62 links. Black Oak, 12 S. 25 W. 27 links
	Surface rolling; soil 1st rate; timber Black and White Oak, Ash and Hickory; under-growth Prickly Ash and Grape-vines.
	North, between sections 17 and 18. (line in reserve not blazed.) Variation 8° East.
56.50	Left bank of Compass River, and leave Blackhawk's reserve.
	Offset East, 8.12 chains from which flag in line on Right bank bears N. 45 W. therefore at—
64.62	Set meander post on Right bank of Compass river.
	Bearings { Buckeye, 15 N. 32 W 10 links. Maple, 6 N. 28 E. 13 links.
80.00	Set post, corner to sections 7, 8, 17 and 18.
	Bearings { Maple 12 N. 46 W. 5 links. Sycamore, 10 S. 30 E. 11 links.
	Bottom 1st rate; timber, Maple, Sycamore and Buckeye.
	East, on true line between sections 8 and 17. Variation 8° 12′ East.
16.97	Elm, 20 inches diameter.
27.58	Set meander post on Right bank of Compass river.

	Bearings { Box Elder, 5 N. 2 E. 16 links. Maple 8 S. 59 W. 11 links.
	Bottom 1st rate, dry; timber Buckeye, Sycamore, Maple and Box Elder; under-growth Ash and Prickly Ash.
	West Random, between sections 7 and 18. Variation 8° 15′ East.
80.10	Intersected West boundary at post.

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Township 59 North Range 36 West, 4th Meridian.

CHAINS.	
	East, corrected between sections 7 and 18. Variation 8° 15′ East.
15.99	White Oak, 20 inches diameter.
19.00	Enter bottom bears S. W.
40.10	Set quarter section post.
	Bearings { White Ash, 14 S. 40 E. 24 links. Maple, 9 N. 36 W. 10 links.
55.15	Set Meander post on West of Chain Lake.
	Bearings { Cottonwood, 20 N 50 E 7 links. Maple, 12 S 39 E 10 links.
	Thence offset South 423 chains; from which flag in line on East bank bears N 65 E. therefore at—
64.21	Set meander post on East bank of Chain lake.
	Bearings { Buckeye, 10 S. 40 W. 17 links. Buckeye, 15 N. 24 W. 13 links.
80.10	Section corner.
	Bottom 1st rate, dry; timber Sycamore, Cottonwood, Maple and Hackberry; no undergrowth.
	North, between sections 7 and 8. Variation 7° 55′ East.
21.54	Sycamore 48 inches diameter.
35.10	Set meander post on South bank of Chain lake.
	Bearings { Maple 10 S. 71 E. 14 links. Maple, 12 S. 52 W. 9 links.
	Offset East 8.14 chains from which, flag on North bank bears N. 45 W. therefore at—
43.24	Set meander post on North bank of Chain lake.
	Bearings { Sugar maple, 15 N 45 W 12 links Beech, 10 N. 39 E. 8 links.
53.00	Leave bottom, bears West.

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Township 59 North Range 36 West 4th Meridian.

CHAINS.	
	Set post, corner to sections 5, 6, 7 and 8.
	Bearings { Sugar maple, 15 S 45 W 4 links. Sugar maple, 18 N 34 E. 6 links.
	Bottom dry; upland rolling; soil 1st rate; timber Sycamore, Ash, Buckeye & Elm; undergrowth Spice and Prickly Ash.
	East Random, between sections 5 and 8. Variation 8° 10′ East.
79.90	Intersected N. and S. line 11 links south of post.
	West, corrected between sections 5 and 8. Variation 8° 15′ East.
21.17	Sugar Maple, 36 inches diameter.
39.95	Set quarter section post.
	Bearings { Sugar maple, 16 N 29 W 18 links Elm, 22 S. 70 E. 19 links.
79.90	Section corner.
	Surface rolling; soil 1st rate; timber chiefly Sugar Maple and Elm; Uundergrowth Prickly Ash.
	May 25, 1846.
	West Random, between sections 6 and 7. Variation 8° 15′ East.
80.16	Intersected West boundary 13 links South of post.
	East, corrected between sections 6 and 7. Variation 8° 9′ East.
32.07	Elm 22 inches diameter.
40.16	Set quarter section post.
	Bearings { Hickory, 12 S. 51 W, 116 links. Sugar maple, 18 N 46 E 10 links
57.25	Tally-rod Creek, 15 links wide, runs South, gentle current, mud bed.
80.16	Section corner.
	Land gently rolling; soil 1st rate; timber

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Township 59 North, Range 36 West 4th Meridian.

CHAINS.	
	Sugar Maple, Ash, Elm and Oak; under-growth Oak and Hickory.
	North Random, between sections 5 and 6. Variation 7° 35′ East.
80.24	Intersected North boundary at post.
	South, corrected between sections 5 and 6. Variation 7° 35′ East.
10.90	Poplar 28 inches diameter.
40.24	Marked Hickory 14 inches diameter for quarter section corner.
	Bearings { Hickory, 18 N. 20 E. 49 links. Ironwood, 8 S. 72 W. 97 links.
42.75	Brook 5 links wide runs swiftly S. W. mud bed; low banks.
80.24	Section corner.
	Surface level; soil 1st rate; timber Hickory Beech, Poplar, Oak, Walnut and Elm; undergrowth Vines, Spice and Ash.
	May 26, 1846.

[Page 70 is blank.]

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MEANDERS.

Township 59 North, Range 36 West, 4th Meridian.

Corners.	*Chains.*	
		Compass River. Beginning at post on left bank in north boundary, thence down stream. Variation 7° 35 East.
South.	5.50	
S. 29 E.	11.50	
S. 5 E.	14.00	In section 2.
S. 26½ W	9.00	At 4 chains enter Mound Prairie, bears east.
S. 47 W.	11.00	
S. 59 W.	10.00	
S. 72 W.	16.23	To line of sections 2 and 3.
		From this post, Maple at head of Out Island, bears N. 87½ W.
		Banks 8 feet high, alluvial; current gentle.
		Variation 7° 45 East.
S 55 W	4.00	Maple on Island bears N. 65½ W.
S 48 W	8.50	In section 3.

S 56 W	12.00	
S 70 W	5.74	To upper corner of Claim No. 1. Banks and bed sandy; current gentle; bottom land 1st rate.
		Beginning at lower corner of Claim No. 3, on left bank; thence down stream. Variation 8° East.
S 75 W	6.00	To Bayou 150 links wide, runs S. W.
N 80 W	18.00	

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Township 59 North, Range 36 West 4th Meridian.

Corners.	*Chains.*	
N 59 W	16.00	
N 75 W	9.50	
S 75 W	11.00	
S 28 W	4.00	In section 9.
S 24½ E	8.00	
S 47 E	21.00	
S 28½ E	9.00	
S 2½ E	6.50	
S 22 E	2.50	At 100 links mouth of Bayou 150 links wide, comes from N. E.
S 12 W	10.00	
S 36 W	8.12	To line of sections 9 and 16. Banks generally low and sandy; bed gravel; current gentle; bottom land subject to inundation, to depth of 6 feet.
		Variation 8° East.
S 57 W	11.00	At 9.50 chains Reeders' Run 20 links wide, comes from S. E.
S 81 W	6.50	In section 16.
N 70 W	7.16	Line of sections 16 and 17. Current swift; bed sand and gravel; banks 8 feet high, loamy bottom, land high and dry, soil 1st rate.
		Variation 8° to 5′ East.
N 72 W	9.86	In section 17:—to upper corner of Blackhawk's Reserve. Bottom land dry, 1st rate; banks 8 feet high; current gentle.
		Beginning at lower corner of Blackhawk's Reserve, on left bank. Variation 8° 15′ East.
S 54 W	2.00	Over Random Creek, 180 links wide, comes from S. E.

[Pages 73 through 79 deleted. The meander notes continue in the same format and style.]

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Township 59 North, Range 36 West, 4th Meridian.

Corners.	*Chains.*	
		Variation 7° 55′ East.
S 61 W	13.00	In section 30.
S 21 W	19.00	Inlet 8 links wide, runs N. E.
S 35½ E	13.00	
S 81 E	3.00	Inlet 6 links wide, runs N. E.
S 84 E	11.15	To point of beginning. Banks low; land 1st rate; water clear and cold.
		Link Lake in section 30.
		Beginning at quarter section corner between sections 30 & 31, thence north, 16.20 chains to margin of Lake, and set post for witness point. Bearings { Buckeye 10 S. 17 W. 41 links. Maple 8 S. 10 E. 19 links.
		Variation 8° East.
S 63 W	5.09	
S 79 W	9.50	
N 49 W	12.00	
North.	10.00	
N 46 E	4.00	
N 17 E	8.50	
N 54 E	5.00	
N 70 E	5.00	
N 52 E	14.00	
N 75 E	8.00	
S 55 E	6.00	
South.	4.50	
S 23 W	10.00	
S 1 W	12.00	At 7 Chains outlet 10 links wide, runs N. 80 E.
S 40½ W	14.55	To point of beginning. Banks low; beach sandy and rocky; water clear and deep.
		MAY 28, 1846

XXV.

(The location of the original copy of these Special Instructions is unknown at this time.)

SPECIAL INSTRUCTIONS

to

John Mullett, Deputy Surveyor

April 22, 1848

Sir,

In the execution of the work embraced in your contract this day entered into for the subdivision of Fifteen Townships and Fractional Townships lying between Green Bay and Menomonie River, in Northern Michigan, you will be governed by the General Instructions to the Deputies of this office, so far as they may be applicable, except as herein stated, and, where they may not be applicable you will be governed by the general principles, applicable to the surveys of the public lands, laid down in the laws of the United States, with all which you have been so long and so well acquainted, that it is deemed unnessary to repeat them here.

The exceptions above referred to are the following, viz: 1st. Instead of establishing new corners of sections on the North and West boundaries of townships, wherever, in running section lines you may intersect the same, you will close at the corners already established on those boundaries, by running random lines from the nearest subdivisional section corners South or East thereof as the case may be, and correcting the same, giving in your notes and on your diagrams the courses and lengths of the corrected closing lines; 2nd. Instead of returning diagrams of townships on a scale of two miles to an inch, your township diagrams must be made on thin, tough paper, and drawn on a scale of two inches to a mile; 3rd. Instead of a *certificate* at the end of each field book, you will take and subscribe an oath to be inserted in lieu thereof, a form of which oath is already in your possession; 4th. Instead of a common compass, you will use a solar compass in your work, and give in your notes the true variation of the needle as often as there may be changes of variation worth noting; 5th. A general description of each township that you subdivide must be given at the end of the field notes thereof, and at the end of the notes of each line the time when it was run should be set down.

In subdividing the Fractional Townships on the Menomonie River, you will ascertain the width of the River at different points and get as frequent and accurate connection with the surveys on the right bank thereof as practicable. All the islands in the River below the Quinnessec Falls, are included in the jurisdiction of Wisconsin.

You will please keep this office advised of the progress of your work, and send in your field notes from time to time as you may have opportunity to do so.

Very respectfully,
Your Obt. Servant

(s) Lucius Lyon
Surveyor General

Surveyor Generals Office
Detroit, April 22nd, 1848

XXVI.

(The location of the original copy of these Special Instructions is unknown at this time.)

SPECIAL INSTRUCTIONS

to

Guy H. Carleton, Deputy Surveyor

Surveyor Generals' Office
Detroit, Michigan
July 14, 1849

Sir:

In subdividing Townships 42, 43, 44, & 45 North of Ranges XII and XIII West, in the northern peninsula of Michigan, embraced in the contract this day made with you, you will be governed by the General Instructions to the Deputies of this office heretofore issued, except as hereinafter stated, which instructions are similar to the printed General Instructions of the Surveyor General at Du Buque, Iowa, a copy of which dated July 26, 1848 you have this day shown me.

The General Instructions of this office are now out of print, and I, therefore, refer you to the printed instructions of the Office at DuBuque for information as to what they are, instead of furnishing you a copy thereof.

A letter of appointment of this date, constituting you one of my Deputies, and a diagram of your district, showing the topography, variation of the needle, and lengths of the exterior township lines thereof, are herewith enclosed.

In the performance of your work you will use a good solar compass of Burt's Patent, and run your lines wholly by the sun without depending on the needle, in all cases where its variation is not uniform and regular.

The oaths of your chainmen and axeman must be inserted in the forepart of your first field book, and near the end of each book you will give a certificate, over your own signature, stating the names and residences of alltthe persons who may have assisted you in making the surveys therein described, and the duties performed by each.

You will also, at the end of the notes of each mile, give the day, month and year, on which it was run, instead of dating each days work as heretofore required.

You will recollect that in all cases there must be at least two bearings noted at every corner, whether fractional or otherwise, and whether a post be set, or a tree be noted in place of a post; and you will please also recollect that the original notes taken on the ground when your lines and corners are established must in all cases be returned to this office, together with a fair neat copy of such field book as may not be plainly written, or as it may, from any cause, be difficult to read.

Your survey must be made by yourself, as required by your contract, and not by any other person, and great care must be taken by you to see that every part of the work is well and faithfully done.

As the east boundaries of townships 42 North of Ranges 13 and 14 West, were originally run from North to South and the corners thereon were so established as to throw the fractional sections on the South instead of on the North sides of those townships, those corners must be re-established at proper distances south of their present position so as to throw the fractions on the north side of each township, as required by law. The old corners must be cut out and field notes of the new corners, showing their direction and distance from the old must be returned with the notes of your subdivisions.

Algernon Merryweather, D. S. who has a district of subdivisions adjoining yours on the west, has been instructed to correct the East boundary of T42NR14W. and may possibly do so before you close on to it. If does not, you will do it, and inform him thereof by a note left in the post at the first quarter section corner and also at the first section corner from the south boundary of the township.

As fast as you finish your townships, you will please send one of your field notes and diagrams thereof (the latter made on a scale of two inches to a mile) that the office work may be kept up as near as practicable with your work in the field.

The Commissioner directs me to advise my Deputies that no draft of theirs will be accepted, nor any order to theirs paid, but that the amount of their account will be forwarded to them respectively to such place as they may direct, by draft from the treasury as soon as they are settled.

Very Respectfully,
Your Obedient Servant

Lucius Lyon
Surveyor General

To: Guy H. Carleton, Deputy
Surveyor, St. Clair, St. Clair Co., Michigan

(This copy of General Instructions was made from an original volume now in the possession of the National Archives.)

[1]

GENERAL INSTRUCTIONS TO HIS DEPUTIES; BY THE SURVEYOR GENERAL of the UNITED STATES, FOR THE STATES OF OHIO, INDIANA AND MICHIGAN.

DETROIT:
PRINTED BY W. W. HART, BOOK & JOB PRINTER.

1850.

[3]

GENERAL INSTRUCTIONS TO DEPUTY SURVEYORS.

Office of the Surveyor General of Ohio, Indiana and Michigan,

DETROIT, 18

To

Deputy Surveyor:

SIR,—You are to survey in person, or by the assistance of some duly authorized Deputy Surveyor, employed by you under the sanction of this Office, and acting under your immediate supervision and direction, while you are yourself with him, so as to inspect his work, the District described in your contract, dated

18 conformably to the following printed instructions, so far as they are applicable to the character of the work which you have contracted to perform, excepting so much thereof as is modified or countermanded by manuscript special instructions, hereinafter written.

[4]

SYSTEM OF SURVEY.

1. The public Lands of the United States are surveyed in a uniform mode, established by law, by lines run by the cardinal points of the compass; the north and south lines coinciding with the true meridian, and the east and west lines intersecting them at right angles, giving to the tracts thus surveyed the rectangular form.

2. The public lands are laid off and surveyed, primarily, into tracts of six miles square, called *Townships,* containing, each, 23,040 acres. The townships are subdivided into thirty-six tracts, called *Sections,* each of which is one mile square, and contains 640 acres. Any number, or series, of contiguous townships, situated north or south of each other, constitute a *Range.*

3. To obtain and preserve a convenient and uniform mode of numbering the ranges and townships, it is usual, in commencing the survey of an insulated body of public lands, to run, or assume, two *Standard Lines,* as the basis of the surveys to be made therein. One of these standard lines is run due north and south, and is called the *Principal Meridian,* to which the ranges are parallel, and from which they are numbered eastward and westward. The other standard line is run due east and west, and is called the *Base Line,* and from which the townships are numbered northward and southward.

4. To distinguish from each other, the systems or series of surveys thus formed, the several Principal Meridians are designated by progressive numbers. Thus, the Meridian running north from the mouth of the Great Miami river, is called the *First* Principal Meridian; the Meridian running north through the centre of the State of Indiana, is called the *Second* Principal Meridian; that running north from the mouth of the Ohio river through the State of Illinois, is called the *Third* Principal Meridian; that running North from the mouth of the Illinois river, through the States of Illinois and Wisconsin, is called the *Fourth* Principal Meridian; and that run-

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ning North from the mouth of the Arkansas river, thro' the States of Missouri and Iowa, is called the *Fifth* Principal Meridian.

5. The surveys in Ohio and Indiana were begun before the present system of surveying the public lands was fully adopted. The only regular base line in Ohio is run due east from a point in the first principal meridian, about one hundred and thirty-three miles north of the beginning of that meridian at the mouth of the Great Miami river. The base line for the surveys in Indiana, crosses the second principal meridian about thirty miles north of the commencement of that meridian, on the Ohio river, and extends west to the Mississippi river, forming, also, a base for the surveys in the State of Illinois. The base line for the surveys in Wisconsin, is the south boundary of that State, established in latitude 42 30 North.

6. The State of Michigan has a base line and principal meridian of its own, separate from those of the adjoining States. The base line begins at a point on Lake St. Clair, 173 links south of the north east corner of private claim No. 222, and extends thence west to Lake Michigan. The principal meridian was run due north from the Maumee river, at Fort Defiance, opposite the mouth of the Auglaize river, in the State of Ohio, but is not adopted as a principal meridian for any other surveys than those of Michigan.

7. Correction lines correct the error that would otherwise arise from the convergency of meridians, and arrest that proceeding from the inaccuracies of measurement. They are run due east and west at stated distances, generally at the end of every tenth township, and each forms a base for the townships north of it.

8. Each range of townships should be made as much over six miles in width, on each base and correction line, as it will fall short of the same width where it closes on to the next correction line north, the excess or deficiency of width being always thrown into the last half

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mile, on all the lines closing out to the west boundary of each township.

9. This mode of executing the public surveys, conduces more, perhaps, than any other which could be devised, to the simplicity, regularity, and symmetry of the work; and to the ease and certainty with which any tract may be identified.

10. The public lands are surveyed under the direction of the Surveyor General, by Deputies appointed by himself. He selects for his deputies none other than skillful and experienced practical surveyors, men of good moral character, in whose integrity and fidelity the fullest confidence can be reposed. Their duties are prescribed in the following code of

General Instructions, a copy of which is furnished to every deputy, for his government.

11. Each deputy surveyor is required, before he enters upon the duties of his appointment. to take and subscribe an oath or affirmation for the faithful performance thereof; which oath or affirmation is to be filed in the office of the Surveyor General. The following form of this oath or affirmation, or the substance thereof) will be used:

"I, A_____ B_____ do solemnly swear (or affirm) that I will well and faithfully perform the duties of a deputy surveyor of the United States Lands, to the best of my skill and ability, and according to the Laws of the United States, and the Instructions of the Surveyor General, as I shall answer to God at the Great Day

A_____ B_____

Sworn and subscribed before me, at _____ county of _____ state of _____, this _____ day of _____ 18

J_____ K_____

Justice of Peace.

12. Each deputy surveyor appoints his own chain carriers, markers, and flag bearers, who must severally take and subscribe an oath, or affirmation, for the faithful performance of the trust reposed in them; which oath, or affirmation, may be administered by the deputy sur-

veyor himself, or by a Justice of the Peace, and must be written and subscribed to on some of the pages, immediately after the title page, of the first field book that may be used in describing the surveys which they may assist in making. The following is the oath to be taken by the chainmen:

"I, C_____ D_____ do solemnly swear (or affirm) that I will well and faithfully perform the duties of chain-carrier, in all surveys of United States Lands in which I shall be employed as such; and that I will level the chain, in measuring over uneven ground, and plumb the tally-pins, whether sticking or dropping the same; and that I will report the true distance to all notable objects, and the true length of all lines that I may assist in measuring, and mark correctly the letters and numbers at all corners that I maybe required to mark, to the best of my skill and ability.

C_____ D_____

Sworn and subscribed before me, this_____ day of _____ 18

A_____ B_____

Deputy Surveyor.

13. The oaths of the markers and flag-bearers may be varied to apply to their duties respectively.

OF CONTRACTS.

1. Before entering upon the execution of any surveys which may be allotted to a deputy surveyor, he enters into a written contract with the Surveyor General, in which the surveys to be performed are described, and the period for their completion, and the compensation per mile, fixed; and wherein the deputy binds himself to a faithful performance of the work, according to the terms of the contract, and pursuant to the laws of the United States, and the instructions of the Surveyor General. To the contract is annexed a bond, executed by the deputy with approved security, conditioned for the faithful performance of the work, in the penalty of double the estimated amount or value of the contract. The place of residence of the deputy, and of each of his sureties,

must be given in the body of the bond, which must be signed by them in presence of at least two subscribing witnesses, whose places of residence must be given opposite their respective signatures. At the end of the contract, there is also the oath before mentioned, which must be taken and subscribed by the deputy, before some person authorized to administer oaths, previous to commencing his work. Three copies of each contract and bond are required to be executed; one for the Deputy, one for the Surveyor General's office, and the other to be sent, by the Surveyor General, to the Commissioner of the General Land Office.

2. The surveys must be executed, in all cases, by the deputy contracting for the same, in his own person, or under his immediate personal superintendence and direction, excepting random lines, which may be run by an assistant surveyor, as hereinafter provided. All subcontracts are illegal.

3. In case of failure to comply with the terms of a contract, unless such failure arise from causes satisfactorily proven to be beyond the control of the contractor, immediate measures are to be taken to recover the penalty of the bond, agreeably to law. And no deputy surveyor who shall improperly fail to fulfil his engagements, will afterwards be employed in the public surveys; and of every such failure the Surveyor General is required to give immediate notice to the Commissioner of the General Land Office.

4. And where any portion of a survey is found or suspected to be erroneous, payment therefor will be suspended until the error is corrected, or the cause of suspicion done away to the full satisfaction of the Surveyor General.

OF SURVEYING INSTRUMENTS.

1. You will provide yourself with *Burt's Improved Solar Compass,* or some other equally good instrument, by which, when the sun shines, any survey may be ac-

curately and expeditiously made without the use of the magnetic needle, which compass, unless it contains within itself the means of correctly adjusting all its parts, must be compared with, and adjusted by, the standard compass in this office.

2. You will likewise procure a *Surveying Chain,* two poles, or thirty-three feet, in length, and containing fifty links; which is to be compared with and adjusted by the *Standard Chain* in the Surveyor General's Office. It should be made of good iron wire, of such size as to prevent the chain from stretching by use, and yet light enough to be readily straightened in measuring. The handles should be made of iron or brass, at least a fourth of an inch in diameter.

3. You must be provided likewise with the *measure* of the standard chain, which may be made similar to your surveying chain, of smaller wire. And by this your surveying

chain must be compared and adjusted, at least every other day, or oftener.

4. You will use eleven tally pins, made of steel, not more than fourteen inches in length, large enough near the point to make them drop perpendicularly, and having a ring at the top in which is fixed a piece of red cloth, or something else of conspicuous color, that they may be more readily seen when stuck in the ground. They should always be counted, by both of the chain men, at the end of every tally, to see that none have been lost.

5. Good marking tools, made especially for that purpose, must be provided and used for marking, neatly and distinctly, all the letters and figures required to be made at corners.

6. You will likewise provide yourself with a good telescope, from 16 to 18 inches in length, with parallel lines correctly set in its principal focus, forming an angle in the field view of not less than 50 minutes, or 5-6 of a degree, to be attached, in a suitable manner, to the sights of your compass, when necessary. Also, two

common targets, and a good tape measure, at least two poles long, correctly divided into links on one side, and into feet, inches and tenths, on the other. The telescope will often be useful in identifying lines and corners across bays and lakes, and, in connexion with the tape line and targets, as hereinafter mentioned, may, in some cases, be advantageously used in measuring inaccessible distances, and in meandering the shores of lakes and rivers which cannot be so easily or correctly meandered in any other way.

7. Your compass and chain must be frequently examined in the field, in order to discover and rectify any error or irregularity which may arise in the use of them.

8. The aberrations of the needle, are a fruitful source of error in surveying. These may arise from a variety of causes. "Local attraction," owing to the presence of iron mineral, is generally assigned by surveyors as the principal cause of the disturbance of the needle. But it is believed that in many instances, the true source of the errors complained of, is to be found in the carelessness or inattention of the surveyor, in the use and management of his compass, or the erroneous measurement of his lines. All these must be constantly and vigilantly guarded against, by every means in your power.

OF THE VARIATION OF THE COMPASS.

There is a certain irregular curve line which passes around the earth towards the north and south poles, called the *"line of no variation."* On every part of this line the magnetic needle coincides with the true meridian. But on each side of it, the needle declines from the true meridian towards it. This declination is usually called the *"variation of the compass;"* and increases gradually, but irregularly, in receding either eastward or westward from the line of no variation, until it reaches its maximum, beyond which it gradually decreases again to the line of no variation. This line is not stationary; but moves to the eastward for a series of

years, and then to the westward through another series of years, but without any regular period, or any known proportion between the *time* of this movement and the *amount* thereof. Hence the variation of the compass, at any place, is continually changing, to an extent corresponding to the change of place in the line of no variation. The line of no variation, at this time, passes through Lake Huron, and across the eastern end of the Northern Peninsula of Michigan, coinciding very nearly, in some places, with the true meridian; in other places, varying very much from it. East of this irregular line, the needle points to the west of the true meridian, and west of it, to the east of that meridian. Its variation increases in going westward, until, at the mouth of the Montreal River, on the northwestern boundary of the State, a distance of about three hundred miles, it amounts to more than seven degrees. It changes, however, almost continually during the day, and, on some days, as much as half a degree in the course of seven or eight hours. This change is called the *diurnal variation of the needle,* and is much greater in the summer than in the winter months. The north end of the needle reaches its greatest daily eastern declination, between one and two hours after sunrise, and its greatest western declination between one and two hours after noon, and points out the magnetic meridian about sunset. Its daily movements may be better understood by an examination of the following table:

Observations made by Wm. A. Burt, D. S., in latitude 42 degress 42 minutes north, near Detroit, in July, 1839.

1839	Thermometer.			Weather.	Weather.	Wind.	Magnetic Variations.		
July.	5½ A M	1 P M	6½ P M	A M	P M		5½ A M	1 P M	6½ P M
13	60	79	62	clear,	light showers,	W. S. W.	1° 42′	1° 28′	1° 42′
14	59	72	67	clear,	flying clouds,	N. W.	1 42	1 26	1 33
15	56	73	64	cloudy,	light showers,	N. W.	1 32	1 28	1 28
16	55	71	66	cloudy,	some cloudy,	West,	1 38	1 28	1 30
17	52	80	69	clear,	clear,	W. N. W.	1 30	1 28	1 30
18	55	85½	83	clear,	clear,	West,	1 41	1 28	1 35
19	56	89	82	clear,	flying clouds,	S. W.	1 40	1 28	1 35
20	63	80	74	clear,	cloudy,	S. S. W.	1 40	1 25	1 35
21	70	82	77	clear,	cloudy,	South,	1 42	1 28	1 30
22	72	86	75	cloudy,	some cloudy,	West,	1 40	1 28	1 35
23	65	88	77	clear,	clear,	East,	1 41	1 23	1 36
24	72	86	77	rain,	clear,	W. S. W.	1 43	1 25	1 35
25	69	83	80	clear,	clear,	N. W.	1 41	1 15	1 32
26	66	88	79	clear,	cloudy,	West,	1 40	1 23	1 35
27	69	80	76	clear,	showery,	West,	1 41	1 30	1 37
28	64	86	80	clear,	clear,	West,	1 42	1 24	1 30
29	66	87	78	cloudy,	clear,	West,	1 41	1 21	1 30
30	69	90	79	clear,	showers,	West,	1 41	1 25	1 33

OF RUNNING AND MARKING LINES.

1. All surveys of every description, where the magnetic variation is not uniform, must be made with Burt's improved solar compass, or some other equally good instrument, operating independently of the needle. All range, township, and section lines, must be run and marked on the true meridian, or at right angles to it, as nearly as practicable, and the courses of these, and of all other lines, must be entered in your field notes, with reference to that meridian. In all cases, where a line or part of a line is run by the needle, the fact that it is so run must be distinctly stated in your notes.

2. All lines which you actually establish, are to be marked as follows: Those trees which your line cuts must have two notches made on each side of them, where the line intersects and leaves them, without any other mark. These arecalled "sight trees," "line trees," or "station trees." A sufficient number of other trees, standing nearest on either side of your line, to render the same conspicuous, are to be blazed on two sides, diagonally or quartering towards the line; the blazes to approach nearer each other the farther the line passes from the blazed trees, and to be as nearly opposite each other as possible, coinciding with the line, where the trees stand very near it. Great care must be taken to have your lines well marked, so that they may be easily seen and followed. Random lines are not to be blazed, but may have the bushes lopped, and stakes set at every ten chains, and, occasionally, a tree blazed on one side, to enable the surveyor to follow and correct them.

3. Whenever, in running lines, your course may be obstructed by insuperable obstacles, as swamps marshes, lakes, rivers, precipices, or other objects over which you cannot pass, you will take the necessary offsets, or work by traverse, or by trigonometry, in order to pass the obstacle, and to ascertain the exact distance on so much of the line as, by reason of such obstructions, may

not be actually run. By whatever method you pass such inaccessible parts of the lines, the utmost accuracy is necessary, to obtain the true measure thereof.

4. No lines, of whatever description, embraced in your contract, excepting the random lines that may be run by your assistant, (should you employ one under the provisions for that purpose,) hereinafter contained, are permitted, in any case, to be run or surveyed by any person but yourself, or some regularly accredited Deputy Surveyor, duly authorized by the Surveyor General. Nor are letters, numbers, or marks of any kind, to be made by any other person than yourself, or such Deputy, except it be in your presence, and under your immediate and personal direction; in which case you are to inspect such letters, numbers, or marks, to see that they are neatly and correctly made.

OF EXTERIOR TOWNSHIP LINES.

1. The Act of Congress of the 18th of May, 1796, requires that the public lands "shall be divided by north and south lines, run by the true meridian, and by others crossing them at right angles, so as to form townships of six miles square." In laying out and surveying the exterior boundaries of

townships, in conformity to this provision of the Act, the greatest possible accuracy must be observed, both in the course and measurement of the lines.

2. Celestial observations to find the variation of the needle, must be made whenever there may be reason to suppose there is any material change therein, and at least as often as once in each mile, whether there be any change or not, which observations must be entered in your field notes.

3. The following is the order and method to be pursued in running exterior township lines: a base line, or a township line assumed as a base, is run due east and west, across the southern boundary of the tract of country to be surveyed. On this line the quarter-section,

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section, and township corners are established at the full measure. The western portion of the south boundary of section 31, in each township should, however, be made as much over 40 chains in length, as the western portion of section 6, will fall short of 40 chains in length on the next correction line north, so that each range shall average six miles in width," From each of the township corners on this line, range lines are run due north, the section and quarter-section corners established thereon, and at the end of the sixth mile on each of those lines, temporary township corner posts are set. But, at the end of the sixth mile on the most easterly line, a township corner is established. From this corner, a township line is run due west across the whole district, intersecting the range lines previously run; which, if the work be well done, will be at or near the temporary township corner posts placed at the end of them. Exactly at the points of intersection, whether at the temporary posts or north or south of them, the township corners are to be established. The distances from the points of intersection, to the temporary posts, must be accurately measured and noted, showing whether they are north or south of those posts. On this west line, the intermediate section and quarter-section corners will be established, as thesurvey of the line advances. The same process will be repeated, in running up due north, from the township corners on this last west line, another series or tier of range lines, to temporary six mile posts; establishing as before, the most easterly one, and from thence extending another due west township line across the whole district, in the manner before directed. The same method is pursued in each successive tier of townships, until the survey of the township lines is completed. On account of the convergency of meridians, however, correction lines should be established at the end of every sixty miles north, on which lines, corners should be established on the same principle as on the base line.

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5. Variations from this order and mode of running township lines, will sometimes be necessary, to accommodate them to the situation and boundaries of the tract of country to be surveyed, or to connect with prior surveys. Such cases, as they occur, will be provided for in Special Instructions.

6. Whatever excess or deficiency may occur in the measurement of the exterior township lines, is to be carried to the north and west end of those lines. But by a vigilant and faithful attention to duty on the part of the skilful and experienced surveyor, those excesses or deficiences, except to a trifling extent, will be of rare occurrence. As the interior section lines must necessarily conform, both in their course and measure, to the township lines; any error committed in the latter will unavoidably be carried out into the former, and may mar the beauty and order of the entire sub-divisions of the township.

7. It will be seen, then, how very important it is, that the townships be, as nearly as possible, six miles square; that the exterior boundaries be run exactly by the true meridian; and that the measures thereof be truly and accurately made.

8. North and southlines are termed range lines, and east and west lines township lines. The bearing trees standing on the west side of range, and on the north side of township lines, are to be entered first in your field notes.

9. With the Field Notes of exterior township lines, the surveyor must return a map or diagram of the lines run, drawn on a scale of three miles to an inch; on which will be represented the length of each line, in miles, chains and links; the variation of the compas by which it is run; and also the water courses, lakes, prairies, samps, roads, and such other objects as may be shown on a map.

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OF MEASURING LINES.

1. In all measurements, the level or horizontal length is to be taken, and not that which arises from measuring along the surface of the ground, where it happens to be uneven, rolling, or hilly. For this purpose, in ascending or descending hills, the chainmen must let down one end of the chain to the ground, and raise the other end to a level therewith, as nearly as may be; from the end of which a tally pin should be plumbed and let fall, to ascertain the spot for setting it. And where the surface of the ground is very steep, it may be found necessary to shorten the chain to one half its length, or even less, so as to obtain the true horizontal measure.

2. Though your lines be measured by a chain of two poles or perches in length, you are notwithstanding, to keep your reckoning in chains of four perches of one hundred links; and all your entries in your Field Book, and all your calculations, plans, &c., must be made accordingly in four-pole chains, and decimal parts (or hundreths) thereof.

3. In measuring lines, every five chains are called a "tally," because at that distance the last of the ten tally pins with which the forward chainman set out, has been set. He then cries "tally," which cry is repeated by the other chainman, and each registers the distance, by slipping a thimble, on a belt worn for that purpose, or by some other convenient method: The back chainman then comes up, and having counted, in the presence of his fellow, the tally pins which he has taken up, so that both may be assure that none of the pins have been lost, takes the forward end of the chain, and proceeds to set them. Thus the chainmen alternately change places, each setting the pins that he has taken up, so that one is forward in all the odd and the other in all the even tallies, which contributes to the accuracy of the measurement, facilitates the recollection of the distances to notable objects on the line, and renders a mis-tally almost impossible

4. You are to pay the strictest attention to the frequent examination and correction of your surveying chain by the standard measure taken with you. The greatest attention must likewise be observed in obtaining, and entering in your Field Book, the exact measure on the lines, to every object which is noted therein. These measurements are very frequently found to be important, after many years, both in tracing the lines and in identifying the corners.

5. The principal source of error in surveying is in the measurement by the chain. And as the interest of the public service, the rights of purchasers of the public lands, as well as your own standing as a surveyor, are at stake, it is enjoined on you, in selecting your Chain-carriers, to have strict regard to their character and fitness for the trust; and to employ those only, in whose moral integrity, capacity, and faithfulness, you can repose the most implicit confidence. You are required to attend vigilantly to the manner in which your chainmen perform their duty, and to cause it to be faithfully and correctly executed; to see, especially, that they carry the chain horizontally on hilly ground; and that all the lines which you may run, be not only correctly measured by them, but the length thereof truly reported to you, for *immediate entry in the Field Book.*

6. In measuring across streams of water, you are to give the width directly across the channels thereof. The distances to the posts which you shall establish on the banks of rivers, lakes, or bayous which are to be meandered, are to be taken with great accuracy.

OF ESTABLISHING AND MARKING CORNERS.

1. The corners of townships, sections quarter sections, and fractions are to be established and marked in the following manner:—

2. On the exterior township lines, corner posts must be erected at the distance of every mile and half mile from the township corner. The mile posts are for the

corners of sections, and the half mile posts for the corners of quarter sections. These posts are always to be made of the most durable wood that can be had, and should be very securely set or driven into the ground and the sides of the posts are to be neatly squared off at the top—the angles of the square to be set in the direction of the cardinal points of the compass. All mile posts, on the township lines, must have as many notches cut on them, on one of the angles thereof, as they are miles distant from the township corner where the line commenced. But the township corner posts shall be notched with six notches on each of the four angles of the squared part. The mile posts on the section lines shall be notched, on the south and east angles of the square, respectively, with as many notches as those posts are miles distant from the south and east boundaries of the township. Wherever a tree may be so situated as to supply the place of a corner post, it is to be blazed on the four sides facing the sections to which it is the corner, and will be notched as the corner posts are, and at least one bearing tree must be taken, in addition thereto, and marked in the usual manner.

3. At all posts thus established for meander section or township corners, there shall be cut with a marking iron, on a bearing tree or some other tree, within each section, and as near as may be to the corner thereof, the number of such section; and over it the letter T, with the number of the township, and annexed thereto, the letter N or S as the township may be north or south of the base line; and above this, the letter R, with the number of the range, and annexed thereto, the letter E or W, as the range may lay east or west of the principal meridian; thus:

R 15 W
T 53 N
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4. The letters and numbers thus marked must be neatly and very distinctly cut into the wood of such

tree with a good marking tool, the bark thereof having been first hewn or peeled off from a spot on the side facing the corner, large enough for that purpose, unless the tree be a beach, in which case its bark, if smooth, may remain on.

5. But at the quarter-section corners there are no numbers to be made; the post is to be flattened on two opposite sides, and thus marked: "1-4 S," to indicate that it is a quarter section post; and the nearest adjoining tree on each side of the sectional line, must be similarly marked.

6. The place of all corner posts, of whatever description, which may be established, are to be perpetuated in the following manner, viz: from each post the courses shall be taken, and the distances measured, to two or more adjacent trees, in opposite directions as nearly as may be; which trees are called "Bearing trees," and shall be blazed near the ground, with a large blaze facing towards the post, and have one notch neatly and plainly made with an ax, square across, and a little below the middle of the blaze. On each bearing tree the letters B T to denote the fact of its being a bearing tree, or, in case of re-surveys, the letters N B T to denote the act of its being a new bearing tree, must be distinctly cut into the wood, in the blaze, a little above the notch. At all township corners, and at all section corners on range, or township lines, four bearing trees are to be marked in this manner, one within each of the adjoining sections.

7. Wherever the section or township lines intersect lakes, streams of water, or islands, which are to be meandered, posts are likewise to be established on the margin or banks thereof, at the points where the lines intersect or leave them. These posts are to be flattened on the two sides, co-inciding with the lines on which they are set; and on each of these sides is to be marked, the number of the section which it faces.

8. Wherever bearing trees cannot be had, quadran-

gular mounds of earth or stone are to be raised around the corner posts, the four angles of which must coincide with the cardinal points of the compass.

9. Mounds at township corners are to have a base of five feet, and a top of two feet in diameter, and a height of three feet. At section, quarter section, and meander corners, they

are to have a base of four feet, a top of one and a half feet, and a height of two and a half feet.

10. When mounds are made of earth, the place from which it is taken is called the *"Pit,"* the centre of which must in all cases, where practicable, be made at a uniform distance, and in a uniform direction from the centre of the mound, viz: At township corners there are to be two pits, one ten links due north, and the other ten links due south; at section corners, one pit, eight links due south; at quarter section corners, one pit eight links due east; and at meander corners, one pit directly on the line, eight links farther from the water than the mound. Whenever the pits are not made as here directed, the course and distance to each must be given in your field book. The mounds are to be neatly covered with sod, placed grass side up, so that the grass may be kept alive, in all cases where sod can be found.

11. The posts established in mounds must be squared, and show above the top of the mound about ten or twelve inches, and, on each side of the square, must be marked the number of the section towards which it faces, and above this, on two opposite sides, at all section corners on township and range lines, there must be marked the appropriate letters and numbers to indicate the township and range.

12. When a section or quarter section happens at a point for establishing a meander corner, the posts and trees are to be marked with the appropriate letters and numbers for such section or quarter section corner.

13. Whenever the proper place for establishing a corner is inaccessible, unless it be in a river or body of water which is to be meandered, you are to establish a

witness corner, as near thereto as practicable, and either due north, south, east, or west of it. Such corner is to be constructed in all respects like the one for which it stands as a witness, with the addition of the letters W and C and the number of links from the true corner, immediately over the usual marks.

OF SUBDIVIDING TOWNSHIPS.

1. Each Township is laid off and surveyed into thirty-six sections of one mile square, by lines running due north and south, corssed by others running due east and west. The sections are known and designated by progressive numbers, beginning at the north-east corner of the township, and numbering westward and eastward, alternately, as shown in the following diagram:

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

2. Each side of a section must be made one mile in measure by the chain. Quarter section corners are to be established at every half mile, except in closing a section, when the closing line varies from eighty chains or one mile; in which case you are to place in closing a section, when the closing the quarter section corner equidistant, or at the average distance from the corners of the section. But in running out the last section lines, to the north and west boundaries of the township, the quarter section corners are to be established at the distance of forty chains from the last section corner, and the excess or deficiency of measure (if any) carried out into the last half mile, and east upon the north and west sides of the township, as required by law.

3. You will begin on the east boundary of the township, at the corner of sections 13 and 24, and run and measure a random line west, or parallel to the south boundary, to the west boundary of the township, and note your intersection, whether at, or north, or south of the corner of sections 18 and 19, and if not at that corner, how far from it. On this random line you will

set temporary section and quarter section posts; and also set stakes, or make some other marks, at all the even tallies, or outs, between those posts. From the corner of sections 18 and 19, on the west boundary, you will then return on the true line, straight towards the corner where you commenced the random, blazing and marking that line, and verifying its course by means of off-sets from the posts and stakes set, or other marks made, on the random line, and mark and establish the proper section and quarter section corners thereon.

4. From the corner of sections 13, 14, 23 and 24, run and measure a random line south, or parallel to the east boundary, to the south boundary of the township, and note the intersections thereof, whether at, east or west of the corner of sections 35 and 36, and if not at that corner, how far from it. On this random line, as it is run, you will set temporary section and quarter section posts, and make other marks for the even tallies, or outs, as directed on the random line through the middle of the township. From the corner of sections 35 and 36, on the south boundary, you will return on the true or direct line, blazing and marking that line, and establishing the quarter section and section corners thereon, at their average distances, or proportionate parts of the whole distance, to the corner of sections 13, 14, 23 and 24, on the middle line.

You will also run and measure a random line east from the corner of sections 25, 26, 35 and 36, to the east boundary of the township, and note its intersection, whether at, or north, or south of the section corner, and how far from it, and correct, mark and establish this line back to the corner from which you set out, in the manner before directed for the correction of random lines, establishing the quarter section corner thereon equidistant between the section corners. Proceed in like manner with each east and west section line, as you progress north, until you close at the corner of sections 13, 14, 23 and 24.

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5. From this corner, run and measure a random line north, or parallel to the east boundary, to the north boundary of the township, and note its intersection, whether at, or east, or west of the corner of sections 35 and 36 in the township north, excepting where you close on a correction line, in which case you will note the distance east or west to the nearest section or quarter section corner, and establish a corner thereon, for sections 1 and 2, one mile west of the north-east corner of the township, according to the measure of the correction line. In running this random line, posts must be set for temporary section and quarter section corners, and stakes or some other marks must be left to indicate the places of all the even tallies, or outs, as before directed in similar cases. From the corner of sections 1 and 2, return on the true line, in the direction of the place of beginning the random, to the corner of sections 1, 2, 11 and 12, blazing and marking the same as before directed for true lines, and establishing the quarter section corner so as to leave the excess or deficiency of the whole measure in the half mile next to the north boundary of the township. From the corner of sections 1, 2, 11 and 12, run and measure a random line east for its corresponding corner on the east boundary. Note its intersection, and correct back, and establish the quarter section corner on the true line at equal distances between the section corners, blazing and marking the corrected line as before directed. In like manner proceed to run, measure, mark and establish all the subdivision lines on this part of the eastern tier of sections, until you close at the corner of sections 13, 14, 23 and 24.

6. Proceed in the same manner with each successive tier of sections, to the last, changing the order only so far as necessary, when interrupted by lakes or other interferences. From the section corners on the east side of the last tier, run random lines west for their corresponding corners on the west boundary of the township, note your intersections, correct back from those corners, as

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directed in other cases, before mentioned, and establish the quarter section corners on the corrected lines at the distance of forty chains from the section corners east of them, so that the excess or deficiency of measure may be thrown into the half mile next to the west boundary, as required by law.

7. Bearing trees are to be taken, and the proper marks and numbers made, for and within the sections between which the lines are run out to the north and west boundaries of the township, in all cases where such bearing trees have not been taken, and such marks made, for the section corners on those boundaries at which those lines close.

8. The plan here laid down is intended to illustrate the principles on which townships must be subdivided so that the section lines may all run parallel either to the east or south boundaries thereof, and that each section may contain 640 acres, as nearly as practicable. To effect these objects, it is indispensably necessary that for every section line, unless it be irregular or fractional, there should first be run a random or trial line, which must afterward be corrected, where necessary, and run, marked, and established, in its proper place, as the corrected or true line. This must always be done according to some regular order, which, when once begun, must, as far as practicable, be continued throughout the township.

As a general rule, the order above prescribed is believed to be the best and most convenient that can be adopted; but if you find any other more convenient, and by which the surveys can be made with equal or greater accuracy, you are at liberty to adopt it, provided you give a clear and distinct statement, at the end of your field notes in each book, showing what that order is. A departure from the *principles* above laid down, *will not, however, under any circumstances, be permitted.*

9. To enable you to have all your random lines correctly run by the sun, as far as practicable, independ-

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ently of the use of the magnetic needle, you are allowed to employ, by the month, an assistant surveyor, who is well skilled in the use of the solar compass, to run and measure such lines, and take the field notes thereof, under your direction, in accordance with the above instructions. The field notes of such assistant must, in all cases, be taken in separate books, and be sworn to and subscribed by him, before some person authorized to administer oaths, and returned by you to this office.

10. The true lengths of all north and south, as well as of all east and west section lines, must be given *according to your measure,* whether they agree with the lengths of the same lines as ascertained by the compass and the measure of the township lines, or not.

11. You are referred, here, to the accompanying specimen of the Field Notes of a township, in which the whole process of the subdivision is illustrated at large by example.

12. The foregoing mode of subdividing townships into sections, it will be perceived, is intended for, and can be fully applied only, to *entire* townships. In the subdivision of *fractional* townships, however, the order of the survey will be varied no farther than may be necessary to adapt it to the situation and boundaries of such fractional township. As a general rule, from which there will be few exceptions, it will be found best to make entire sections on the township lines bounding a fractional township, and making the work to close on the irregular boundaries thereof.

13. An act of Congress of the 24th of May, 1824, authorizes a departure from the ordinary mode of surveying the public land on any river, lake, or bayou, whenever, in the opinion of the President of the United States, the public interest would be promoted thereby; so as to survey such lands in tracts of two acres in width, fronting on such river, lake, or bayou, and running back to the depth of forty acres. But as no general rules could be framed to govern all such surveys,

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this branch of the service is left to be provided for in *Special* Instructions, as cases thereof may occur.

14. Should you find a manifest error in the measurement of any township line within, or bounding your district, (which will be readily detected by the closing of your lines thereon,) you are to correct such error, by re-measuring such township line, from where the error is found, to the north or west end

thereof. The section and quarter section corners thereon are to be removed to the proper distances, and there established; and the marks and numbers at the cancelled corners are to be cut out or effaced, and the distances at which you pass those corners must be noted by you. Of such re-measurement and corrections you are to take full and complete Field Notes, in a separate book, to be returned to the Surveyor General's Office, with the Field Notes of your subdivisions. For such corrections, however, the Surveyor General is not authorized to make any compensation, unless the amount thereof can be obtained from the Deputy by whom the erroneous survey was made, or shall be allowed by the Commissioner of the General Land Office.

OF MEANDERING RIVERS, &C.

1. You will accurately meander, by course and distance, all navigable Rivers which may bound or pass through your district; all navigable bayous flowing from or into such rivers; all lakes and deep ponds, of the area of forty acres and upwards; and all islands suitable for cultivation. At all those points where the township or section lines intersect the banks of such rivers, bayous, lakes or islands, posts are to be established, as before directed. In meandering, you are to intersect all these posts, closing at each post the course and distance on which it is intersected. You will likewise notice all streams of water falling into the river, lake, or bayou, which you are surveying, with their width at their mouth; all springs, noting the size thereof, and whether

pure or mineral water; the head and mouth of all bayous, all rapids, falls, or cascades; all islands and bars with intersections to their upper and lower points, to establish their exact situation. This must be done with the greatest accuracy, in relation to all islands which you shall meander, so as to determine and show their precise location and bearing on the maps of the surveys, and particular care must be taken to pass no object in any degree worthy of note, nor any change in the topography along the waters that you meander, without giving a particular description thereof in its proper place in your meander notes.

2. Should any lake or pond which you shall meander, be situated within any one section, so as not to be intersected by any of the lines thereof, you will run and measure a line very exactly, but without marking, from one of the corners, or one of the half mile posts, or other given point on one of the lines of said section, to the point on the margin of the lake at which you shall commence the meanders thereof. The true location of such lakes is necessary, in order to calculate the contents of the subdivisions of such sections.

3. The width of streams of water or bayous binding on, or forming a boundary of your surveys, must be ascertained at every intersection of your lines therewith, by trigonometrical process, or otherwise; which can generally be most conveniently done in taking the meanders. This is necessary for the correct exhibition of such streams on the township plats.

4. Except in cases where navigable streams constitute the boundary line between two series or systems of surveys commencing from different standard lines, such streams are not to interrupt the regular survey of the townships through which they pass, the lines of which shall be continued across those streams to the complete measure. And where the surveys have been closed on a stream, as a boundary of a cession, or from other cause, and are afterward to be continued across such

stream, the surveyor continuing the surveys on the opposite side, must extend the lines across the stream, so as to make the sections thereon complete.

5. To establish a uniform and simple mode of designating and distinguishing the two sides of navigable streams, the terms "Right bank," or "Left bank," will be used, in all cases, thus:—suppose yourself standing at the head of the river, looking down stream; then that bank of the stream on your right hand is to be called and referred to in your field notes as the "right bank," and that on your left hand as the "left bank." And these terms, thus applied to navigable rivers, are to be used in all cases, whether in running lines or taking meanders.

6. Great care must be taken to describe clearly the post at which any meanders of a river, bayou, lake, or island commence; and also all the posts, on township or section lines, which may be intersected in the progress of the meanders.

7. The Field Notes of meanders are to be written at the end of the subdivisions. The courses are to be inserted in a column on the left of the page; the distances, in chains and links, in a column next to this, and the notes or remarks on the right, opposite the proper course and distance. The column of distances must be added up at the foot thereof, on each page.

8. Errors in meandering are of very frequent occurrence, arising principally, it is believed, from bad chaining. Your special attention is called to the manner in which this part of the work is executed; and all possible accuracy is enjoined, both in the courses and measurement, and the entry thereof in your field book.

9. Where the meanders of small lakes cannot be accurately run and measured by course and distance, in the usual manner, by reason of obstacles along their shores or banks, a well constructed series of triangles may be made across the lake, so connected that all the angles of the lake coast can be accurately platted. A

map of these triangulations must be made on a scale of 8 inches to the mile, and their reduction into the meanders of the lake coast must be carefully entered in your field book.

10. Streams to be meandered, having shores of like character, may have their courses taken with a solar compass, and measured by the angles made between two parallel lines so placed in the principal focus of a suitable telescope, attached to the sights of the compass, as to form an angle in the field view of at least 50 minutes, or 5-6 of a degree. For this purpose, the telescope is made to bear upon a rod, divided into feet, inches and tenths, and furnished with two targets, the upper one stationary, and the other moveable on the rod, to suit the angle seen through the telescope at various distances. The distance between the two targets on the rod being

then the measure of the angle formed by the two lines in the focus of the telescope, represents the distance between the compass and the rod, which may be taken out, in chains and links, from a table previously prepared for that purpose.

11. By observing, accurately, the number of feet, inches, and tenths, which the targets are apart, when they measure the angle formed by the parallel lines in the telescope, at a given distance, of from three to five chains from the compass, you will have data from which such a table may be readily constructed for all other distances at which the telescope will enable you to observe a difference in the distance between the targets of one-tenth of an inch.

12. Wherever meanders are made by this method, the fact that they are so made should be distinctly shown in the heading of your field notes, and the precise angle between the parallel lines in the focus of your telescope, must also be stated. The stations at which observations are made, must be designated by progressive numbers, and all the observations made at each station must be set down with great care and accuracy. Where a distance

is noted, as measured by the telescope, the number of tenths of an inch on the rod, which corresponds to that distance, must also be carefully given, in order to facilitate the detection of errors, wherever they may occur.

13. Having taken the width of the river so frequently, and made such observations, on both sides of it, as to enable you to protract, accurately, its shores, you will make a plat thereof on a scale of eight inches to a mile, and from it enter the meanders of each shore in your field book in the usual manner, immediately after the field notes of your telescopic observations for each township. All such plats, whether of rivers or lakes, must be returned with your field notes to this office.

OF PRIVATE CLAIMS, INDIAN RESERVATIONS, &C.

1. In surveying Private Claims, Indian Reservations, or other tracts not conforming to section lines, the location thereof must be particularly described, and the place of beginning clearly stated in your Field Notes; also the name of the claimant in whose right the survey is made, with the number by which it is known; and if a reservation, the quantity contained in it, and the name of the reservee. The Field Note of all the lines of each tract must be complete, and are to be entered in the Field Book separately from the notes of other tracts. The Field Notes of Private Claims and Indian Reservations, must be entered in separate books.

2. Wherever a section or township line intersects a line of a private claim or Indian reservation, there a corner must be established. The particular line intersected, with its course, and the name of the claimant or reservee with the number or other designation by which it is known, must be noted. And from such intersection, the private claim or reserve line must be carefully measured, each way along said line, to the end thereof, unless it should be intersected by another section or township line before the end be reached.

3. The course of every line of the survey of a private

claim or Indian reservation, with the length thereof, and the variation of the compass, and date of the survey, are to be inserted in the Field Notes, which are to be certified and signed by you.

OF FIELD NOTES.

1. The field books are all to be made of one uniform size, viz: foolscap octavo; or a sheet of common sized cap paper, folded into sixteen pages. The paper must be of good quality, and the books covered with morocco or other leather, and neatly stitched and trimmed and contain space enough for all the field notes of a township. The pages are to be ruled with red ink and feint lined.

2. The field notes of the subdivision of every township, whether fractional or not, are to be written in a separate book.

3. No one page, either of the notes of township lines, or of subdivisions, is to embrace the field notes of more than one section line.

4. The description of the surface, soil, minerals, timber and undergrowth on each section line, is to follow the notes of the survey of such line, and not to be mixed up with them.

5. The language of your field notes must be so concise and clear, and the hand in which they are written so plain and legible, that no doubt can exist as to your figures, letters, words or meaning. If otherwise, they must be accompanied with true and fair copies.

6. The only abbreviations allowable in your field notes, are—"in. diam.," for "inches, diameter," and the capital letters N. S. E. and W., for North, South, East and West. These latter words, however, must always be written in full, except when combined to express some course varying from the cardinal points.

7. The description of each mile must be independent, and not refer to a preceding description.

8. The field notes must be taken, in all cases, precise-

ly in the order in which the work is done on the ground, and must show truly the direction in which each line is run and measured.

9. The date of each day's work must follow immediately after the notes thereof.

10. All your writing, of every description, whether of field notes, memorandums, or arithmetical or trigonometrical calculations, relating to surveys that you may execute, must be taken, either in your regular field books, or in memorandum or miscellaneous books, of the same size and shape, which, when called for, must be returned to this office. It is not, therefore, allowable to make any notes, memorandums, or calculations, on loose pieces of paper.

11. On the first page of your field book of each township, insert in a plain and neat manner, by way of title, the number of the township and range, with the state in which it lies, and by whom surveyed, with the date of the commencement, and the date of completing the subdivision of the same.

12. Between the second and third pages, insert, without

fastening there, a diagram neatly folded, drawn on tough bank note paper, on a scale of half a mile to an inch. On this diagram you will accurately delineate, as near as may be practicable by occular observation on the spot, as you progress with the work, the crossing and courses of all streams of water, the intersection, situation, and boundaries of all prairies, marshes, swamps, lakes, hills, and all other things mentioned in your field notes, the situation of which can be conveniently shown on1 the diagram. You will also insert thereon, in small figures, the length of all the section lines of the township.

13. On the fourth page, make an index diagram, representing all the sections in the township, on a scale of two miles to an inch, on each line of which, after the survey thereof is completed, you will write or print, in a neat and distinct manner, the number of the page of the book where the notes of that line may be found,

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and, where the notes of the random line and of the corrected line are on different pages, the former must be referred to in red, and the latter in black ink."

14. Leaving, after this, sufficient room for the oaths of your chain-men and markers, if necessary, at the head of each subsequent page, on which the field notes are written, you will insert a running title, designating the number of the township and range, which is to be separated from the field notes by a double red line.

15. The *Field Notes* of the surveys furnish primarily the materials from which the plats and calculations of the public lands are made; and are the source from whence the description and evidence of the location and boundaries of those surveys are drawn and perpetuated. It is evidently, then, of the utmost importance that the Field Notes should be, at once, an accurate, clear, and minute record of every thing that is done by the Surveyor and his assistants, (in accordance with these Instructions,) in relation to running, measuring and marking lines, establishing corners, &c., as well as a full and complete topographical description of the country surveyed, as it regards every thing which may afford useful information, or gratify public curiosity.

16. For this purpose you are to enter in your Field Book, in a neat and distinct manner, notes or minutes of the following objects, viz:

17. The description, course and length of every line which you may run, beginning with the variation of the needle, if known to you, at the corner where you start.

18. The name, and estimated diameters of all corner and bearing trees, and the courses and distances of the bearing trees from their respective corners.

19. The name of the material of which you construct mounds, with the course and distance to the pits.

20. The names and estimated diameters of at least one or two of those trees which fall in your lines, called *station* or *line trees,* with their exact distances on the line, between every two corners. They should be so

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taken as to divide the line as nearly into equal parts as practicable.

21. The face of the country, whether level, rolling, broken, hilly, or mountainous.

22. The quality and character of the soil, and whether first, second, or third rate.

23. The several kinds of timber and undergrowth with which the land may be covered, naming each kind of timber in the order in which it is most prevalent; and in prairie, the kind of grass or other herbage which it produces.

24. All rivers, creeks and smaller streams of water, with their right-angled width, and the course they run where the lines of your survey intersect or cross them, and whether the current be rapid, sluggish, or otherwise.

25. All rapids, cataracts, cascades, or falls of water, and the estimated amount of their fall, in feet.

26. All springs of water, and whether fresh and pure, or mineral; showing also on which side of the line situated, and the distance therefrom, and the course of the stream flowing from them.

27. All lakes and ponds, with the description of banks surrounding them, and whether the water be deep or shallow, pure or stagnant.

28. The meanders of all lakes, navigable rivers, bayous, islands, and streams forming boundaries.

29. All prairies, swamps, and marshes.

30. All coal banks or beds, and peat or turf grounds.

31. All precipices, caves, stone quarries, and ledges of rock, with the kind of stone found in them.

32. All towns and villages, Indian towns and wigwams, houses or cabins, fields or other improvements, sugar-tree groves, and sugar camps.

33. All minerals and ores, with particular descriptions of the same, as to their quality and extent.

34. All diggings for minerals, smelting or other furnaces, forges and factories.

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35. The exact situation, and description of all mines, salt springs, salt licks and mill-seats, which you may discover, or that may come to your knowledge.

36. All fossils, petrifactions, and other natural curiosities, with descriptions thereof.

37. All travelled roads, and "trails," with their courses, and denoting the places from, or to which they lead.

38. The tracks of tornadoes or hurricanes, commonly called "windfall," or "fallen timber," shewing the direction of the wind, as indicated by the fallen trees.

39. All ancient works of art, as mounds, fortifications, embankments, ditches, or other similar objects.

40. All offsets, or methods of whatever kind, by which you shall obtain the measurement or distance on any line which cannot be actually measured

41. At what distance you enter and at what distance you

leave every lake, bay, pond, creek, bottom, windfall, grove, prairie, ravine, marsh and swamp, with the course of the same at both points of intersection; also the distances at which you begin to ascend, arrive at the top, begin to descend, and reach the foot of all hills and ridges, with their course, and estimated heights in feet above the level land of the surrounding country, or above the bottom lands, ravines, or waters on which they are situated.

42. The variation of the needle must be noted at, and on each side of all places on the lines where there is any material change of variation, and the distances to the points where the observations are made must be given.

43. The precise course and distance of all witness corners from the true corners which they represent, must be stated in the descriptions of those corners.

44. In addition to the foregoing items, you will insert notes of any others as the occasions therefor may occur. The field notes are to be written out in your book, on the spot, as you proceed with the work. Noth-

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ing in your notes must be left to be supplied by memory.

45. Rivers, creeks, and smaller streams, lakes, swamps, prairies, hills, mountains, or other natural objects, are to be distinguished in your field notes by their received names only, where names have heretofore been given. In any case you are not to give original names.

46. Beside the ordinary Field Notes taken on the lines, you will add at the end of your field book, such further description or information as you may be able to give, concerning any thing in the township, worthy of particular notice, or which you may judge necessary or useful to be known. And you will add also, a general notice or description of the township, in the aggregate, as it regards the face of the country, soil timber, &c.

47. In your field book, the courses and distances must be placed in a column on the left hand side of the page, and your notes and remarks on the right. The *original* field notes must in all cases, be returned into the office of the Surveyor General.

48. Following the general description of each township, at the end of the field notes in each book, you will give a list of the names and residences of all the persons who may have assisted either in running measuring or marking, the lines and corners therein described, stating the capacity in which each acted; and below such list, a certificate must be written affirming its correctness, and that the township has been in every respect well and faithfully surveyed, according to the instructions of the Surveyor General, which certificate must be subscribed and sworn to by the persons named in the list, either before yourself, as a Deputy Surveyor, or before some other person duly authorized to administer oaths. The following forms, as far as applicable, may be used for this purpose:

List of names and residences of persons who assisted in running, measuring, or marking the lines and corners

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described in the foregoing field notes of township _____ N. of Range _____, in the State of _____, viz:

A_____ B_____, a resident of _____ in the county of _____ in the State of _____ and C_____ D_____ of _____ in the county of _____ and State of _____ performed the duty of chainmen and marked the corners; E_____ F_____ of _____ in the county of _____ and State of _____ and G_____ H_____ of _____ in the county of _____ and State of _____ performed the duty of axe-men; and I_____ K_____ of _____ in the county of _____ and State of _____ performed the duty of compass-man, under the personal supervision and direction of L_____ M_____ Deputy Surveyor, in running most of the lines, above referred to.

We hereby certify that we assisted L. M., Deputy Surveyor, in subdividing township _____ of Range _____ in the State of _____ that our names and residences, and the duties that we respectively performed, are correctly set forth in the above statement, and that said township has been in every respect well and faithfully surveyed, according to the instructions of the Surveyor General.

A _____ B _____ Chainman,
C _____ D _____ Chainman,
E _____ F _____ Axe-man,
G _____ H _____ Axe-man,
I _____ K _____ Compass-man.

Subscribed and sworn to by the above named persons, before me at _____ this _____ day of_____ 18_____.

O_____ P_____, Justice of the Peace (or other officer authorized to administer oaths) of the county of _____ and State of _____

49. In every field book, after the certificate above mentioned, an affidavit of the following form is to be written, and sworn to and subscribed by you before some person duly authorized to administer oaths, viz.

I, L_____ M_____ of _____ in the county of _____ and State of _____, a Deputy Surveyor, do solemnly swear

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(or affirm) that, in pursuance of a contract with C_____ N_____ Surveyor General of the United States, for Ohio, Indiana, and Michigan, bearing date _____ day of _____ 18_____. and in strict conformity to the laws of the United States, and the instructions of the said Surveyor General, I have faithfully and correctly surveyed township number _____ of range no _____ of the principal meridian, in the State of _____ and I do further solemnly swear (or affirm) that the foregoing are the true and original field notes of the said survey, executed as aforesaid.

L_____ M_____, Deputy Surveyor. Subscribed by said L_____ M_____, Deputy Surveyor, and sworn to before me at _____ this _____ day of _____ 18_____.

O_____ P_____, Justice of the Peace, (or other officer authorized to administer oaths) of _____ in the county of _____ and State of _____

50. Should you employ an assistant to run random lines, an affidavit, of the following form, must be written, subscribed and sworn to by him after his field notes in each book, viz:

I, R_____ S_____, of _____ in the county of _____ and State of _____ do solemnly swear, that the foregoing are the true and original field notes of the random lines

therein described, in township _____ of range _____ in the State of _____ and that the said lines were carefully and accurately run by me with a good solar compass, independently of the needle, except as mentioned in said notes, and that they were measured in my presence under the direction and at the expense of L_____ M_____ Deputy Surveyor, while I was employed by him and paid by the month.

R_____ S_____,

Random line Surveyor.

Subscribed by said R_____ S_____ random line surveyor, and sworn to before me this _____ day of _____ 18_____.

O_____ P_____, Justice of the Peace,

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(or other officer authorized to administer oaths) of _____ in the county of _____ and State of _____.

51. A printed specimen of the Field Notes of the subdivision of a township into sections, accompanies these Instructions; which will serve to illustrate both the order and method of performing the surveys, and the most approved form of keeping the Field Notes; for which purpose, it is to be regarded as a part of these General Instructions. Where the notes of the true line follow immediately after those of the random, the provisions of section 3, under the head of field notes, must be carefully adhered to. When they do not so follow, a page may embrace the notes of more than one mile, provided they do not extend to the next page.

52. Any material departure from these Instructions, or negligence in the observance thereof, will be considered as a violation of the conditions of your contract, and a forfeiture of all claim for payment. And loose, inaccurate, precipitate, or defective work, either as it respects the surveys in the field, or the notes and returns thereof on paper, *will not be admitted.*

53. That you may better understand the responsibility under which you are acting, your attention is particularly called to the provisions of the third section of an act of Congress, approved August 8th, 1846, entitled "an act to equalize the compensation of the Surveyor General of the public lands of the United States, and for other purposes," which is as follows, viz:

"SEC. 3. That the Surveyor General of the public lands of the United States, in addition to the oaths now authorized by law to be administered to deputies on their appointment to office, shall require each of their deputies, on the return of his surveys, to take and subscribe an oath or affirmation that the surveys have been faithfully and correctly executed, according to law and the instructions of the Surveyor General; and, on satisfactory evidence being presented to any court of competent jurisdiction that such surveys, or any part thereof,

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had not been thus executed, the deputy making such false oath or affirmation shall be deemed guilty of perjury, and shall suffer all the pains and penalties attached to that offence; and the district attorney of the United States for the time being, in whose district any such false, erroneous, or fraudulent surveys shall have been executed, shall, upon the application of the proper Surveyor General, immediately institute suit upon the bond of such deputy; and the institution of such suit shall act as a lien upon any property owned or held by such deputy, or his sureties, at the time such suit was instituted." The provisions of the above section will, in all cases, and in every particular, be rigidly enforced.

Surveyor General

SUBDIVISION

OF

Township 53 North, Range 15 West.

OF THE

PRINCIPAL

MERIDIAN OF MICHIGAN,

BY A. B., DEPUTY SURVEYOR.

Begun, April 1st, 1850.
Finished, May 1st, 1850.

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Township 53, North Range 15 West, Meridian Michigan.

Chs.	Lks.	
West,		Beginning at post on East boundary between sections 13 and 24. Thence *Random between sections* 13 *and* 24. Variation 5° 00′ East.
34	50	Stream 15 links, course N.W.
40	00	Set temporary post. Variation 5° 50′ East.
80	00	Set temporary post corner of sections 13, 14, 23 and 24. Land rolling; first rate clay soil. Timber, Sugar, Beech, Lynn, Elm, Hickory, Black Walnut, &c. No undergrowth.
West,		*Random between sections* 14 *and* 23. Variation 5° 15′ East.
20	00	Indian trail from sugar camp in section 24 to Indian village. Course N. W. and S.E.
40	00	Set temporary post. Variation 5° 00′ East.
80	00	Set temporary post corner of sections 14, 15, 22 and 23. Land gently rolling; second rate clay soil. Timber, Beech, Sugar, Hickory, Ironwood, Elm, Lynn, &c.

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Townshiy 53, North Range 15 West, Meridian Michigan.

Chs.	Lks.	
West,		*Random between sections* 15 *and* 22. Variation 5° 00′ East.
28	00	Intersect pond. Course North and South, mostly South of line.
35	00	Leave pond. Course N.E. and S.W.
40	00	Set temporary post. Variation 5° 10′ East.
80	00	Set temporary post, corner of sections 15, 16, 21 and 22.

		Land gently rolling, and first rate. Timber, Beech and Sugar trees.
West,		*Random between sections* 16 *and* 21. Variation 5° 00′ East.
40	00	Set temporary post. Variation 4° 55′ East.
80	00	Set temporary post, corner of sections 16, 17, 20 and 21. Land gently rolling, and second rate. Timber, Beech, Sugar, Hickory, Ironwood, Elm and Lynn.

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
West,		*Random between sections* 17 *and* 20. Variation 4° 50′ East.
13	50	Road, course N.E. and S.W.
20	00	Intersect East boundary of Indian Reservation, and enter cultivated fields; house and saw mill about 5 chains south on stream. Variation 4° 50′ East.
40	00	Leave fields. Course N. and S.
51	00	Enter bottom land. Course N.W. and S.E.
60	50	Stream, 40 links. Course N.W.
72	00	Stream, 50 links. Course North.
74	00	Ascend 20 feet from bottoms to White and Yellow Pine Plains. Course North and South.
80	00	Set temporary post in Reserve. Land, first 5 chains rolling, second rate; remainder bottoms and Pine Plains.

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
West,		*Random between sections* 18 *and* 19. Variation 4° 15′ East.
20	00	Intersect West boundary of Indian Reservation. Variation 4° 00′ East.
40	00	Set temporary post. Variation 4° 00′ East.
75	50	Intersect West boundary 139 links North of post. Land level. Timber, White and Yellow Pine plains; third rate sandy soil.
N. 89° 50′ E		*Corrected between sections* 18 *and* 19. Variation 4° 00′ East.
10	50	White Pine, 20 in. diam.
25	00	Yellow Pine, 13 in. diam.
35	50	Set quarter section post. White Pine 10 North, 19° East, 31 links. Yellow Pine 30 South 23° West, 45 links.
48	70	White Pine 8 in. diam.
55	50	Intersect West line of Indian Reservation, and set post. Yellow Pine 10 North 50° East, 20 links. Ditto 15 South, 25° West, 60 links. Measured South on West line of Indian Reservation, 40 chains to S.W. corner.
75	50	Corner of sections 17, 18, 19 and 20 in Reserve. April 1st, 1850.

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
N. 89° 50′ E		*Corrected between sections* 17 *and* 20.
60	00	Intersect East line of Indian Reservation, and set post in East side of improvements. Beech 25 North 18° East, 75 links. Birch 17 South 29° West, 43 links.
68	00	White Oak 13 in. diam.
80	00	Set post corner of sections 16, 17, 20 and 21. Black Oak 25 North 40° East, 29 links. Hickory 18 South, 29° West, 40 links.
N 89° 50′ E		*Corrected between sections* 16 *and* 21.
8	00	Beech 12 in. diam.
25	00	Black oak 15 in. diam.
40	00	Set quarter section post. Hickory 14 North, 50° East, 28 links. Beech 10 South, 28° West, 19 links.
48	00	White Oak 18 in. diam.
64	00	Maple 14 in. diam.
80	00	Set post corner of sections 15, 16, 21 and 22. Elm 14 South, 25° East, 18 links. Birch 20 North, 20° West, 45 links.

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
N. 89° 50′ E.		*Corrected between sections* 15 *and* 22.
15	00	Ironwood 18 in. diam.
35	50	White Ash 13 in. diam.
40	00	Set quarter section post. Ironwood 8 North, 25° West, 17 links. Black Ash 10 South, 18° East, 28 links.
53	00	Black Oak 10 in. diam.
80	00	Set post corner of sections 14, 15, 22 and 23. Beech 20 North, 28° West, 60 links. Black Oak 15 South, 40° East, 80 links.
N. 89° 50′ E.		*Corrected between sections* 14 *and* 23.
14	00	Ironwood 1 in. diam.
30	00	Beech 24 in. diam.
40	00	Set quarter section post. Lynn 18 South, 2° West, 40 links. Elm 28 North, 40° East, 60 links.
50	00	Black Walnut 25 in. diam
68	00	Hickory 18 in. diam.
80	00	Set post corner of sections 13, 14, 23 and 24. Black Walnut 18 North, 24° West 15 links. Elm 14 South, 45° East, 29 links.

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
N 89° 50′ E.		*Corrected between sections* 13 *and* 24.
20	00	Hickory 15 in. diam.
23	00	Elm 40 in. diam.
40	00	Set quarter section post. Sugar 25 North, 29° West, 48 links. Lynn 18 South, 18° East, 60 links.
68	00	Beech 25 in. diam.
80	00	Intersect East boundary at post. April 2d, 1850.
South,		*Random between sections* 23 *and* 24. Variation 5° 15′ East.
8	50	Indian trail from sugar camp in N.E. corner of section 24. Course N. W.
40	00	Set temporary post. Variation 5° 15′ East.
80	00	Set temporary post corner of sections 23, 24, 25 and 26. Land rolling, first rate; Timber, Sugar, Beech, Lynn, Elm, Hickory, Black Walnut, Ironwood, &c.

South,		*Random between sections* 25 *and* 26.
		Variation 5° 50′ East.
40	00	Set temporary post.
		Variation 5° 45′ East.
80	00	Set temporary post corner of sections 25, 26, 35 and 36.
		Land gently rolling, second rate; Timber, Beech, Sugar, Lynn, White Ash, Maple, Ironwood, &c.

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
South,		*Random between sections* 35 *and* 36.
		Variation 5° 30′ East.
15	90	Enter prairie. Course N.E. and S.W.
40	00	Set temporary post.
		Variation 5° 45′ East.
49	00	Leave prairie and enter grove. Course N.E. and S. W.
71	00	Leave grove and enter prairie. Course East and West.
80	12	Intersect South boundary 35 links West of post.
		Land gently rolling, second rate; Timber North of prairie, Beech, Maple, Oak, &c. Timber in grove principally Oak. Soil of prairie dry, light colored, sandy loam.
N. 5′ W.		*Corrected between sections* 35 *and* 36.
		Variation 5° 00′ East.
9	50	Black Oak 10 in. diam.
24	00	Black Oak 20 in. diam.
40	02	Set quarter section post in prairie, and raised a mound of earth and sod around it.
70	00	Beech 10 in. diam.
80	04	Set post corner of sections 25, 26, 35 and 36.
		Beech 20 North, 40° East, 10 links.
		Maple 18 South, 25° West, 05 links.
		April 3d, 1850.

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
East,		*Random between sections* 25 *and* 36.
		Variation 5° 30′ East.
30	00	Enter prairie. Course N.E. and S.W.
40	00	Set temporary post.
		Variation 5° 50′ East.
79	90	Intersect East boundary at post.
		Land first 30 chains gently rolling, second rate; Timber, Beech, Maple, Ash, Ironwood, &c. Remainder rolling prairie; soil good sandy loam, almost first rate.
West,		*Corrected between sections* 25 *and* 36.
		Variation 5° 50′ East.
39	95	Set quarter section post in prairie; raised a mound of earth and sod.
63	20	Beech 20 in. diam.
79	90	Section corner.
N. 5′ W.		*Corrected between sections* 25 *and* 26.
13	50	Beech 18 in. diam.
34	00	White Ash 14 in. diam.
40	02	Set quarter section post.
		Sugar 25 North, 18° East, 15 links.
		Beech 15 South, 25° West, 16 links.
49	00	White Ash 14 in. diam.
62	50	Lynn 20 in. diam.
80	04	Set post corner of sections 23, 24, 25 and 26.
		Black Walnut 14 North, 5° East, 29 links.
		Ironwood 12 South, 29° West, 04 links

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Township 53 North, Range 15 West, Meridian Michigan.

East,		*Random between sections* 24 *and* 25.
		Variation 5° 50′ East.
40	00	Set temporary post.
		Variation 5° 50′ East.
80	04	Intersect East boundary 12 links North of post.
		Land gently rolling, first rate; Timber, Beech, Sugar, Lynn, Elm, Hickory, Ironwood, &c. Undergrowth the same.
		April 4th, 1850.
N. 89° 55′ W.		*Corrected between sections* 24 *and* 25.
		Variation 5° 00′ East.
24	00	Sugar 15 in. diam.
40	02	Set quarter section post.
		Hickory 18 North, 15° West, 07 links.
		Red Elm 14 South, 14° East, 04 links.
50	00	Red Elm 18 in. diam.
70	00	White Ash 15 in. diam.
80	04	Section corner.
N. 5′ W.		*Corrected between sections* 23 *and* 24.
13	00	Lynn 30 in. diam.
29	00	Hickory 20 in. diam.
40	02	Set quarter section post.
		Sugar 15 North, 40° West, 10 links.
		Maple 10 South, 10° East, 8 links.
52	00	Elm 30 in. diam.
67	00	Beech 18 in. diam.
80	04	Corner of sections 13, 14, 23 and 24.

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
North,		*Random between sections* 13 *and* 14.
		Variation 5° 15′ East.
27	00	Enter alder bottoms. Course East and West.
31	00	Stream 30 links, course West. Beaver dam and pond 2 chains East.
34	50	Leave alder bottoms. Course East and West.
55	00	Enter swale. Course East and West.
60	00	Leave swale. Course East and West.
80	00	Set temporary post corner of sections 11, 12, 13 and 14.
		Land gently rolling; second rate. Timber, Beech, Maple, Hickory, Elm, Black Ash, &c. Undergrowth on upland, Spice bush; in bottoms, Alder.
North,		*Random between sections* 11 *and* 12.
		Variation 5° 10′ East.
32	00	Descend 10 feet, and enter bottom land, Meadow.
40	00	Intersect stream, 200 links. Course West.
		Variaton 5° 00′ East.
54	25	Ascend 10 feet from bottom, and enter burnt land. Course East and West.
80	00	Set temporary post, corner of sections 1, 2, 11, and 12.
		North of bottoms, burnt land, third rate, sandy soil; bottoms dry, rich, first rate land; South of bottoms gently rolling, first rate; Timber Sugar, Beech, Lynn, Elm, Hickory, Black Walnut, &c. Undergrowth Sugar, and Ironwood.

[58]

Township 53 North, Range 15, West Meridian Michigan.

Chs.	Lks.	
North,		*Random between sections* 1 *and* 2. Variation, 5° 10′ East.
28	00	Leave burnt land, and enter windfall. Course N. W. and S. E.
18	50	Stream, 40 links. Course West.
40	00	Set temporary post. Variation 5° 00′ East.
61	25	Leave windfall, in thicket. Course N. W. and S. E.
79	50	Intersect north boundary, at post.
		Land, Balsam Thicket, windfall, and burnt land, rolling and third rate. April 5th, 1850.
South,		*Corrected between sections* 1 *and* 2. Variation 5° 00′ East.
		Black Oak 10, South 40° West, 15 links.
		Poplar 13, South 28° East, 8 links.
15	00	Balam tree, 10 in. diam. in thicket.
39	50	Set quarter section post, in windfall.
		Black Oak 20 North, 75° East 1.60 links. No other tree near.
65	00	Black Oak, 15 in. diam.
79	50	Set post Corner of sections 1, 2, 11, and 12.
		Black Oak, 10 North 50° East 28 links
		White Oak, 8 South, 48° West, 60 links.

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
East,		*Random between section* 1 *and* 12. Variation, 5° 10′ East.
39	00	Leave burnt land, and enter windfall. Course N. W. and S. E.
79	90	Intersect East boundary in windfall at post.
		Land rolling, burnt land and windfall; Soil sandy and third rate; Timber, nearly all dead Black and White Oak, and Aspen.
West.		*Corrected between sections* 1 *and* 12.
20	00	White Oak, 10 in. diam.
39	95	Set quarter section post. Variation, 5° 50′ East.
		White Oak, 14 North, 15° East 25 links.
		Black Oak 4, North 8° West, 18 links.
60	15	Dead Beech, 10 in. diam.
79	90	Section corner, in burnt land.
South,		*Corrected between sections* 11 *and* 12.
19	36	Beech 10 in. diam.
40	00	Set quarter section post, on left bank of stream 200 links wide. Course West, and raise a mound of earth, and sod around it.
50	30	Hickory, 20 in. diam.
70	00	Red Elm 24 in. diam.
80	00	Set post corner of sections 11, 12, 13 and 14.
		Sugar 18 North, 15° East, 10 links.
		Beech 24 S. 24° W. 8 links. April, 6th 1850.

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Township 35 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
East,		*Random between sections* 12 *and* 13. Variation 5° 10′ East.
35	00	Descend 10 feet to river bottoms. Course N. W. and S. E.
42	50	Intersect sluggish stream and pond. Course North and South.
49	50	Leave Pond and stream. Course N. W. and S. E.
67	00	Ascend 10 feet, from river bottoms to burnt land. Course N. W. and S. E.
80	00	Intersect east boundary, 23 links north of post.
		Land, first 35 chains gently rolling, first rate clay soil; timber Sugar, Beech, Lynn, Elm, Hickory, Black Walnut, &c. Bottom, dry wild meadow, with scattering clumps of alder bushes. Grass good for hay.
S. 89° 50′ W.		*Corrected between sections* 12 *and* 13. Variation 5° 15′ East.
13	10	Black Oak 8 in. diam.
40	00	Set quarter section post, Variation, 5° 15′ East.
		Sugar tree, 14 N. 5° W. 37 links.
		Lynn, 19 S. 36° W. 20 links.
59	85	Beech 22 in. diam.
80	00	Section corner.

(Pages 61 through 91 Deleted. The notes continue in the same format, order and style.)

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
South,		*Random between sections* 31 *and* 32. Variation 5° 00′ East.
47	00	Stream 10 links wide. Course East.
79	85	Intersect South boundary of township 14 links East of post.
		Land level, third rate; Timber, Maple, Black Ash and Swamp White Oak.
N. 2′ E.		*Corrected between sections* 31 *and* 32. Variation 5° 25′ East.
11	00	Maple 19 in. diam.
30	00	Black Ash 17 in. diam.
39	97½	Set quarter section post. Variation 5° 50′ East.
		Black Ash 20 N. 45° E. 8 links.
		Black Ash 15 S. 49° W. 7 links.
61	00	Maple 30 in. diam.
79	95	Set post corner of sections 29, 30, 31 and 32.
		Black Ash 16 N. 30° E. 18 links.
		Black Ash 14 N. 28° W. 11 links. April 23d, 1850.

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
East,		*Random between sections* 29 *and* 32. Variation 5° 00′ East.

23	00	Stream 10 links, course North.
34	00	Enter marsh, course N.W. and S.E.
54	50	Leave marsh, course N.E. and S.W.
79	75	Intersect North and South line, 8 links South of post.
		Land level and wet, third rate; East of marsh, second rate;
		Timber, Black Ash, Maple and Oak.
S. 89° 57′ W.		*Corrected between sections* 29 *and* 32.
30	00	Beech 10 in. diam.
39	87½	Set quarer section post, in marsh.
		Variation 5° 10′ East.
		Black Ash 13 S. 500 links. No other tree near.
55	00	Maple 12 in. diam.
67	50	Black Oak 25 in. diam.
79	75	Section corner.

[94]

Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
West,		*Random between sections* 30 *and* 31.
		Variation 5° East.
40	00	Set temporary post.
		Variation 5° East.
76	00	Intersect West boundary 17 links South of post.
		Land level and wet, third rate; Timber, Black Ash, Maple, Oak, &c.
S. 89° 52′ E.		*Corrected between sections* 30 *and* 31.
		Black Oak 20 N. 50° E. 11 links.
		Maple 25 S. 40° E. 18 links.
15	00	Maple 19 in. diam.
36	00	Set quarter section post.
		Maple 30 N. 40° E. 11 links.
		Black Ash 15 S. 29° W. 8 links.
49	00	White Oak 15 in. diam.
71	80	Maple 28 in. diam.
76	00	Section corner.
N. 2′ E.		*Corrected between sections* 29 *and* 30.
20	00	Maple 19 in. diam.
39	97½	Set quarter section post in wet land.
		Variation 5° 00′ East.
		Willow 4 N. 45° E. 176 links. No other tree near.
49	00	Cedar 18 in. diam.
79	95	Set post Corner of sections 19, 20, 29, and 30, in bottoms; no trees; raised a mound of earth and sod, from a pit which bears N. 50 E. 34 links distant.

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
East,		*Random between sections* 20 *and* 29.
		Variation 4° 55′ East.
7	00	Leave bottoms and enter wet land, course N.E. and S.W.
31	00	Leave wet land and enter swamp, course N.W. and S.E.
80	02	Intersect North and South line 20 links South of post.
		Land mostly cedar and spruce swamp and wet land; all except bottoms third rate.
S. 89° 51′ W.		*Corrected between sections* 20 *and* 29.
8	00	Cedar 18 in. diam.
29	00	Spruce 14 in. diam.
40	01	Set quarter section post.
		Variation 5° 10′ East.
		Spruce 4 N. 29° W. 8 links.
		Cedar 9 S. 81° E. 11 links.
60	00	Black Ash 14 in. diam.
80	02	Section corner.

April 24th, 1850.

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
West,		*True Line between sections* 19 *and* 30.
		Variation 4° 55′ East.
18	00	Intersect lake, and set meander post in bottom land.
		Variation 4° East.
		Black Ash 13 S. 23° W. 367 links. No other tree near.
		A tree on East end of island bears N. 80° W.
54	80	Over lake trigonomotrically, and set meander post on S.E. side of island.
		Beech 18 N. 31° W. 9 links.
		Beech 14 S. 80° W. 4 links.
55	30	Top of ascent, 30 feet; line runs along top of bank.
62	00	Descend 30 feet to lake.
64	00	Set meander post on West side of island.
		Beech 15 N. 20° E. 11 links. No other tree near.
		Land, East side of lake, rich meadow bottoms; island, high, rolling, second rate; banks high all around it.
N. 2′ E.		*Corrected between sections* 19 *and* 20.
21	00	Bayou 50 links wide. Course East and West.
31	50	Stream 50 links wide. Course East.
40	00	Intersect South line of Indian Reservation, 20 chains from S. W. corner, and set post in bottoms.
		White Pine 26 N, 57° W. 12.30 links.
		Yellow Pine 16 N. 1° E. 9.50 links.

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
North,		*Random between sections* 17 *and* 18.
		Variation 3° 45′ East.
13	00	Descend bank, 20 feet.
20	00	Stream 50 links. Course West.
37	00	In Indian village.
43	00	River road. Course nearly East and West.
50	57	Intersect left bank of Salmon river.
		Variation 3° 30′ East.
		Object on opposite side of river bears North; measured East 5 chains 67 links, and same object bears N. 31° W.
60	00	Over river trigonometrically, and set temporary post. Begin to ascend.
74	50	Top of ridge, 60 feet. Course N.N.E.
80	00	Set temporary post on summit of ridge, corner of sections 7, 8, 17 and 18.
		Land, North of Salmon river, hilly, rocky, and third rate. Timber, Birch, Aspen, Beech and Oak.

April 25, 1850.

(Pages 98 thru 105 deleted. The notes continue in the same format, order and style.)

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Township 53 North, Range 15 West, Meridian Michigan.

Chs.	Lks.	
S. 20′ W.		*Corrected between sections* 17 *and* 18.
11	50	Sugar 19 in. diam.

20	00	Set meander post on right bank of Salmon river. Sugar 21 N. 39° W. 10 links. Sugar 15 West, 11 links. Monday, April 29th, 1850.

NOTE.—If any abbreviations other than those mentioned in Article 6, on Page 32 of these Instructions, are made, they should be in all cases explained in a Note at the end of your Book, signed by you, and must be uniform, thus: T. for Township, R. for Range, Var. for Variation, Rand. for Random, Corr. for Corrected or Corretion, Sec. for Section, Secs. for Sections, Btwn. for Between. All the timber may be designated by the initials for the color, and the trees should be written in full; as, W. Ash for White Ash, Y. Pine for Yellow Pine, "Sugar" for Sugar Maple, "Maple" for Soft Maple, W. Pine for White Pine, &c.

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MEANDERS.

Meanders of left bank of Salmon River, beginning at post, on North boundary of Township, in Section three, thence down stream.

Courses.	C. L.	
		Variation 5° East.
S. 30° W.	10.00	Meadow bottoms, along river, from 15 to 20 chains wide; banks 6 to 10 feet high.
S. 40° W.	5.00	
S. 50° W.	5.00	
S. 65° W.	5.00	
S. 40° W.	7.00	
S. 70° W.	6.00	
S. 30° W.	7.00	To mouth of stream, 150 links wide from South East.
South,	1.50	Over stream; about 10 chains up this stream, is a bridge, over which the river road passes.
S. 70° W.	5.00	
S. 40° W.	10.00	
S. 65° W.	15.00	
S. 80° W.	20.75	To post, in line between sections 3 and 4. Variation 4° East.
S. 80° W.	5.00	In section 4.
S. 60° W.	10.00	
S. 10° W.	15.00	
S. 27½° W.	8.50	To post, in line between sections 4 and 9, and at upper corner of L. Lyon's claim. Variation 4° 10′ East.

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Township 53 North, Range 15 West, Meridian Michigan.

Courses.	C. L.	
		From lower corner of J. Mullett's claim in section 9. Variation 4° 00′ East.
S. 20° W.	5.00	
South,	9.75	To post in line between sections 9 and 16. Variation, 4° East.
S. 30° W.	5.00	In section 16.
S. 70° W.	10.00	
N. 86° W.	9.50	To post in line, between sections 16 and 17 Variation, 4° East.
West,	20.00	In section 17, to post, at N. E. corner of Indian Reservation. Variation, 4° East.
		From post, North West corner of Indian Reservation, at mouth of stream, from S. E. on left bank of River; thence in section 18. Variation, 3° 15′ East.
N. 75° W.	10.00	Sand bank, from 10 to 25 feet high, along bank of river.
N. 80° W.	5.00	
N. 70° W.	10.00	
N. 80 W.	15.00	
S. 70° W.	10.00	
West.	7.00	To post on West boundary of township. Variation 4° 00′ East.

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Township 53 North, Range 15 West, Meridian Michigan.

Meanders of the Right Bank of Salmon River, beginning at post on West boundary of township in section 18, thence up stream.

Courses.	C. L.	
		Variation, 3° East
East,	8.00	Along foot of Ledge of Rocks, from 30 to 50 feet, perpendicular.
N. 70° E.	10.00	Ditto.
East.	5.00	"
S. 50° E.	5.00	"
N. 70° E.	15.00	"
S. 80° E.	15.00	To marble bed, on bank of river. Variation, 2° East.
N. 70° E.	10.00	
S. 30° E.	3.00	
S. 80° E.	5.00	
N. 60° E.	5.00	Leave marble bed, at post in line between sections 17 and 18. Variation, 3° East.
N. 42° E.	13.50	In section 17.
N. 50° E.	10.00	At 3 chains, stream 50 links from North.
N. 70° E.	10.00	To post, in line between sections 8 and 17. Variation, 3° East.
N. 60° E.	14.00	In section 8, along foot of high mountain; summit about 40 chains north 1000 feet high. Banks of river 10 feet high.
S. 70° E.	8.00	
S. 80° E.	20.00	
N. 85° E.	20.00	To post, in line between sections 8 and 9. Variation, 4° East.

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Township 53 North, Range 15 West, Meridian Michigan.

Courses.	C. L.	
S. 80° E.	7.00	In section 9, bank of river 10 feet high.
N. 70° E.	6.00	
N. 5° E.	12.50	Banks 8 feet high.
N. 15° E.	10.00	River 9 chains wide.
N. 45° W.	15.00	Ferry to Union, on opposite side.
N. 35° W.	10.00	To post in line between sections 8 and 9, N. 55½′ E. to south point of Island. Variation, 4° 50′ East.

N. 50° W. 3.50	In section 8; river rapid; narrow, channel between, main land and Island
N. 20° W. 10.00	
N. 23° E. 7.00	
N. 40° E. 5.00	To line between sections 8 and 9. S. 64½° E. to head of Island.
	Variation, 3° 10′ East.
N. 68° E. 7.75	In section 9; River bluffs, rising gradually North; River rapid; River 3 chains wide.
S. 80° E. 8.00	
S. 60° E. 7.00	
S. 65° E. 5.00	To falls 15 feet.
N. 70° E. 2.00	River rapid.
S. 60° E. 5.00	
N. 65° E. 5.00	Leave Rapids.
N. 70° E. 10.00	
N. 50° E. 5.00	
N. 15° E. 10.00	To post in line between sections 4 and 9.
	Variation 3° 15′ East.

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Township 53 North, Range 15 West, Meridian Michigan.

Courses. C. L.	
N. 27½° E. 9.25	In section 4
N. 12° E. 18.00	
N. 50° E. 15.00	
N. 75° E. 10.00	To post in line, between sections 3 and 4.
	Variation, 3° 50′ East.
N. 82° E. 20.20	In section 3.
N. 70° E. 10.00	
N. 45° E. 5.00	
N. 60° E. 10.00	
N. 30° E. 7.00	
N. 70° E. 7.00	
N. 40° E. 6.00	
N. 55° E. 10.00	
N. 35° E. 10.00	To post on N. boundary of township.
	April 30th, 1850

Meanders of Island, in river, opposite Union, beginning at post in line between sections 8 and 9, on north side of Island; thence

S. 70° W. 0.80	In section 9. Variation, 4° East.
S. 30° W. 4.00	
S. 15° E. 5.00	
S. 10° E. 3.00	
S. 50° E. 1.20	To post on line South side of Island

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Township 53 North, Range 15 West, Meridian Michigan.

Courses. C. L.	
S. 50° E. 3.80	In section 8.
N. 30° E. 3.00	
North, 5.00	
N. 15° E. 5.00	
N. 16° E. 4.50	At 2 chains, bridge from Island to Union.
S. 80° W. 5.00	
S. 70° W. 2.20	To place of beginning.

Meanders of Lake in Section 28, beginning at a point 23 chains North of corner to sections 28, 29, 32 and 33; thence

East, 10.00	To Lake; thence
N. 50° E. 5.00	
N. 20° W. 10.00	At 5 chains, enter wet marsh.
N. 60° E. 10.00	At 1 chain, sluggish stream, 20 links, from West.
S. 60° E. 15.00	At 2 chains, leave wet marsh and enter swamp.
N. 80° E. 10.00	Leave swamp.
S. 50° E. 5.00	
S. 30° W. 10.00	
S. 20° E. 5.00	
S. 60° W. 10.00	
S. 80° W. 10.00	
S. 10° E. 5.00	
N. 70° W. 10.00	
N. 23° E. 14.50	To place of beginning.

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Township 53 North, Range 15 West , Meridian Michigan.

Meanders of part of a Lake in Sections 19 and 30, beginning at post on West boundary, on North side of Lake; thence

Courses. C. L.	
East, 20.00	In section 19, sandy beach.
N. 50° E. 5.00	
S. 80° E. 5.00	
S. 40° E. 10.00	At 5 chains enter rich bottom land, wet.
S. 20° E. 5.00	Tree on East end of Island bears S. 32° W.
N. 80° E. 5.00	
N. 30° E. 10.00	
S. 50° E. 3.50	Outlet 50 links wide, and leave sandy beach.
S. 31° E. 3.50	
S. 10° W. 10.00	
S. 40° E. 10.00	
S. 10° E. 6.50	To post in line between sections 19 and 30.
	Tree, before noted, on East end of Island, bears N. 80° W.
	Variation 4° East.
S. 33° W. 9.25	In section 30.
N. 80° W. 10.00	
S. 30° W. 10.00	
N. 70° W. 5.00	
S. 60° W. 10.00	
S. 80° W. 15.00	West side of Island bears N. 2° East.
N. 70° W. 10.00	To post on West boundary, South side of Lake.

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Township 53 North, Range 15 West, Meridian Michigan.

Meanders of Island in Lake in Sections 19 and 30, beginning at post in line of Sections 19 and 30, on East side of Island; thence

	Variation 4° East.
Courses. C. L.	
N. 30° E. 4.00	In section 19.
S. 80° E. 3.00	
N. 60° E. 3.00	
N. 10° E. 2.00	
N. 60° W. 8.00	
West, 6.00	

S. 50° W.	7.00	
S. 10° E.	6.00	To post, in line between sections 19 and 30, on West side of Island.
S. 55° E.	5.00	In section 30.
N. 60° E.	5.80	To place of beginning.

Wednesday, May 1st, 1850.

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GENERAL DESCRIPTION.

The surface of this township, is unequal; the Eastern and South-eastern portion, being gently rolling; the South-western level, and that portion lying North-west of Salmon River broken, hilly, and rocky. The soil is also varied. The largest portion of the Township south of Salmon River, is sandy second, and third rate, with a variety of timber, such as Beech, Maple, Ironwood, Oak, Birch, Sugar, &c. The South-eastern portion of the Township is a better quality of soil, being mostly first rate, and changing from sand to a clay loam. The timber is principally Sugar Maple, which grows in groves of large extent, affording sugar in great abundance, to the Indians, whose sugar camps are established in many places in this vicinity, one of which was noted in section twenty-four. Beech, Lynn, Elm, Black Walnut, Hickory, and other varieties of valuable timber are also found in this portion of the township.

A small portion of a beautiful rolling prairie, covers the south-east corner of this township, in which is noted a grove of timber on the line between sections 35 and 36.

The plains in sections 18 and 19, extending, also, into the Indian Reservation, are elevated from the river and country around; but the soil is dry, barren and sandy, supporting a scattering growth of stunted White and Yellow Pines, which are of no value.

Following the course of Salmon river and the large streams, is a level strip of bottom land, which is covered with wild grass of the first quality. The soil is sandy loam, and very rich in the Western part of the township. Along the stream which flows from a lake in sections 19 and 30, into Salmon River, the bottoms are

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Township 53 North, Range 15 West, Meridian Michigan.

low and wet, caused by inundations which occur two or three times during the year.

The large Swamp in the interior of the Township is heavily timbered with Cedar, Tamarack and Spruce. East of the line between sections 20 and 21, it is dry, and capable of drainage, and may be made valuable for agricultural purposes.

Limestone appears at the surface on the line between sections 27 and 28, where the variation of the needle is somewhat increased. The course of this ledge is nearly East and West, and the outcrop continues for nearly 30 chains easterly, to the junction of two small streams, where it disappears from the surface. It is seen again in the bed of the stream, at the falls, on line between sections 22 and 27. This stone makes excellent lime. A kiln for burning it is situated at the junction of the streams before mentioned.

A regular bluff, rising gradually from Salmon river to from 100 to 150 feet in height, continues from the rapids below the falls, in section 9, along the North side of the river, to the North boundary. From the top of these bluffs, a level plateau of land extends westerly, covering several square miles.

A large bed of marble has been discovered on the right bank of Salmon River, in section 18. This marble is variegated, and an excellent quality for building purposes; capable of receiving a very high polish.

The variation of the needle, South of Salmon River, is nearly uniform. A decrease, however, in the East variation, is observed as you go West, and in some places it decreases to about 3½° East.

North of Salmon River, in the mountainous parts of the township, the variation is more fluctuating. On the line between sections 6 and 7, it increases, going West, from 1° West at the corner of sections 5, 6, 7 and 8, to 30° West, and then diminishes to no variation; from

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Township 53 North, Range 15 West, Meridian Michigan.

which point the East variation increases, till at the West boundary it is 10° East.

A high ridge North of the line, containing iron ore, is probably the cause of these abberrations of the needle. An iron furnace is erected, and a company at work upon this ore bed. There is a good road leading from the furnace to Salmon River, opposite Union.

The variation on the line between sections 5 and 6, is still more irregular. It changes abruptly at several points on the line, from East to West, and on the North side of the trap knob, noted on this line, the North end of the needle points S. 50° W. This unusual attraction is attributed to the presence of copper—a spar vein, containing grains and small lumps of native copper, being exposed on the western declivity of the trap knob before mentioned, at which point a shaft has been sunk, and diggings commenced, but not yet far enough advanced to determine the extent or value of the mine.

XXVIII.

(These General Instructions are copied from an original document now in the possession of the National Archives. The document contains the following hand-written notation "Florida General Instructions Original with S. G's letter of Dec. 7, 1850, 25319a". The document is signed by "B. A. Putnam Surveyor General" and was sent "To Henry Wells Deputy Surveyor".)

GENERAL INSTRUCTIONS.
Surveyor General's Office.

[FLORIDA, 1850]

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TO DEPUTY SURVEYORS:

You will provide yourself with a good nonius Compass and two 2-pole chains, subdivided into fifty equal links each, which will be regulated by the standard instruments of this office, before you will be at liberty to leave for your field of operations. One of your chains you will keep as a standard by which you will adjust the one used every other day, *at least.*

All surveys will be made by north and south lines, run agreeadly to the true meridian, and others crossing them at right angles.

The lands are to be laid off in Townships of precisely six miles square, by lines running due north and south, east and west, commencing on the southern and eastern boundary of the district to be surveyed, thereby throwing the error or deficiency on the north and west sides thereof. On each of these lines, precisely at the distance of one mile, section corners are to be established, and at every half mile quarter section posts should be placed.

In subdividing townships, parallel lines are to be run each way from the section corners on one side to the corresponding corner on the opposite side. At the intersections of these lines section corners are to be established, which, if the survey is correct, will be at the end of one mile on each line (should the difference be more than fifty links the line must be remeasured and corrected.) These lines are to be run in the manner best calculated to afford the greatest facility to the perfect execution of the work, and will divide the township into 36 sections, beginning with No. 1 in the N. E. corner and proceeding west and east alternately through the township, until the whole are numbered.

All section lines closing on the exterior township lines, and not forming a perfect close on the posts or corners thereon established, must be corrected back and the variation noted, so as to make the post already established on the township line the corner of the section.

In running the section lines, quarter section posts must be set precisely equi-distant from the section corners; except in the northern and western tier of sections, when they are to be set exactly at 40 chains from the corner; throwing the excess or deficiency in that part of the sections north and west of these quarter section posts.

It is required that all lines shall be run by the true meridian; you will therefore, once at least in every township, and as much oftener as may be necessary, ascertain the variation of the *magnetic* from the *true* meridian, and record it in your field books.

The greatest possible care is to be observed in marking corners, which should be done in the following manner: At all township and section corners, if a tree is not to be found immediately at the corner, a post of durable wood, not less than three feet long, square at the top to not less than six inches, will be firmly planted in the ground with the angles in the direction of the cardinal points of the compass; the sides to be marked with the number of the section that it faces, and the nearest suitable tree in each section marked with the No. of the Range, Township and Section in which it is situated. Thus,

R 4 E
T 9 S
34

and the letters B T some distance below the other marks. These letters and numbers should be marked in the bark, and in such manner as not seriously to wound the tree, to render them as permanent as possible. The bearing and distance of these trees are to be taken, and kind designated, and carefully noted in the field books. The quarter section posts must also be of durable wood, 3 feet long, firmly set in the ground, *flattened* on opposite sides, and marked "¼ S."; and the nearest tree in each section must be marked and its bearing and distance noted in the same manner as is directed for section corners; when trees are found at the corners, so that posts are not required, these trees should be marked with the numbers and letters directed to be put upon the bearing trees (omitting the letters B. T.) In prairies or other places when bearing trees cannot be had, mounds of stone or earth are to be raised around the posts, not less than 2½ feet high, and the bearing and distance to the pit from which the earth was taken carefully noted.

When your course is obstructed by any impassable obstacle, you will take offsets, or by traverse or triangles ascertain the exact distance across it.

All township lines are to be marked with 3 chops 6 inches apart, in the bark only, on all fore and aft or side line trees, and section lines in like manner with 2 chops 3 inches apart, and not less than one tree on each side of the line, to each chain, if within 50 links, to be blazed facing the line.

Whenever a township or section line intersects lakes, ponds, or streams of water, or any obstacle that interrupts the regular order of the survey, and which require to be meandered, posts flattened on 2 sides and marked with the numbers of the sections it faces are to be set at the intersections.

When a section line terminates on a claim line or other reservation, a post must be set and bearing trees taken in the manner prescribed for a corner, and the course and distance from such terminus to the nearest post or corner of such line must be taken and noted, so that the exact area of the fractional section may be ascertained.

If variations from this mode of surveying the townships and sections are at any time required to adapt them to the situation of a particular tract of country or to connect them with prior surveys, special instructions will in such cases be given.

When you are subdividing townships into sections you will meander all navigable streams, all lakes and deep ponds exceeding half a section in area and all islands suitable for cultivation. In meandering you will in all cases connect with the posts on the township and section lines set upon their margins as before directed.

The field notes of your meanders are to be written at the end of the subdivisions of the townships; and the traverse work in each section tested by latitude and departure as you proceed.

The width of streams and bayous bounding your surveys, as well as those intersecting them, are to be carefully noted at every intersection of your lines therewith, and except when such streams constitute the boundary between two series of surveys, they are not to interrupt the regular lines of the townships through which they pass, but those lines are to be continued across the stream to the complete measurement.

In designating the two sides of a stream you will suppose

yourself looking down stream, the bank on your right hand will in all cases be termed the *right* bank, and that on your left hand the *left* bank.

When swamps or marshes prevent the closing of your survey upon a coast, river or lake, you will state the facts in your field notes, and not meander the margin of those swamps, or marshes, but leave them as unfinished surveys; and when from this or any other cause you report any of your work impracticable, you will insert in your field notes a full description of the causes that render it so.

All lines must be measured horizontally, your reckoning must be kept in chains of 4 poles, 100 links, and all your calculations and plats must be made in accordance therewith. Your tally rods or pins should not exceed fourteen inches in length. You will attend vigilantly to the manner in which your chainmen performs their duty, and cause it to be correctly and faithfully executed.

For the surveying and location of private claims or other tracts, not conforming to the section lines, *special instructions* will be given. All permits under the armed occupation law must conform to the section lines. The settler is authorized to take continuous or contiguous half quarter sections so as to include his improvements, and as much of the land desired by him not exceeding 160 acres as can be embraced by regular legal subdivisions or half quarter sections of the same or different sections. He must designate to you in writing the half quarter sections for which he wishes a permit; but if he fails to do so, you will select the same so as to include his main improvements.

Your field notes must contain an accurate, clear and minute record of every thing that is done by you under these instructions.

You will carefully note the distances from your last corner post to the point where you meet with or leave any lakes, rivers, creeks, brooks, swamps, prairies, hills, roads, canals or any other natural or artificial object, with their general course; and also take their bearings, so as to establish the position of any important object which you may see on either side of your line, that your field notes may have a full and topographical description of the country surveyed by you. You will be especially careful to note in your field books where groves of Live Oak, Red Cedar and long leaf Yellow pine abound.

On the first page of your field book you will insert the number of the Township and Range, by whom surveyed; the date of the survey; and at the head of each subsequent page the number of the Township and Range.

At the end of the notes of each section line the quality of the land and description of the timber growing thereupon is to be given.

Besides the field notes taken on the lines you will add at the end of the notes of each township such further description or information as you may be able to give concerning the general quality of the soil and productions with all other things worthy of notice.

Your original field notes must in all cases be returned to the office of the Surveyor General and if not in a fair and legible hand, true and fair copies must also be returned with them.

Each field book must contain the entire survey of a Township and at the close thereof the following oath or affirmation will be required. "I Deputy Surveyor do solemnly swear (or affirm) that in pursuance of a contract made the day of 184 with A. B. Surveyor General of the United States for the State of Florida and in strict conformity to the laws of the United States and instructions of said Surveyor General, I have regularly surveyed and subdivided into sections, Township (or Factional Township) No. of Range No. in the State of Florida. And I do further solemnly swear that the foregoing are the true and original field notes thereof executed as aforesaid, and that those parts which are reported impracticable, were rendered so from the cause therein stated."

If the field book is of Township lines and not of Subdivisions, instead of using the words "and subdivided into Sections Township (or Fractional Township)—or Range"—you will use the words "the exterior Township lines therein mentioned.

You will return a plat or diagram of the Towship lines surveyed by you with the field notes, this may be on a scale of two inches to a Township.

On each of the lines the length in miles must be inserted; and also the variation of the magnetic meridian; together with the general outline of the topographical features of the country.

A plat of each Township subdivided by you will likewise be returned with the field notes thereof protracted on a scale of 40 chains to an inch; exhibiting in like manner all lakes, ponds, rivers, creeks, swamps, prairies, hills, and other natural objects with their known original names and also the roads, canals, mines, minerals, salt-springs, mill-sites, towns villages &c &c. The courses and distances of all lines when not run by the true meridian, must be indicated upon them with the distances to the crossings of the streams or other natural or artificial object—and a general outline of the topographical features of each section.

Any material departure from these instructions, or negligence in the observance thereof will be considered as a violation of the conditions of your contract, and forfeiture of *all claim for payment*: All loose, inaccurate, precipitate or defective work, either as it respects the surveys in the field or the notes and returns thereof on paper WILL BE REJECTED.

The original field notes with a fair copy thereof are required to be returned to the Surveyor General's Office, and no payment will be made for any part of the Survey not executed by you in your own proper person.

B. A. Putnam
Surveyor General

27th Novr 1850

To
Henry Wells
Deputy Surveyor

(This copy of General Instructions was made from an original volume now in the possession of the National Archives. The field notes indicate they were issued in 1851.)

GENERAL INSTRUCTIONS.

OFFICE OF THE SURVEYOR GENERAL OF WISCONSIN AND IOWA

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OFFICE OF THE SURVEYOR GENERAL OF WISCONSIN AND IOWA,
DUBUQUE, 18

To , Deputy Surveyor:

SIR:—You are to survey in person, or by the assistance of some duly authorized Deputy Surveyor, acting under your immediate direction and supervision, the district assigned you under contract of

18 , conformably to such parts of the following instructions as apply to the character of the work for which you have contracted, except so much thereof as is modified or countermanded by manuscript special instructions, hereinafter written.

SYSTEM OF SURVEY.

1. The United States lands are surveyed into rectangular tracts, bounded by north and south, east and west lines. They are first surveyed into townships or tracts of six miles square, which are subdivided into thirty-six equal parts, called sections.
2. Townships and ranges number from base and meridian lines—the former bearing due east and west, and the latter intersecting them at right angles, and bearing due north and south.
3. The base line of the surveys in Wisconsin is the south boundary of so much thereof as borders the State of Illinois; that of Iowa, is located near the geographical centre of the State of Arkansas.
4. The fourth principal meridian, to which the surveys in Wiscon-

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sin relate, starts from the mouth of the Illinois river. The fifth principal meridian, to which the surveys in Iowa relate, starts from the mouth of the Arkansas river.
5. The townships, both in Wisconsin and Iowa, number from their respective base lines, northward; the ranges, in each, number from their respective meridians, both east and west.
6. Sections are numbered from east to west and from west to east progressively, commencing with the north-east corner section.
7. Correction lines provide for the error that would otherwise arise from the convergency of meridians, and arrest that arising from the inaccuracies of measurement. They are run due east and west, at stated distances, forming a base to the townships north of them. This base, for each township, is extended sufficiently to meet the convergency for a given distance.

INSTRUMENTS.

Base, meridian, correction and township lines are to be run with an instrument that operates independently of the magnetic needle, which is to be employed only to show the true magnetic variation. Section, meander and all other lines interior of a township, may be run either with the same instrument, or with the Plain Compass, provided it is of approved construction and furnished with a vernier or nonius.

ASSISTANTS—THEIR OATHS.

You are to employ no other assistants than men of reputable character, each of whom must, before performing any duty as such, take and subscribe an oath (or affirmation) of the following form, which must be forwarded to or deposited in this office, prior to or upon the return of your field notes:—

For Chainmen.

I, A. B., do solemnly swear (or affirm,) that I will impartially and faithfully execute the duties of Chain Carrier, that I will level the chain upon uneven ground, and plumb the tally-pins whether sticking or dropping the same; that I will report the true distance to all notable objects, and the true length of all lines that I assist in measuring, to the best of my skill and ability.

Sworn and subscribed before
me at this
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Justice of the Peace.
(or other officer authorized to administer oaths)
of , County of , State,
(or Territory) of

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For Flagman or Axeman.

I, C. D., do solemnly swear (or affirm) that I will well and truly perform the duties of axeman or flagman, according to instructions given me, and to the best of my skill and ability.

MARKING LINES, ESTABLISHING AND MARKING CORNERS.

1. All lines which you actually establish are to be marked as follows: Those trees which intercept your line are to have two notches upon the side where your line intersects and leave them, without any other mark whatever.
2. A sufficient number of those trees which approach nearest your line, to render the same conspicuous, are to be blazed upon two sides, diagonally or quartering towards the line; the blazes to approach nearer each other the farther the line passes from the blazed trees, and to be as nearly opposite—coinciding with the line—as possible, in cases where they are barely passed.
3. Corner posts are to be made only of the most durable wood found in the vicinity of your lines. Township corner posts must not be less than five, section and meander corner posts four, and quarter section posts three inches in diameter. These posts must be set firmly into the ground, by digging a hole to admit them two feet deep, and be very securely rammed with earth, also with stone when convenient. They are to appear above ground, at township corners, three feet,

at section and meander corners, two and a half feet, and at quarter section corners, two feet.

4. All township and section corner posts are to be squared upon their upper ends and the angles of the square set with the cardinal points of the compass. Township corner posts must have six notches upon each of the said angles; section corner posts, upon township lines, as many notches upon one of the said angles as they are miles distant from the township corner where the line commenced, and interior section corner posts as many notches, both upon their south and east angles, as they are miles distant from the south and east boundaries of the township, respectively.

5. Quarter section and meander corner posts are to be blazed upon two opposite sides, and set with those blazes facing the sections between which they occur.

6. A tree supplying the place of a corner post, is to be squared and marked as directed for posts.

7. All posts established at corner of sections, are to be marked upon each side of their squared part with the number of the four sections

which those sides respectively face, at meander corners with the number of the sections between which such posts are set, and at quarter section corners with ¼ S. upon the two blazed sides.

8. Bearing trees are those of which you take the course and distance from a corner. They are distinguished by a large smooth blaze or chop, fronting the corner, upon which is marked, with an iron made for that purpose, the number of the range, township and section, except at quarter section corners where ¼ S. will supply the number of the section, thus;

R. -------E. or W.
T. -------N.
S.--------or ¼ S.

The letters B. T. are also to be marked upon a smaller chop, directly under the large one, and as near the ground as is practicable.

9. Witness trees are signalized and marked as above, but the course and distance to them, as well as the small chop, are omitted.

10. Trees, employed either for the purpose of bearing or witness trees, are to be alive and healthy and not less than five inches diameter.

11. From all posts established for township corners, or for section corners upon township lines, four bearing trees, if within a reasonable distance, must be taken; one to stand within each of the four sections.

12. At interior section corners four trees, one to stand within each of the four sections, are to be marked with number of township and range, as well as section in which they stand.

13. From quarter section and meander corners two bearing trees are marked, one within each of the adjoining sections.

14. Wherever bearing trees cannot be had, quadrangular mounds of earth or stone are to be raised around the corner posts, the four angles of which must coincide with the cardinal points of the compass.

15. Mounds at township corners are to have a base of five feet, a top of two feet, and a height of three feet; at section, meander and quarter section corners, they are to have a base of four feet, a top of one and a half feet, a height of two and a half feet.

16. Where mounds are made of earth the place from which it is taken is styled the *Pit*, which is to be a uniform and stated distance from the mound in all instances where the same is practicable, viz.: at township corners there are to be two pits, one ten links due north, and the other ten links due south; at section corners one pit, eight links due south; at quarter section cornes one pit eight links due east, and at meander corners one pit, eight links either due north, south, east or west. The distance of the mound and pit to be obtained

by measuring from centre to centre. The mounds are to be neatly covered with sod in all cases where the same can be had.

17. Posts established in mounds for township corners are to be marked upon each side of the square, with the appropriate number of the range and township; at section corners upon township lines with the appropriate number of the range and township upon two sides thereof, and at interior section corners with the range and township within which such post stands.

18. Whenever the true place of establishing a corner is inaccessible, or unadapted to the establishment of a proper corner, except it occurs in a body of water that is to be meandered, you are to establish a witness corner as near thereto as is practicable and either due north, south, east or west of it. Such corner is to be constructed in all respects like the one for which it stands as a witness, with the addition of the letters W. C., immediately over the numbering, both upon the post and trees.

19. When a section or quarter section corner happens at the point for establishing a meander corner, the posts and trees are to be marked with the appropriate numbers for such section or quarter section corner. Or, in lieu of posts, you may at *any* corner, insert endways into the ground, to the depth of seven or eight inches, a stone, the number of cubic inches in which shall not be less than the number contained in a stone fourteen inches long, twelve inches wide and three inches thick. The edges of which must be set north and south on north and south lines; and east and west on east and west lines. The dimension of each stone to be given in the field notes at the time of establishing the corner.

Where stone section corners are made on the range and township lines, as many notches will be distinctly cut with a pick or chisel on the two sides in the direction of the line, as the corner is sections from the nearest township corners. At township corners six notches will be cut on each edge or side toward the cardinal points. At section corners in the interior of a township, as many notches will be cut on the south edge and east sides as the corner is sections distant from the south and east boundaries of the township; and at the corners of subdivisional intersections with the north boundaries of the townships, six notches on the south edge, and at the intersec-

tion with the west boundaries six notches on the east edge; and as many notches on the east or south sides (as the case my require,) as the corner is sections distant from the township corner. Quarter section corner stones will have ¼ cut on the west side on north and south lines, and on the north side on east and west lines.

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Where a corner is perpetuated by a stone of the dimensions, marked and set in the manner above described, no mound need be erected.

When the closing lines to the north or west boundaries of the townships, either in subdivision or exterior work, exceed one hundred chains of length, corners for the legal subdivisions of the sections will be established at every twenty chains north or west of the quarter section corner.

MEASUREMENTS AND WHERE TO ESTABLISH MEANDER CORNERS.

1. Your distances are all to be noted and returned in chains and links, and to be taken with a half or two pole chain of fifty parts, each measuring seven inches and ninety-two-hundredths. The length of your chain should be adjusted by means of a screw attached to the handle of the hind end; every tenth link should compose a swivel, and all the rings and loops should be welded or brazed. The accuracy of your chain is to be preserved by comparing it with a standard adjusted at this office.

2. Your tally-pins, eleven in number, must not exceed fourteen inches in length, must be of sufficient weight to drop plumb, and are to be made of iron or seasoned wood pointed with steel.

3. The length of every line you run is to be ascertained by horizontal measurement.

4. Whenever your line is obstructed by an object over which you cannot measure with the chain, you are to pass the same by offsets, traverse or trigonometry, observing that the distance thus obtained extends no farther than is necessary to actually pass the interposing object.

5. Whenever your course is so obstructed by navigable streams, or other bodies of water which are to be meandered, you are to establish a meander corner at the intersection of your lines with both margins thereof, and also on each side of all islands which said lines may cross.

TOWNSHIP LINES.

1. North and south lines are termed range lines; east and west, township lines. The former are styled, in the field notes, the line between certain ranges; the latter, the line between certain townships. Each mile, both of a range and township line, is particularized by the number of the sections between which it is run, thus; north between sections 31 and 36, west between sections 1 and 36.

2. Upon the base or township line forming the southern boundary

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of your district, township corners are established at intervals of six miles. From each of these corners you are to run range lines due north, six miles; establishing a quarter section corner at the end of the first forty, and a section corner at the end of the first eighty chains, and observing the same order and intervals of establishing quarter section and section corners to the end of the sixth mile, where you will temporarily set a township corner port.

3. You will then commence at a township corner upon the first range line east of your district, and immediately east of the township corner ports temporarily set by you, and from thence run due west across your whole district, intersecting your range lines at or within three chains and fifty links, due north or south, of your said six mile posts. At the point of intersection, if within the above limits, you will establish a township corner. Upon this township or last mentioned line, quarter section and section corners are to be established at the same distances and intervals as directed for range lines; observing that the length of each and every township line which you are to establish, is in no case to exceed or fall short of the length of the corresponding township boundary upon the south, more than three chains and fifty links. If, however, in closing your first tier of townships, and all others closing to or upon old work, you find it impossible to preserve the true course of your lines and close within the above limits, you are to resurvey and examine until you detect the real cause of discrepancy, which if not in your own work, you will report to this office, and for which you will provide in the field, in all instances where the same is practicable, by adding to, or deducting from the length of your first range line or lines. And where, in order to close a township to or upon old work, you are compelled to employ a variation greater or less than the true magnetic variation, both must be stated.

4. After closing your first tier of townships, you are to run up and close successive tiers, to the completion of your district, by the same method of survey as directed for the first tier.

5. You are to observe and note the true magnetic variation, at least once upon every mile or section line, and as much oftener as there is a change therein.

6. The bearing trees, standing upon the west side of range, and upon the north side of township lines, are to be entered first in your field notes.

7. After a township corner is established as before directed, you are to complete the notes of the corresponding range line, by inserting the

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said corner, with the true distance thereto, and adding or erasing the notes of any topography or other minutes, that may be included or excluded by thus adding to or deducting from the length of the range line as temporarily established.

8. With your field notes you must return a diagram, drawn upon a scale of three inches to six miles, on which you are to represent each boundary you have run with the length and

variation thereof, and with all the topography thereupon that can be propery expressed upon that scale.

SUBDIVISION.

Length of North and South and East and West Lines, and where to establish Quarter Section Posts.

1. Every north and south section line except those terminating in the north boundary, are to be one mile in length. The east and west section lines, except those terminating in the west boundary, are to be within one hundred links of eighty chains in length; and the north and south boundaries of any one section, except in the extreme western tier, are to be within one hundred links of equal length.

2. The length of the section lines closing to the north and west boundaries, are to be governed by the length of the sixth or closing miles, both of the range and township lines, and must be as nearly of the same length, or of an average thereof, as is practicable.

3. Quarter section corners, both upon north and south and upon east and west lines, are to be set equidistant from the corresponding section corners, except upon those closing to the north and west boundaries, where the quarter section corners will be established precisely forty chains north or west of the respective section corners from which those lines start.

Method of Subdividing; Random, Corrected and True Lines, and Diagram.

1. The first mile, both of the south and east boundaries of each township you are to subdivide, is to be carefully traced and measured before you enter upon the subdivision thereof. This will enable you to observe any change that may have taken place in the magnetic variation, as it existed at the running of the township lines, and will also enable you to compare your chaining with that upon the township lines.

2. Any discrepancy, arising either from a change in the magnetic variation or a difference in measurement, is to be stated as directed under the head of field notes.

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3. After adjusting your compass to a variation which you have thus found will retrace the eastern boundary of the township, you will commence at the corner to sections 35 and 36, on the south boundary, and run a line due north, forty chains, to the quarter section corner which you are to establish between sections 35 and 36; continuing due north forty chains further, you will establish the corner to sections 25, 26, 35 and 36.

4. From the section corner last named, run a random line, without blazing, due east for corner of sections 25 and 36, in east boundary. If you intersect exactly at the corner, you will blaze your random line back and establish it as the true line. But if your random line intersects the said range line, either north or south of the said corner, you will measure the distance of such intersection, from which you will calculate a course that will run a true line back to the corner from which your random started.

5. From the corner of sections 25, 26, 35, 36, run due north between sections 25 and 26, setting the quarter section post, as before at forty chains, and at eighty chains establishing the corner of sections 23, 24, 25, 26. Then run a random line due east for the corner of sections 24 and 25 in east boundary; correcting back in the manner directed for running the line between sections 25 and 36.

6. In this manner proceed with the survey of each successive section in the first tier, until you arrive at the north boundary of the township, which you will reach in running up a random line between sections 1 and 2. If this line should not intersect at the post established for corner to sections 1, 2, 35 and 36 upon the township line, you will note the distance that you fell east or west of the same, from which distance you will calculate a course that will run a true line south to the corner from which your random started.

7. The first tier of sections being thus laid out and surveyed, you will return to the south boundary of the township, and from the corner of sections 34 and 35 commence and survey the second tier of sections, in the same manner that you pursued in the survey of the first, closing at the section corners on the first tier.

8. In like manner proceed with the survey of each successive tier of sections, until you arrive at the fifth or last tier. From each section corner which you establish upon this tier, you are to run random lines for the corresponding corners established upon the range line forming the western boundary of your township, and in returning, establish the true line as before directed.

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9. All section lines are to be right lines, regardless of the number or nature of intervening obstacles; except in the event of their intersecting a lake or pond of such diameter, at the points of intersection, as forbids their continuance by means of a trigonometrical calculation, in which case, and in cases also where a river, lake, correction line, or reservation, form a part of the boundary of a township, when the closing lines thereupon, will be *true lines,* the courses of which will have a strict reference to the variation and closing of the adjacent lines; the quarter section posts upon which are to be set forty chains from the section corner at which such true lines commenced.

10. In closing upon a correction line, you are to establish a section corner at the point of your intersection therewith, stating the true distance of such intersection from the nearest corner thereon.

11. Field notes of random lines are to embrace nothing but the variation, length and closing thereof.

12. Topography of every description, line trees and corners, are to be taken upon the corrected lines and included in the notes thereof, following which is to be written the description of the land and timber.

You will report in your general descriptions, and indicate upon your diagrams, the whole number of residences, or other edifices, and as nearly as practicable the character and extent of improvement within each township. Where you cannot determine these important facts accurately without leaving your lines, you must specify the smallest subdivision

or subdivisions upon which such residence or other improvement exists.

You are to return the distance at which you strike, and that at which you leave every stream or other body of water that exceeds one hundred links of width at an ordinary stage of water; giving also the right angled width of the same.

CHAIN CARRIERS.

Your chain carriers must be reversed at every tally, so that one may be ahead upon the odd and the other upon all the even tallies. The discrepancies of measure likely to arise from unequal strength or care in chainmen, are thus rendered compensative; a check is instituted upon the accuracy of the tally, and the labor of recollecting and reporting objects is divided. As the chain men pass each other, the pins must be, in every instance, counted by each of them.

MARKERS AND MARKING IRONS.

You are to provide yourself with marking irons of the most approved

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description, and which are to be used only be experienced and skillful markers. In the marking of your lines in timber and the establishing and marking of your corners, whether in prairie or timber, particular care is to be taken, and such parts thereof as are not executed by yourself are to be personally inspected by you. The importance of this caution will be manifest, when you reflect that it is upon this evidence alone that the settler depends in locating or entering his land.

STANDARD-CHAIN.

Your chain, adjusted to the standard in this office, must be carefully guarded against all injury, and by it you will compare and adjust your measuring chain every morning after the latter has been in service, and note the difference between them in your field-book, and if none, then state that fact also.

CORRECTIONS AND RESURVEYS.

Full notes of every line and part of a line which you retrace, of every one which you re-establish, of every random line which it is necessary for you to run, whether measured or not—of every corner which you re-establish, alter or perfect—of every offset—of the elements of every distance obtained by triangulation, are to be carefully entered at the time in the proper place in your field books

FIELD NOTES AND BOOKS.

The second page in each field book must contain the names and duties of assistants then engaged upon your lines. Whenever you employ a new assistant or change the duty of one, the fact, with the cause thereof, must be given in an entry immediately preceding the notes taken under the new arrangements.

The notes which you take in the field are to be returned to this office. With this view you will enter your notes, taken as above directed, in books containing a number of pages, that will admit of their being entered in every particular in conformity to these instructions. The books must be of regular form, size and material. If after the notes of any one or more townships are thus taken, the book or books are too much worn, soiled or defaced to be returned in conformity to said instructions, you will make out and submit, *with the original,* a fair handed and neat copy of the same. You are to use no other than black ink of the best quality. No erasures are to be made. If mistakes occur, the pen may be drawn across the erroneous entry, but always in such a manner that the words can be read afterwards. No leaves are to be cut, torn or otherwise taken out of your field books, as reason is thus given for

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suspicion that there was something upon the missing leaves which it was not to the interest of the deputy to have known.

With these instructions you are furnished diagrams of each of the townships of your district upon a scale of two inches per mile, upon which are accurately laid down the respective boundaries of each township, the length of each of the closing lines, the magnetic variation of each mile, and at least two of the bearing trees, at all the section corners thereon, where bearings were taken. P. in M. signifies post in mound, the pits to which (unless it is otherwise stated) are in the direction and at the distance hereinbefore prescribed.

DIAGRAMS.

With your field notes you are to return a map of each township of your district, upon the scale above named, upon which is to be expressed the length and variation of each of your lines with *all* the topography neatly laid down. With a view to the completeness of these maps, you should make sketches of the topography as you progress with your lines, that you may be able to present not only the points upon your lines at which the same occurs, but also its direction and position between the lines or within each section, as every object of topography is to be properly closed or connected. These maps form the basis of all the official plats, and are carefully preserved in this office.

SWAMP LANDS.

By an act of Congress, approved September 28th, 1850, all of the swamp and overflowed lands that are unfit for cultivation, which were unsold at the date of the passage of the said act, were granted to the State or Territory in which said lands are located. In order that the field notes of surveys may hereafter clearly present the quantity and locality of the lands thus granted, you will, in addition to the objects of topography required by the foregoing instructions, note the point upon which you enter and leave all lands which are clearly the subject of the above grant, stating the character of the land thus noted, and whether it is a swamp or marsh, or subject from other cause to inundation, to an extent that would in the absence of artifical means render it uncultivable. The depth of inundation, if in timber, may be easily determined from the marks upon the trees, and its frequency may be ascertained, either from your knowledge of the gener-

al character of the stream which overflows, or from the testimony of those residing upon or near the locality under examination. The usual phraseology for entering or leaving a swamp or marsh may be employed with the addi-

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tion of "unfit for cultivation;" but if the margin of bottom, swamp, or marsh in which uncultivable land exists is not identical with the margin of such uncultivable land, then a separate entry must be made for each opposite the marginal distance at which they respectively occur.

LANDS OVERFLOWED BY ARTIFICIAL MEANS.

When lands are overflowed by artificial means (say by dams for milling, logging or other purposes) you will in no instance set meander posts, but continue your lines across said overflowed tract, in the manner directed in the foregoing instructions, stating particularly in your notes the depth of water and how the overflow is caused.

ERRORS IN TOWN LINES.

Should you find a manifest error in the measurement of any of the township lines of your district, you are to correct the same by resurveying and re-establishing such line or lines, from the point where the error was detected, to the north or west end thereof, noting your intersection with each one of the erroneous corners as you progress, which you are to demolish and deface with all evidences thereof. Of such remeasurement and corrections you are to take full and complete field notes, in a separate book, to be returned to the Surveyor General's office, with the field notes of your subdivision.

HOW AND WHAT TO MEANDER.

1. In subdividing any one township, you are to meander as hereinafter directed, any lake or lakes, pond or ponds, lying entirely within the boundaries thereof, of the area of forty acres and upwards, and which cannot be drained and are not likely to fill up, or from any cause to become dry.

2. Whenever required by special instructions, to meander any stream or body of water, passing through or lying within your district, you are also to meander all islands situated therein.

3. Standing with your face towards the mouth of a stream, the bank on your left hand, is termed the *left bank,* and that upon your right hand, the *right bank.* These terms are to be universally used to distinguish the two banks of a river, both in running lines and meandering.

4. In meandering rivers, you are to commence at a meander corner in the township boundary, and take the course and distance of the bank upon which you commence, to a meander corner upon the same or another boundary of the same township, carefully noting your inter-

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section with all intermediate meander corners. By the same method you are to meander the opposite bank of the same river.

5. In meandering lakes, ponds or bayous, you are to commence at a meander corner upon the township line and proceed as above directed for the banks of a navigable stream, except where a lake, pond or bayou lies entirely within the township boundaries, when you will commence at a meander corner established in subdividing, and from thence take the course and distance of the entire margin thereof.

6. To meander a pond, lying entirely within the boundaries of a section, you will run a random line thereto from the nearest section or quarter section corner. At the point where this random line intersects the margin of such pond, you will establish a witness point, by fixing a post in the ground and raising a mound or taking bearings, as at a meander corner, except that the post and the large face upon the bearing trees will be marked with the letter W. only.

7. In meandering islands, you are to proceed as directed in sections 5 and 6 of this chapter, except that where there are no meander corners established upon an island, you are to take the course and distance of your starting point from the nearest meander corner, instead of section or quarter section corner.

8. The meanders of each fractional section, or between any two meander posts, or of a pond or island interior of a section, must close within one chain and fifty links.

9. Your field notes of meanders in any one township, are to follow immediately after the notes of the subdivision thereof. They are to state and describe, particularly, the meander corner from which they commenced, each one with which they close, and are to exhibit the meanders of each fractional section separately; following and composing a part of which, will be given a description of the land, timber, depth of inundation to which the bottom is subject, and the banks, current and bottom of the stream or body of water you are meandering.

10. To furnish data that will enable this office to fix their exact location, you will note in the proper place in the meanders of each fractional section the exact position and extent of all falls and rapids, fords, portages and mill sites existing in, or connected with the river or other body of water which you are meandering.

11. No blazes or marks of any description are to be made upon your meander lines, though the utmost care must be taken to pass no object of topography, *or change therein,* without giving a particular description thereof in its proper place in your meander notes.

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FIELD NOTES.

1. Your field notes are to form a full and perfect history of your operations in the field.

2. The field notes of the subdivision of every township, whether fractional or not, are to be written in a separate book.

3. Description of the timber, undergrowth, surface, soil and minerals, upon each section line, is to follow the notes thereof, and not to be mixed with them.

4. The language of your field notes must be so concise and clear, the hand in which they are written so plain and legible,

that no doubt can exist as to your figures, letters, words or meaning.

5. *No abbreviations* are to be made in your field notes, except such as relate to course, to express which, the proper combinations of the capital letters, N. S. E. and W. are to be used; except when a course is exactly to a cardinal point, in which case it is to be written in full.

6. The description of each mile must be independent, *and not refer to a preceding description.*

7. The date of each day's work must follow immediately after the notes thereof.

8. All rivers, creeks and other streams, lakes, ponds, prairies, swamps, marshes, groves, hills, bluffs, windfalls, roads and trails, are to be distinguished in your field notes by their original and received names only, and where such names cannot be ascertained or do not exist your imagination is not to supply them.

9. Your field notes must be kept in the exact form of the specimen herewith furnished you.

Objects and data to be embraced in your field notes.

You are to enter in their proper places in the field notes of your survey, a particular description and the exact location of the following objects:—

1. The length and variation or variations of every line you run.

2. The name and diameter of all bearing trees, with the course and distance of the same from their respective corners.

3. The name of the material of which you construct mounds, with the course and distance to the pits.

4. The name, diameter and exact distance to all those trees which your lines intersect.

5. At what distance you enter, and at what distance you leave every river, creek or other "bottom," prairie, swamp, marsh, grove or windfall, with the course of the same at both points of intersection.

6. The surface, whether level, rolling, broken or hilly.

7. The soil, whether first, second or third rate.

8. The several kinds of timber and undergrowth, naming the timber in the order of its prevalency.

9. All rivers, creeks and smaller streams of water, with their actual or right angled widths, course, banks, current and bed, at the points where your lines cross.

10. A description of all bottom lands—whether wet or dry, and if subject to inundation, state to what depth.

11. All springs of water, and whether fresh, saline or mineral, with the course and width of the stream flowing from them.

12. All lakes and ponds, describing their banks and the depth and quality of their water.

13. All coal banks, precipices, caves, sink-holes, quarries and ledges with the character and quality of the same.

14. All water-falls and mill sites.

15. All towns and villages, houses, cabins, fields and sugar camps, factories, furnaces and other improvements.

16. All metalliferous minerals or ores, and all diggings therefor, with particular descriptions of both, that may come to your knowledge, whether intersected by your lines or not.

17. All roads and trails, with the courses they bear.

18. All offsets or calculations by which you obtain the length of such parts of your lines as cannot be measured with the chain.

19. The precise course and distance of all witness corners from the true corners which they represent.

AFFIDAVIT.

1. Following the field notes and general descriptions, in each of your field books, an affidavit of the following form is to be written, and to be signed by yourself and each of your assistants in the field:—

I, A. B., Deputy Surveyor, do solemnly swear (or affirm) that, in pursuance of a contract with C. D., Surveyor General of the United States for Wisconsin and Iowa, bearing date the day of , 18 , and in strict conformity to the laws of the United States, and the instructions of the said Surveyor General, I have regularly surveyed

principal meridian (State or Territory) of
and I do further solemnly swear (or affirm)

that the foregoing are the true and original field notes of the said survey, executed as aforesaid.

A. B., *Deputy Surveyor.*

G. H.
J. K. } *Chainmen.*

L. M., *Marker.*
N. O., *Flagman.*

Subscribed by said A. B., Deputy Surveyor, and sworn before me at this day of 18 . P. Q., Justice of the Peace (or other officer authorized to administer oaths) of in the county of State (or Territory) of

2. Your attention is directed to the following section of an act of Congress, approved, August 8th, 1846, entitled "An Act to equalize the compensation of Surveyors General of the public lands of the United States, and for other purposes:"

3. "That the Surveyors General of the public lands of the United States, in addition to the oath now authorized by law to be administered to deputies on their appointment to office, shall require each of their deputies, on the return of his surveys, to take and subscribe an oath or affirmation that those surveys have been faithfully and correctly executed, according to law and the instructions of the Surveyor-General; and, on satisfactory evidence being presented to any court of competent jurisdiction that such surveys, or any part thereof, had not been thus executed, the deputy making such false oath or affirmation shall be deemed guilty of perjury, and shall suffer all the pains and penalties attached to that offence; and the district attorney of the United States for the time being, in whose district any such false, erroneous, or fraudulent surveys shall have been executed, shall, upon the application of the proper Surveyor General, immediately institute suit upon the bond of such deputy; and the institution

of such suit shall act as a lien upon any property owned or held by such deputy, or his sureties, at the time such suit was instituted."

The above section of the said law applies to the foregoing affidavit, and will be in all particulars and in every instance, rigidly enforced.

GENERAL REMARKS.

Your attention is particularly directed to the following specimen of field notes, which will illustrate the order and method of performing the work, and the manner in which your field notes are to be returned, and

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is to be regarded, therefore, as a part of these general instructions, any departure from which, without special authority, will be considered a violation of your contract and oath, and a forfeiture to all claim of payment. As your work will be rigidly examined in the field, by a Deputy appointed by this office for the special purpose, any neglect on your part cannot fail to be reported, and the penalty, however disagreeable, will certainly be enforced.

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SURVEY

OF

TOWNSHIP LINES,

MADE BY

GEORGE TAYLOR,

UNDER CONTRACT, DATED MAY 16TH, 1851.

[20]

NAMES OF ASSISTANTS.

STEPHEN SUMNER, THOMAS SPRING, } *Chainmen.*

DAVID WINTER, *Axeman.*

JOHN SMITH, *Flagman.*

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TOWNSHIP LINES.

Between Townships 26 and 27 North, Range 11 East of 4th Meridian.

CHAINS.	
	West, between sections 1 and 36, Variation 7° 15′ East,
1,00	Black Creek, runs S. E.
5,00	Road to Stephen's Point, bears N. 20 W.
8,00	Black Creek, 20 links wide, runs N. E.
10,00	Enter field, bears S. W.
17,00	Leave field, bears N. W., Road bears N. W.
40,00	Enter marsh bottom, N. W. unfit for cultivation, and set quarter section post,
	Bearings { Oak, 12 N. 77 E. 114 links, Bur Oak, 9 N. 45 W. 240 links,
46,50	Stream, 20 links wide, runs S. E.
	A house bears N. 20 W.
	A house bears N. 4 W.
66,00	Leave marshy bottom, bears N. 45 W. unfit for cultivation.
	Subject to inundation 2 feet deep. A house bears N. 19 E.
	Another house bears N. 40 E.
69,50	Stream 20 links wide, runs N. E.
69,75	Enter bottom—unfit for cultivation.
80,00	Set posts for corners to sections 1, 2, 35 and 36.
	Bur Oak, 10 N. 22 E. 34 links,
	Bur Oak, 9 N. 41 W. 65 links,
	Surface, gently rolling; soil sand and loam, 2d rate; timber Black and White Oak; good quality openings.
	West between sections 2 and 25, Variation 7° 15′ East,
40,00	Set post for ¼ section corner,
	White Oak, 29 N. 25 E. 370 links,
	Black Oak, 10 N. 5 E. 325 links,
	James Adam's house bears N. 50 W.
	John Munroe's house bears S. 12 E.
42,00	Bend of stream S. E.
43,00	Leave bend of stream S. W. Road from Princeton to Steven's point.
56,50	Road to Irvin's Mill, bears S. 80 W.
	A house bears S. 70 E.; another N. 65 E.
80,00	Set posts for corner to sections 2, 3, 34 and 35,
	White Oak, 7 N. 44 E. 15 links,
	Black Oak, 10 N. 83 W. 52 links,

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Between Townships 26 and 27 North, Range 11 East of 4th Meridian.

CHAINS.	
	Black Oak, 10 S. 15 W. 35 links,
	White Oak, 18 S. 17 E. 39 links,
	Surface gently rolling; soil 2d rate,
	Timber, Black and White Oak.
	West, between sections 3 and 34, Variation 7° 15′ East,
4,33	A. Spencer's house bears S. 35 W.
7,50	Enter Mrs. Ford's field, bears North,
	Spencer's house bears S. 20 E.
	Mrs. Ford's house bears S. 45 W.
15,50	Leave field. House bears S. E.
17,00	Enter marsh; bears N. W.; unfit for cultivation.
40,00	Set post for ¼ section corner,
	Black Oak, 12 N. 54 W. 728 links,
	Black Oak, 12 S. 89½ W. 1350 links,
53,00	Leave marsh, bears S. 50 E.
59,22	White Oak, 8 inches in diameter,
80,00	Set post for corner to sections 3, 4, 33 and 34,
	Black Oak, 13 N. 78 W. 26 links,
	Black Oak, 13 N. 65 E. 41 links,
	Black Oak, 14 S. 42 W. 80 links,
	Surface, level; soil wet, 2d rate; Oak openings.

	West, between sections 4 and 33, Variation 7° 15′ East,
	Enter swamp, bears N. E. and S. E.
40,00	Set post for ¼ section corner,
	White Oak, 12 N. 35 W. 65 links,
	White Oak, 12 S. 77 E. 137 links,
52,00	Leave swamp; bears N. W.
80,00	Set post for corner to sections 4, 5, 32 and 33,
	White Oak, 12 N. 79 E. 175 links,
	White Oak, 18 N. 5 W. 228 links,
	White Oak, 14 S. 1 E. 312 links,
	White Oak, 14 S. 2 W. 317 links,
	Surface, level and wet, mostly marsh; unfit for cultivation. Timber, Black Oak, Tamarac and White Oak.
	West, between sections 5 and 32, Variation 7° 15′ East,
00,50	Enter Tamarac swamp, bears north and south; unfit for cultivation,
13,00	Leave swamp,
18,00	Black Creek, 20 links wide, runs S. E.
39,00	Leave marsh, bears N. W.
40,00	Set post for ¼ section corner,
	Black Oak, 14 N. 89½ W. 335 links,
	Black Oak, 10 S. 14 W. 224 links,

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Between Townships 26 and 27 North, Range 11 East of 4th Meridian.

CHAINS.	
55,00	Enter marsh, bears S. E.
79,00	Leave same, N. 80 E. and S. E.
80,00	Set post corner to sections 5, 6, 31 and 32,
	Black Oak, 10 S. 20 W. 25 links,
	White Oak, 12 S. 30 E. 36 links,
	White Oak, 14 N. 40 E. 49 links,
	Black Oak, 16 N. 50 W. 64 links,
	Surface level and wet; mostly marsh unfit for cultivation. Timber, Black Oak, Tamarac and White Oak,
	West, between sections 6 and 31, Variation 7° 25′ East,
25,00	Enter swamp, bears south,
38,00	Leave same, bears S. W.
40,00	Set quarter section post,
	Black Oak, 9 N. 45 W. 57 links,
	Black Oak, 20 S. 11 E. 52 links,
41,50	Enter field, bears S. 50 W.
50,50	Leave same, bears N. 30 W.
73,72	Intersect range line 58,02 chains South of temporary post, and set post for corner to townships 26 and 27 North, ranges 10 and 11 East of the 4th meridian,
	Black Oak, 8 N. 1 W. 10 links,
	Black Oak, 10 N. 4 E. 8 links,
	Black Oak, 12 S. 9 E. 27 links,
	Black Oak, 14 S. 16 W. 64 links,
	Surface, gently rolling; soil sandy, 2d rate. Timber principally Black Oak.
	June 2d, 1851.
	Measuring chain compared with standard chain and found to be correct.

TOWNSHIP 27 NORTH.

Between Ranges 10 and 11 East of the 4th Meridian.

CHAINS.	
	North, between sections 31 and 36, Variation 7° 15′ E.
8,29	Black Oak, 9 inches in diameter,
32,00	Enter marsh, bears East and West; unfit for cultivation,
40,00	Set post for quarter section corner,
	Tamarac, 10 S. 9 W. 147 links,
	Tamarac, 10 S. 8 E. 124 links,
80,00	Set posts for corner to sections 25, 30, 31 and 36,
	Black Oak, 7 S. 85 W. 198 links,
	Aspen, 10 N. 10 W. 189 links,
	Tamarac, 8 S. 3½ E. 440 links,
	No other tree near on N. E.
	Surface, level; soil sandy, 2d rate; timber, Black Oak.

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TOWNSHIP 27 NORTH.

Between Ranges 10 and 11 East of the 4th Meridian.

CHAINS.	
	North, between sections 25 and 30, Variation 7° 30′ East,
5,00	Leave marsh, bears East and West,
15,00	Enter same, bears East and West; unfit for cultivation,
40,00	Set ¼ section post,
	Aspen, 10 S. 10 W. 80 links,
	White Pine, 12 S. 35 W. 79 links,
65,00	Leave marsh, bears East and West,
80,00	Set post for corner to sections 19, 24, 25 and 30,
	Black Oak, 20 S. 34 W. 50 links,
	Black Oak, 15 N. 75 W. 238 links,
	Black Oak, 12 N. 61 E. 122 links,
	Black Oak, 10 S. 6 E. 65 links.
	Surface, level; soil sandy, 3d rate; timber, Black Oak, Tamarac and Birch.
	North, between sections 19 and 24, Variation 7°, 50′ East,
16,00	Enter marsh, bears East and West; unfit for cultivation,
40,00	Set quarter section post,
	Aspen, 12 N. 42 W. 159 links,
	Black Oak, 9 S. 57 E. 78 links,
80,00	Set post for corner to sections 13, 18, 19 and 24,
	Tamarac, 10 S. 62 W. 42 links,
	Tamarac, 12 N. 61 W. 57 links,
	Tamarac, 12 N. 50 E. 74 links,
	Tamarac, 8 S. 7 E. 140 links,
	Surface level; soil sandy, 3d rate; timber Tamarac and Black Oak.
	North, between sections 13 and 18, Variation 7° 55′ East,
3,00	Leave marsh, bears East and West,
40,00	Set quarter section post,
	White Oak, 18 S. 20 W. 38 links,
	Black Oak, 14 N. 61 E. 50 links,
63,50	Enter marsh, bears East and West,
69,50	Leave same; unfit for cultivation,
77,00	Road from Princeton to Pinery, bears N. W.
80,00	Set post for corner to sections 7, 12, 13 and 18,
	Black Oak, 10 N. 81 W. 112 links,
	Black Oak, 12 S. 34 W. 110 links,
	White Oak, 15 S. 13 E. 6 links,
	White Oak, 14 N. 84 E. 58 links,
	Surface level; soil sandy, 3d rate; timber Black Oak and Tamarac.

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TOWNSHIP 27 NORTH.

Between Ranges 10 and 11 East of the 4th Meridian.

CHAINS.	
	North, between sections 1 and 6, Variation 8° East,
30,00	Enter Lunch Creek bottom; unfit for cultivation; bears East and West,
31,50	Lunch Creek, 20 links wide, 30 inches deep; runs S. E.; current swift; banks low; bed sand,
34,00	Leave creek bottom, bears S. E.
40,00	Set post for quarter section corner, Black Oak, 10 N. 73 W. 14 links, Black Oak, 12 S. 82 E. 23 links,
15,93	Black Oak 18 inches in diameter,
53,80	Double Black Oak 30 inches in diameter,
86,70	Set post for corner to Townships 27 and 28 North; ranges 10 and 11 East of the 4th Meridian, Bur Oak, 20 N. 14 W. 175 links, Bur Oak, 16 S. 24 W. 274 links, Bur Oak, 19 S. 6 E. 307 links, Black Oak, 22 N. 80 E. 75 links, Surface rolling; soil sandy; 2d rate; timber, Aspen, Black Bur and White Oak, very scattering; undergrowth, Alder, Hazel and Oak. June 4th, 1851.
	Measuring chain compared with standard chain, found to be ½ an inch too short; adjusted same.

TOWNSHIP 27 NORTH.

Between Ranges 11 and 12 East of the 4th Meridian.

CHAINS.	
	North, between sections 31 and 36, Variation 7° 20′ East,
2,00	Road bears West,
3,79	White Oak, 15 inches in diameter,
40,00	Set post for ¼ section corner, Bur Oak, 9 N. 34 W. 82 links, Bur Oak, 11 N. 19 E. 150 links,
44,50	Enter J. Slocum's field; bears West,
65,50	Leave same; bears West; Slocum's house bears N. 60 W.; Daniel Green's N. 18 E. 10 chains,
78,00	Enter field; bears West; E. J. Johnson's house bears West 8 chains,
80,00	Set post for corner to sections 25, 30, 31 and 36, Bur Oak, 20 S. 32° 30′ W. 242 links, Black Oak, 10 S. 14° 15′ E. 379 links. Black Oak, 10 N. 22° 45′ E. 719 links, No other tree on N. W. Surface level; soil sandy; 2d rate.

(Pages 26 through 29 Deleted. The notes are of the east and north boundaries of the township and in the same order, style and format.)

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AFFIDAVIT.

I, George Taylor, Deputy Surveyor, do solemnly swear that in pursuance of a contract with Surveyor General of the United States, for Wisconsin and Iowa, dated May 16, 1851, and in strict conformity to the laws of the United States, and the instructions of said Surveyor General, I have regularly surveyed and established the following Township Boundaries, situated East of the Fourth Principal Meridian, in the State of Wisconsin, viz:—Lines between Ranges 10 and 11 and 11 and 12 of Township 27, and Lines between Townships 26 and 27 and 27 and 28 of Range 11. And I do further solemnly swear, that the foregoing are the true and original field notes of the said survey executed as aforesaid.

GEORGE TAYLOR, *Deputy Surveyor.*

STEPHEN SUMNER, }
THOMAS SPRINGS, } *Chainmen.*

DAVID WINTER, *Axeman.*
JOHN SMITH, *Flagman.*

Subscribed by said George Taylor, Deputy Surveyor, and sworn to before me, at my office, in Washington, Franklin County, Wisconsin, this 11th day of July, 1851.

ANDREW FULLER, *Notary Public.*

{SEAL}

Franklin Co., Wisconsin.

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SUBDIVISION

OF

TOWNSHIP NO. 27 NORTH,

OF

RANGE 11 EAST OF 4TH PRINCIPAL MERIDIAN, WISCONSIN.

COMMENCED MARCH 6TH, 1852; FINISHED MARCH 23D, 1852;

BY

WM. A. JACKSON, DEP. SUR.

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NAMES OF ASSISTANTS.

WM. VON ROGLE,
HENRY STROUGHTON, } *Chainmen.*

SAMUEL FROST, *Axeman*

PETER SNOW, *Flagman.*

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Township 27 North, Range 11 East of 4th Principal Meridian.

	Measuring chain compared with standard chain and adjusted thereto, it being found ½ inch too long.
	To determine the course of the East Boundary of the Township, I commence (with my compass adjusted at a variation of 7° 20′ East) at the corner to Townships 26 and 27, Ranges 11 and 12, and run thence North on a blank line, at 39,80 chain, fell 45 links East of quarter section post; at 79,61 chains, fell 99 links East of corner to sections 25 and 36, Township 27 North, Range 11 East. From corner to Townships 26 and 27, Ranges 11 and 12, with compass adjusted at a variation of 7° 15′ East, 1 run West on a blank line, along south boundary of section 36, Township 27 North, range 11 East; at 40, 14 chains, fell 25 links North of quarter section corner; at 79,96, fell 52 links North of corner to sections 35 and 36.
CHAINS.	North, between sections 35 and 36, Variation 8° 30′ East,
33,50	New road from Hamilton to Stevens' Point, bears N. W. and S. E.
37,88	Black Oak, 9 inches diameter,
40,00	Set quarter section post,
	Bearings { Black Oak, 15 N. 78 E. 191 links, Bur Oak, 14 N. 86 W. 88 links,
66,00	Old road from Hamilton to Stevens' Point, bears W. N. W.
70,75	Enter marsh, crossing thin cane-brake, bears East and West
78,50	Leave same, bears S. E. and N. W.
80,00	Set post corner to sections 25, 26, 35 and 36, White Oak, 19 S. 80 E. 125 links, Black Oak, 11 N. 77° 30′ E. 82 links, Surface of South half level Woods; soil, 2d rate; timber, Black, White, and Bur Oak; no undergrowth
	East Random, between sections 25 and 36, Variation 7° 15′ East,
79,80	Intersect range line 40 links South of post.
	West corrected, between sections 25 and 36, Variation 7° 32′ East,
19,25	Black Oak, 14 inches in diameter,
35,08	White Oak, 17 inches diameter,
39,75	Road from Hamlton to Stevens' Point, bears N. N. W.
39,90	Set quarter section post, White Oak, 27 N. 42° 30′ W. 50 links, White Oak, 19 S. 45° 30′ W. 102 links,
43,40	Enter marsh, bears North and South, Marsh waste and worthless,
46,00	Leave same and enter Spruce swamp,
53,04	Leave Spruce swamp for Moss marsh,

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Township 27 North, Range 11 East of 4th Principal Meridian.

CHAINS.	
70,54	Leave Moss marsh, for Oak timber land,
79,80	Section corner, Surface of West end not much elevated. The whole of the marsh uncultivable and impassable to horses and cattle. March 6, 1852.
	Measuring chain compared with standard chain, and found correct.
	North, between sections 25 and 26, Variation 8° 40′ E.
40,00	Set quarter section post, White Oak, 15 N. 44° 30′ W. 115 links, Black Oak, 13 S. 55 E. 114½ links,
68,35	Black Oak, 9 inches diameter,
74,95	Enter small marsh with pond, 3 feet deep, covered with grass,
77,05	Leave same, bears East and West,
80,00	Set post corner of sections 23, 24, 25 and 26, Black Oak, 20 N. 70 E. 142 links, Black Oak, 18 N. 77° 30′ W. 174 links, Surface undulating; Oak uplands but little elevated above marsh; timber chiefly Black and Scrub Oak; undergrowth Oak bushes and Hazel.
	East Random, between sections 24 and 25, Variation 7° 32′ East,
80,20	Intersect range line 15 links south of post.
	West corrected, between sections 24 and 25, Variation 7° 38′ East,
21,36	Leave marsh, bears North and South, and cross dry ridge,
38,86	Leave dry ridge and enter small marsh; bears N. E. and S. W.
40,10	Set quarter section post, White Oak, 11 N. 21 W. 186 links, White Oak, 31 S. 70 W. 304 links,
42,86	Leave marsh; bears North and South, and rise high bluff,
80,20	Section corner,

	Surface East ½ of line flat and marshy; West 1½ over dry Oak ridges; soil of upland 2d rate; timber Black and White Oak; little undergrowth but Oak bushes.
	North, between sections 23 and 24, Variation 8° 45′ East,
22,38	White Oak 20 inches diameter,
38,50	Road from Hamilton to Stevens' Point; bears W. N. W. and S. S. E.
40,00	Set quarter section post, White Oak, 9 S. 50 E. 26 links, White Oak, 8 West 280 links,
42,41	Black Oak, 27 inches diameter,
80,00	Set post corner of sections 13, 14, 23 and 24,

[35]

Township 27 North, Range 11 East of 4th Principal Meridian.

CHAINS.	
	White Oak, 13 N. 88 W. 950 links, White Oak, 23 S. 81° 30′ W. 936 links, Surface varying between marsh and upland; soil for the most part poor; timber, White and Black Oak; undergrowth, Whortleberry and Hazel.
	East Random, between sections 13 and 24, Variation 7° 30′ East,
80,64	Intersect range line 67 links North of post.
	West corrected, between sections 13 and 24, Variation 7° 1′ East,
14,39	Intersect left bank of White River, 50 links wide, runs South; swift, strong current; sandy bottom, 4 to 10 feet deep; clear water; banks in some places set with Willow and Black Alder, in others clear of bushes,
14,89	Gain right bank of river and pass bayou or old channel; bears North and South,
17,95	Gain West bank of bayou, bears N. E. and S. E. and leave same,
25,64	Leave firm bottom land for uncultivable marsh; bears North and S. W.
40,32	Set quarter section post, Black Oak, 12 S. 14° 30′ E. 498 links, Black Oak, 11 S. 40° 30′ E. 494 links,
65,14	Leave marsh for narrow point of timber,
65,64	Leave same for irreclaimable marsh,
80,64	Section corner, Surface level; East of White River, a White Ash and Alder swamp, mixed with Poplars and Tamaracs; land next West of White River firm; first rate bottom; land with here and there scraggy Jack Oaks.
	North between sections 13 and 14, Variation 7° 30′ East,
15,08	Leave Tamarac swamp for open marsh,
27,00	Leave wet marsh, bears East and S. W. and enter dry meadow,
28,00	Leave meadow for Oak openings,
40,00	Set quarter section post, Black Oak, 18 N. 14 W. 105 links, Black Oak, 11 N. 62° 30′ E. 247 links,
80,00	Set post corner of setions 11, 12, 13, and 14, Black Oak, 9 N. 78 W. 87 links, Poplar, 10 S. 70 E. 35 links, Surface level; a little raised through timber; soil on South ½ 3d rate, on North ½ 2d rate; timber, Black and Bur Oak and Poplar.
	March 8, 1852

[36]

Township 27 North, Range 11 East of 4th Principal Meridian.

	Measuring chain compared with standard chain, found to be ½ an inch too short; adjusted same.
CHAINS.	East Random, between sections 12 and 13, Variation 7° 30′ East,
80,86	Intersect range line 26 links North of post.
	West, corrected, between sections 12 and 13, Variation 7° 19′ East,
36,26	Intersect left bank of White River, 50 links wide; runs South,
36,76	Gained right bank of same,
40,43	Set quarter section post in a mound of earth and sod; pit 8 links East,
66,96	Leave marsh, bears W. N. W. and S. E. and enter Poplar and White Birch copse,
80,86	Section corner, Surface level; soil, along White River bottom, rich and subject to inundation to depth of 3 feet; but little timber on line, except at West end, which is densely covered with White Poplar, Alder and White Birch.
	North, between sections 11 and 12, Variation 7° East,
1,50	Enter marsh of White River bottom; bears East and West,
22,15	Right bank of White River, 55 links wide; runs East,
22,70	Gain left bank of same,
35,00	Enter Tamarac swamp; bears East and West,
40,00	Set quarter section post, Tamarac, 10 N. 71° 30′ E. 31 links, Tamarac, 10 S. 43° 15′ W. 23 links,
41,10	Tamarac, 8 inches diameter,
67,00	Leave Tamarac swamp; bears East and West,
80,00	Set post corner of sections 1, 2, 11 and 12, Black Oak, 14 N. 36 E. 30 links, White Oak, 12 S. 14 W. 42 links, Surface level; soil 2d rate; timber Black and White Oak and Tamarac.
	East Random, between sections 1 and 12, Variation 7° 30′ East,
80,66	Intersect range line 71 links North of post.
	West corrected, between sections 1 and 12, Variation 7° East,
1,46	Black Oak, 13 inches diameter,
9,91	Bur Oak, 8 inches diameter,
40,33	Set quarter section post, Black Oak, 10 N. 47 E. 278 links, Bur Oak, 7 S. 10 W. 97 links,

(Pages 37 through 52 deleted. The notes continue in the same order, style and format.)

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Township 27 North, Range 11 East of 4th Principal Meridian.

CHAINS.	
67,25	Leave marsh; bears N. W. and S. E.
80,29	Section corner, Surface generally flat; at West end of line a little elevated soil, 2d rate; timber, Black Oak of poor quality; blue joint grass along White River bottom.
	West Random, between sections 17 and 18, Variation 9° 18′ East,
71,54	Intersect range line 73 links North of post.
	East corrected, between sections 7 and 18, Variation 9° 49′ East,

12,54	Road from Princeton to Dacotah; bears North and South,
15,79	Old road from Princeton to Pinery; bears North and South,
31,54	Set quarter section post,
	Black Oak, 15 N. 17 W. 187 links,
	Black Oak, 22 S. 3° 30′ W. 179 links,
42,50	Enter marsh, good for hay; bears N. W. and S. E.
42,56	Leave same; bears N. W. and S. E.
60,53	Enter inundated marsh; bears North, West and South,
69,14	Leave same; bears N. W. and S. E.
71,54	Section corner,
	Surface flat; soil, except marsh, 2d rate; little or no undergrowth.
	March 20, 1852.
	Measuring chain compared with standard chain, and found ¾ of an inch too short; adjusted the same.
	North, between sections 7 and 8,
	Variation 7° 50′ East,
40,00	Set quarter section post,
	Tamarac, 9 S. 81 W. 82 links,
	Tamarac, 12 S. 54 E. 60 links,
46,00	South side of Mud Lake and set meander post,
	Tamarac, 7 N. 89 E, 27 links,
	Swamp Oak, 6 S. 17 W. 42 links,
	Thence offset 4 chains West; thence 15 chains North; thence 4 chains East on to line; therefore at
61,00	North side of Mud Lake and set a meander post,
	White Oak, 14 N. 9 W. 56 links,
	Black Oak, 12 N. 37 E. 62 links,
65,00	Black Oak 10 inches diameter,
80,00	Set a post for corner to sections 5, 6, 7 and 8,
	Black Oak, 13 N. 73 E. 147 links,
	Black Oak, 11 S. 87 E. 153 links,
	Surface flat; soil 2d rate; margin of Lake oozy, treacherous soil; timber, Black and White Oak; not much undergrowth.

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Township 27 North, Range 11 East of 4th Principal Meridian.

CHAINS.	
	East Random, between sections 5 and 8,
	Variation 7° 30′ East,
80,99	Intersect Meridian section line 98 links North of post.
	West corrected, between sections 5 and 8,
	Variation 6° 49′ East,
8,00	Leave marsh for Poplar swamp; bears North and South,
10,50	Leave swamp; bears North and South,
37,85	Road from Hamilton to Plover Portage; bears N. N. E. and S. S. E.
40,49½	Set quarter section post,
	Black Oak, 10 S. 19 W. 53 links,
	White Oak, 8 N. 17 W. 47 links,
80,99	Section corner,
	Surface rolling, except marsh; soil 2d rate; timber, White and Black Oak; undergrowth Scrub Oak.
	West Random, between sections 6 and 7,
	Variation 7° 30′ East,
71,60	Intersect range line 258 links North of post.
	East corrected between sections 6 and 7.
	Variation 9° 33′ East,
22,50	Road from Princeton to Pinery; bears North and South,
31,60	Set quarter section post,
	White Birch, 7 N. 17 W. 77 links,
	Black Ash, 16 S. 18 W. 88 links,
47,57	Enter marsh; bears North and South,
52,31	White River, 50 links wide; runs South,
52,81	Over same, water deep, gentle current, and enter wet marsh,
61,10	Leave inundated marsh for Tamarac swamp,
70,10	Leave swamp; bears North and South,
71,60	Section corner,
	Surface low; soil almost worthless; marshes subject to inundation; scattering timber of White and Black Oak, White Birch and Black Ash.
	North Random, between sections 5 and 6,
	Variation 7° 55′ East,
85,23	Intersect South boundary of Township 28 North, range 11 East, 254 links East of corner to sections 31 and 32.
	South corrected, between sections 5 and 6,
	Variation 9° 37′ East,
2,56	White River, 50 links wide; runs S. W.; 4 to 10 feet deep sandy bottom; current gentle; banks bushy,
3,28	Over same to left bank and enter Oak openings,
31,00	Enter wet marsh, unfit for cultivation, bears S. W. and E. N. E.
45,23	Set quarter section post in marsh,
	White Birch, 7 N. 17 E. 178 links,

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Township 27 North, Range 11 East of 4th Principal Meridian.

CHAINS.	
	Tamarac, 10 S. 23 E. 187 links,
48,73	Leave wet marsh; bears East and West,
85,23	Section corner,
	Surface, except marsh, slightly undulating; soil 2d rate; timber, White and Black Oak; marsh unfit for cultivation; White Birch and a few Tamaracs of poor quality.
	March 22d, 1852.

COURSES.	CHAINS.	
		Meanders of Mud Lake, situated within sections 7 and 8, beginning at meander post on South side of Lake between sections 7 and 8, thence
		In section 8.—Var. 7° 55′ East,
S. 3° 30′ E.	5,91	
S. 26, 30 E.	10,67	
S. 60, 30 E.	10,00	
S. 74, 15 E.	10,3	
S. 70, 30 E.	5,50	
S. 69, 45 E.	7,00	
S. 51 E.	8,03	
S. 73 E.	7,82	To South-east corner of Lake,
N. 56 E.	4,00	At 1,00, White River 60 links wide; runs East,
N. 27 E.	5,00	
N. 23 E.	10,42	
N. 7,45 W.	8,50	
N. 31, 39 W.	8,41	
N. 40, 30 W.	9,24	
N. 58, 45 W.	4,22	
N. 62 W.	7,74	
S. 70, 15 W.	4,37	
West,	9,00	
N. 59, 30 W.	6,23	
N. 31, 30 W.	2,75	
N. 65 W.	7,01	
N. 67 W.	9,50	To meander corner on North side of Lake between sections 7 and 8; shore of Lake flat, almost all a marsh.
N. 67 W.	2,00	In section 7—Variation 7° 55′
S. 25 W.	5,90	At 2,00 chains White River, 150 links wide, comes in,
S. 18 W.	4,54	
S. 19, 30 E.	6,65	
S. 33 E.	6,78	To meander post on South side of Lake, place of beginning; South shore very

		wet; marsh almost impassable; water of Lake turbid, about six feet deep; but little timber along shore.

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Township 27 North, Range 11 East of 4th Principal Meridian.

COURSES.	CHAINS.	
		Meanders of a Lake in section 7—leaving quarter section post between sections 6 and 7, thence running S. 30 W. Variation 7° 35′ E.
	38,36	Strike Lake and set a meander witness post on North shore of same, Black Oak, 13 N. 48 W. 50 links, Black Oak, 9 N. 57 E. 36 links, Beginning at this post thence
S. 64 W.	9,00	
S. 30 W.	4,11	
S. 37 E.	4,50	
S. 14, 30 E.	6,36	
S. 5, 30 E.	5,00	
S. 18, 15 E.	3,79	
N. 19 E.	6,00	
N. 87 E.	1,08	
S. 57, 45 E.	3,76	
S. 34, 30 E.	4,54	
S. 15, 45 W.	2,74	
S. 38, 15 W.	11,00	
S. 73, 45 E.	8,50	
S. 69, 15 E.	7,50	
N. 44, 45 E.	7,50	
N. 1, 30 E.	6,64	
N. 80, 45 W.	5,25	
N. 26, 45 E.	13,50	
N. 14, 45 W.	6,00	
N. 63, 45 W.	6,37	
N. 76 W.	11,00	
N. 65, 45 W.	1,43	
N. 39 W.	1,86	To the place of beginning; banks of Lake 3 to 8 feet high; water clear. March 23, 1852.
		Meanders of Comstock's Lake in section No. 11, From quarter post, between sections 2 and 11, Variation 7° 45′ East; run a line S. 15 E. 18 chains to bank of lake and set a witness post, taking bearings, Black Oak, 16 N. 37 W. 45 links, White Oak, 20 N. 89 E. 27 links, thence on North side of Lake, Variation 78 45 East,
S. 49 E.	4,87	
N. 88 E.	9,00	
S. 71 E.	5,99	

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Township 27 North, Range 11 East of 4th Principal Meridian.

COURSES.	CHAINS.	
S. 85 E.	5,38	
S. 13 E.	7,13	
S. 58 W.	8,56	
S. 8 E.	9,45	
N. 66 W.	11,72	
N. 20 W.	1,81	
N. 40 W.	15,22	
N. 11 W.	6,35	
N. 68, 15 E.	5,44	To the meander witness post, place of beginning; banks of Lake high; water clear and deep; banks skirted with White, Black and Bur Oak. March 12, 1852.

GENERAL DESCRIPTION.

This Township contains numerous small marshes, and a few of considerable extent. There are also several Tamarac swamps; most of them are unfit for cultivation, although some of the marshes are good for hay. The surface is generally level; a part is Upland, where the soil is first and second rate. Timber is scattered all over the Township, and is chiefly White and Black Oak. Poplars and White Birch trees line the margins of the marshes. The White River enters the Township near the Northwest corner, and runs in a Southerly course until it meets the Mud Lake, where it loses itself; resuming its course from the Eastern side of Lake, flows on with a gentle current in an Easterly direction. It is a narrow, deep stream, but not sufficiently adapted to the forming of a good motive power for mills. There are several improvements within the Township. There are two houses on the N. E. ¼ of N. E. ¼ of section 36; also two other houses on the South ¼ of S. W. ¼ of the same section. An improvement of about ten acres on S. E. ¼ of S. E. ¼ of section 34. A house and improvement on S. E. ¼ of section 8.

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Township 27 North, Range 11 East of 4th Principal Meridian.

AFFIDAVIT.

I, William A. Jackson, Deputy Surveyor, do solemnly swear, that in pursuance of a contract with Surveyor General of the United States, for Wisconsin and Iowa, bearing date the first day of January, 106a.d. 1852, and in strict conformity to the laws of the United States and the instructions of said Surveyor General, I have regularly surveyed and subdivided into sections, Township No. 27 North of range No. 11 East of the Fourth Principal Meridian, State of Wisconsin. And I do further swear, that the foregoing are the true and original field notes of the said survey excuted as aforesaid.

WM. A. JACKSON, *Deputy Surveyor.*

WILLIAM VON ROGLE, }
HENRY STROUGHTER, } *Chainmen.*

SAMUEL FROST, *Axeman.*
PETER SNOW, Flagman.

Subscribed by said William A. Jackson, Deputy Surveyor, and sworn to before me at my office in Smithville, Jones County, Wisconsin, this 31st day of March, A.D. 1852.

JAMES BROWN,
{SEAL} *Justice of the Peace.*

A. P. WOOD, Printer,
Dubuque, Iowa,

XXX.

(The following instructions are copied from an original volume now in the possession of the National Archives.

INSTRUCTIONS

TO

DEPUTY SURVEYORS

OF THE

UNITED STATES

FOR THE DISTRICT OF

ILLINOIS AND MISSOURI

ST. LOUIS, MO.

1856

GENERAL INSTRUCTIONS
TO
DEPUTY SURVEYORS,
FOR
SURVEYING PUBLIC LANDS
AND
PRIVATE CONFIRMED CLAIMS

-Page 1-

Office of the Surveyor General for the States of Illinois and Missouri.

*St. Louis,*_____*185*
*To*_____*Esq.,*
Deputy Surveyor.

SIR:

In the execution of Surveys under the authority of this office, the following General Instructions have been prepared for the government of the Deputy Surveyors, and must be strictly adhered to in all cases not otherwise provided for by special instructions, which may be rendered necessary on account of peculiar circumstances.

[1.]

RULES TO BE OBSERVED IN SURVEYING GENERALLY.

You will provide yourself with a compass of excellent quality and approved construction, having a *nonious division*, and movable sights; also, with two two-pole chains, of 50 links each. One of said chains must be adjusted to the standard in this office, and by it you will compare and adjust that which is used, at least once in every two days, and note their difference, if any, in your Field Book; and, if there is no difference, state the fact of your having compared and found them to agree. You must likewise be provided with a full set of tally rods, of iron or steel, or pointed therewith, and allow none others to be used but the precise number you shall have selected for that purpose.

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[2.]

Moral Integrity of hands.

Your chain-men, axe-men and flag-men, must be men of strict moral integrity; none must be employed, in whom *implicit* confidence cannot be reposed.

[3.]

Field Books and Hands.

Each of your Field Books will commence with a list of your chain-men, axe-men and flag-men, then in your service, and intended to be employed in performing the surveys you are about to execute. The first book under your contract will contain an attested record of their oaths; and whenever you may employ any others, you will insert their names, together with their oaths, in your Field Book, before they are permitted to commence work. You will also, when a chain-man, axe-man or flag-man is dismissed, or quits work from any cause *whatever*, note it, together with the cause of his dismissal, or the reason for which he quits work, and refer thereto by a note in the front part of your book.

[4.]

Form of Oath for Chain-men.

I, A. B., do solemnly swear in the presence of Almighty God, that I will faithfully and impartially execute and fulfill the duties of a Chain Carrier; that I will level the chain, and plumb the pins, so as to obtain the true horizontal distance; and that I will make a true report of the length of all the lines that I may assist in measuring, to the best of my abilities, so help me God A. B.

Sworn to and subscribed,
before the undersigned,
this_____ day of _____ 185

C. D. Justice of the peace for the township of _____ county of _____ State of _____

[5.]

Form of Oath for Flag-men and Axe-men.

I, E. F., do solemnly swear in the presence of Almighty God, that I will faithfully and truly perform the duties of a flag-man (or axe-man, as the case may require,) to the best of my abilities, so help me God.

E. F.

Sworn to and subscribed,
before the undersigned,
this _____ day of _____ 185

C. D., Justice of the peace for the township of _____ county of _____ State of _____

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[6.]

Lines, Flag and Compass.

All lines must be run with the assistance of a flag or fore vane-man; and Township boundary lines, with the compass adjusted to the true meridian, unless otherwise instructed by this office.

[7.]

Attraction.

If by reason of mineral attraction, or any other cause whatever, any line or lines cannot be accurately surveyed with the use of the needle, other means must be adopted, so as to ensure the correct execution of the work; and the manner of operating must be carefully noted in the Field Book.

[8.]

Line Trees and Blazes.

All trees which your lines (except random lines) strike, must be noted in your Field Book, and have two notches cut

on each side thereof in the direction of the line; but no other spot or blaze, whatever, is to be made thereon.

THE FOLLOWING PARAGRAPHS, FROM NINE TO EIGHTY-SEVEN, ARE INTENDED MAINLY TO GOVERN THE EXECUTION OF WORK IN REGARD TO THE SURVEY OF PUBLIC LANDS; YET, WHEREVER APPLICABLE, THEY MUST EQUALLY BE OBSERVED IN THE SURVEY OF PRIVATE CLAIMS.

[9.]

Running and blazing of lines, and establishment of Corners thereon.

All trees on each side of the lines, and near thereto, (except random lines) must be marked with a spot or blaze on each side, diagonally or quartering towards the line. Range lines (N. & S. Township boundary lines) will be run North, and corners for Sections and quarter Sections will be established thereon at every half mile, and mile, for the Sections and quarter Sections to the West, and not for those to the East of the line, except at Township corners. East and West standard lines will be run East or West, as the case may require, and corners established thereon for the quarter Sections, Sections, and Townships, North of the line, and not for those to the South of it. East and West fractional Township lines, which close to a boundary line of this Surveying District, or to an India or State boundary, will be run East or West, as may be required; and the quarter Section and Section corners will be established thereon for the quarter Sections and Sections to the North of the line, and not for those South of it.

[10.]

Random and true Township lines—S. boundary of Sec. 31.

All other E. & W. Township lines will be run west on randoms, and

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corrected East from Township corner to Township corner; and the excess or deficiency must be added to, or deducted from, the South boundary of Section 31, West of the quarter Section corner.

[11.]

Adjustment of the Compass.

Sub-division lines of a Township will be run with the compass adjusted to the East boundary thereof; and the true variation of the needle will be determined so as to show the difference (if any) between the said true variation and the variation at which the surveys are executed.

[12.]

Manner of Establishing Corners.

Section, fractional Section, and Township corners, will be perpetuated by planting a post at the place of the corner, of the most durable wood that can be had in the vicinity thereof. The posts must be set in the earth by digging a hole to admit them two feet deep, and be very securely rammed in with earth, and also with stone, if convenient—the township corner posts must be at least 5, and the Section and fractional section corner posts 4 inches diameter; they must be neatly squared off at the top, and placed so that the corners will correspond with the cardinal points. The posts at the corners of Sections in the interior of a Township must indicate, by a number of notches on each of the four corners directed to the cardinal points, the number of miles that it stands from the outlines of the Township; the four sides of the post will be numbered to correspond to the number of the Section they respectfully face. If, however, a tree is at the place of any corner, it will be notched as aforesaid, and answer for the corner in lieu of a post.

[13.]

Marking and Numbering of Corner Posts.

Section corner posts on Range and Township lines, will indicate, by a number of notches on two corners directed to the proper cardinal points, the number of miles it stands from the nearest Township corner; and two sides of said posts will be numbered to correspond to the number of the Section they face.

[14.]

Notching Post, &c.

Corner posts at Township corners will have 6 notches on each of the four corners, directed to the cardinal points, and each of the four sides thereof will be numbered to correspond to the number of the Section they face. All corner posts where mounds are not used must rise at least 3 feet above the surface of the ground.

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[15.]

Corner Stones.

Or, in lieu of posts, you may, at *any* corner, insert endways into the ground, to the depth of 7 or eight inches, a stone, the number of cubic inches in which shall not be less than the number contained in a stone 14 inches long, 12 inches wide and 3 inches thick—the edges of which must be set North and South, on North and South lines; and East and West, on East and West lines—the dimensions of each stone to be given in the Field Notes at the time of establishing the corner.

[16.]

Marking Corner Stones.

Where stone Section corners are made on the Range and Township lines, as many notches will be distinctly cut with a pick or chisel on the two sides in the direction of the line as the corner is sections from the nearest Township corners. At Township corners, 6 notches will be cut on each edge or side towards the cardinal points; at Section corners in the interior

of a Township as many notches will be cut on the South edge and East sides as the corner is sections distant from the South and East boundaries of the Township; and at the corners of sub-divisional intersections with the North boundaries of the Townships, 6 notches on the South edge, and at the intersection with the West boundaries 6 notches on the East edge; and as many notches on the East or South sides, as the case may require, as the corner is sections distant from the Township corner. Quarter section corner stones will have 1-4 cut on the West side on North and South lines, and on the North side on East and West lines.

[17.]

Courses and Distances to Witness Trees—Marking the same.

You will ascertain and state in your Field Notes, the course and distance from the several Section and Township corner posts, trees or stones, to a tree in each section for which they stand as a corner; each of said trees you will mark with a notch and blaze facing the post, tree or stone; the notch to be at the lower end of the blaze; and on the blaze, which must be neatly made, you will mark, with a marking iron, in a plain, distinct and permanent manner, the letter S, with the number of the Section, and over it the letter T, with the number of Township; and above this the letter R, with the number of the Range. And in all cases where there is no tree in any section within a reasonable distance of a corner, on which to mark the number of Section, Township and Range, that fact must be stated in your Field Notes.

[18.]

Mound Corners.

Township corners in a prairie, or other situation, where bearing or

-Page 6-

witness trees are not at hand, will be perpetuated by depositing in the ground, and at least 3 inches beneath the natural surface thereof, a portion of charcoal, (the quantity to be specified in your Field Notes,) not less than two quarts, at the place of such corners, over which you will erect a mound of *earth*, three feet high, five feet square at the base, and two feet square at the top; the sides whereof must be reveted or faced with *sods* laid horizontally and in successive layers on each other, each of said layers having an offset inwards, corresponding to the general slope of the face of the mound; and in the mound you will insert a post of the dimensions and marked as before directed, which post shall rise at least one foot above the top of the mound; or you may deposit at the place of the corner, three stones, not less than five inches square, by three inches thick, all of which you will particularly describe in your Field Notes—the top of the uppermost stone to be three inches below the natural surface of the ground, and the other two successively and immediately beneath the first—and over said stone you will erect a mound similar to that directed to be made over the deposite of charcoal; or, in lieu of charcoal or stone, to be deposited as before stated, you may perpetuate the corner by inserting endways into the ground, a stone, of the dimensions marked and set, in the manner before mentioned, overwhich no mound need be erected.

[19.]

Witness Mounds to Township Corners.

If a Township corner, where bearing or witness trees are not to be found within a reasonable distance therefrom, shall fall within a ravine or in any other situation where the nature of the ground or the circumstances of its locality shall be such as may prevent, or prove unfavorable to the erection of a mound, you will perpetuate such corner by selecting, in the immediate vicinity thereof, a suitable plot of ground as a site for a bearing or witness mound, and erect thereon a mound of earth in the same manner, and conditioned in every respect, with charcoal or stone deposited beneath, as before directed for a Township corner; and measure, and state in your Field Notes, the distance and course from the position of the true corner, of the bearing or witness mound so placed and erected.

[20.]

Witness Mounds to Section Corners.

Section corners in a prairie or other situation where bearing or witness trees cannot be had, will be perpetuated in the manner before directed for a township corner, except, that, where mounds are made they need be only two feet six inches high, by four feet square at the base, and two feet square at the top.

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[21.]

The establishment of quarter Section Corners—Marking of Witness Trees—Mounds.

Quarter Section corners will be perpetuated by a post (of durable wood) 3 inches diameter, place in the ground and marked 1-4 S., from which you will state in your Field Notes the course and distance to two of the most suitable trees in two different quarter Sections for which you are establishing the corner; which two trees you will mark with a blaze and notch facing the post; and on the blaze above the notch you will mark 1-4 S., with a marking iron. And where bearing or witness trees are not at hand, you will perpetuate quarter Section corners by erecting a mound, beneath which no deposite need be made—the mound to be of similar construction to those for Section and Township corners, except, that they may be only two feet high, three feet six inches square at the base, and one foot 6 inches square at top.

[22.]

Insuperable obstacles—Witness Points.

Whenever your course may be obstructed by insuperable obstacles, such as ponds, swamps, marshes, lakes, rivers, creeks, &c., you will prolong the line across such obstacles by

taking the necessary right angle off-sets; or, if this is inconvenient, by a traverse or trigonometrical operation, until you regain the line on the opposite side. And in case a North and South, or a true East and West line is regained in advance of any obstacle, you will prolong and mark the line back to the obstacle so passed, and state all the particulars in relation thereto in your Field Notes; and at the intersection of lines, with both margins of impassable obstacles, you will establish a witness point (for the purpose of perpetuating the intersections therewith,) by setting a post, and giving in your Field Notes the course and distance therefrom to two trees on opposite sides of the line, each of which trees you will mark with a blaze and notch facing the post, except on the margins of navigable water courses or navigable lakes; in these cases you will mark the trees with the proper number of the fractional Section, Township and Range.

[23.]

Townships, sub-divisions thereof, and numbering the Sections.

The Townships are to be laid off as nearly six miles square as practicable, by lines running from South to North 6 miles, and the corresponding corners joined by lines running easterly and westerly; and they will be subdivided into 36 Sections, containing, as nearly as may be, 640 acres each. The Sections to be numbered by beginning with No. 1, in the North-East corner of the Township, and going West and East, alternately, through the Township, with progressive numbers, ending with 36, which will be in the South-East corner thereof.

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[24.]

Navigable Streams, Lakes, &c.—Meandering.

The course of all navigable rivers which may bound or pass through your district must be accurately surveyed, and their width taken at those points where they may be intersected by Section or Township lines. Those navigable rivers which may pass through your district, must be surveyed on each side. You will also meander all lakes or ponds of sufficient magnitude to justify such expense. In meandering you will state particularly, in your Field Notes, at what corner you commence the meanders of each fractional Section, and also the corner to which you close. You will likewise state on which side of the river you are meandering, whether on the right or left bank, (going downwards,) and, also, whether on the *East, West, North, South, North-East, North-West, South-East, or South-West* side of the river, or other water course, through or adjoining your district.—[See Article 84.]

[25.]

Limits in Closing.

Any excess or deficiency in the length of any Township boundary line, or excess of error in the falling off from the corner to which any closing Township line shall be run, that may exceed five chains; or any excess or deficiency exceeding one chain in the length of any Section line, or excess of error in the falling off from the corner to which any Section line shall be run, that shall exceed one chain in closing the lines of a whole Section; and at the same rate for the Section lines, and at the same rate of one chain and fifty links per mile of the meanders, in closing the meanders of a navigable river or other water course with the line or lines of a fractional section, must be corrected by you and reduced within those limits, before leaving the ground, by re-surveying the line or lines which may have occasioned the excess or deficiency in the length of such Township or Section line, or excess of error in closing the lines of a Township, or of a whole or fractional Section.

[26.]

Corrections, Re-surveys and References.

All notes of corrections and re-surveys must be entered as such in the proper place of the Field Book, according to the order in which they may be executed; and the former and erroneous survey must be referred to in said entries. Also, in the margin of the pages containing erroneous surveys, that fact must be stated, and the page on which the notes of the re-survey or correction are entered, must also be referred to.

[27.]

Subdivision of Townships.

In subdividing Townships you will commence at the corner to Sections

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35 and 36, on the South boundary, (one mile west of the South-East corner thereof,) and move on in continued progression from East to West, and from South to North, in order that the excess or deficiency of the Township, as to complete Sections, may be added to, or deducted from, the Northern and Western Ranges of quarter Sections.

[28.]

North and South Section Lines—How to be Surveyed.

Each North and South Section line must be made one mile in measure by the chain, except those which close to the North boundary of the Township, so that the excess or deficiency will be thrown in the Northern range of quarter Sections, viz:—In running North between Sections 1 and 2, at 40.00 chains establish the quarter Section corner, and note the distance at which you intersect the North boundary of the Township; and also, the distance you fall East or West of the corresponding Section corner for the Township to the North; and, at said intersection, establish a corner for the Sections between which you are surveying.

[29.]

Surveying of E. and W. Section Lines.

The East and West Section lines, except those in the West

Range of Sections and those which cross navigable water courses, will be run from the proper Section corners, East on random lines, (without blazing,) for the corresponding Section corners. Temporary posts will be set at 40.00 chains, and the distance at which you intersect the Range or Section line, and your falling North or South of the corner run for, will be noted in your Field Book; from which corner you will correct the line West by means of off-sets from stakes, or some other marks set up or made on the random at convenient distances, and remove the temporary post, and place it and establish the quarter Section corner on the true line, equidistant, or at the average distance between the proper Section corners. If, however, you strike the corner run for, you have only to blaze the line back, and establish the quarter section corner at the intermediate distance.

[30.]

Surveying of East and West lines in the West Range of Sections.

The East and West lines, in the West Range of Sections, will be run West on true lines; the quarter section corner will be established at 40.00 chains; the corners for the proper sections will be established at the intersection with the Range line, and the distance which it intersects North or South of the corresponding Section corner West of the line will be noted in the Field Book.

[31.]

Legal Subdivisions of Sections.

When the closing lines to the North or West boundaries of the Town-

ships, either in subdivision or exterior work, exceed 100 chains in length, corners for the legal subdivisions of the Sections will be established at every 20 chains North or West of the quarter Section corner.

[32.]

East and West lines intersecting Navigable Streams—Correction of errors.

Whenever an East and West Section line, other than those in the West Range of Sections, crosses a navigable river, or other water course, you will not run a random line and correct it as in ordinary cases where there is no obstruction of the kind, but you will run East and West on a true line, (at right angles to the adjacent North and South lines,) from the proper section corners, to the said river or navigable water, and make an accurate connection between the corner established on the opposite banks thereof; and if the error, neither in the length of the line, nor in the falling North or South of each other of the fractional corners on the opposite banks, exceeds the limits before specified in these instructions for the closing of a whole Section, you will proceed with your operations. If, however, the error exceeds those limits, you will state the amount thereof in your Field Notes, and proceed forthwith to ascertain which line or lines may have occasioned the excess of error, and reduce it within the proper bounds by re-surveying or correcting the line or lines so ascertained to be erroneous, and note in your Field Book the whole of your operations in determining what line was erroneous, and the correction thereof.

[33.]

East and West lines intersecting Rivers in bends thereof.

If, by reason of bends in a river, or other navigable water course, the whole of any East and West Section line would not be surveyed, if the parts which are run East or West respectively were to terminate at their first intersection with the said river or other navigable water course, that part of the line, which, by being prolonged, would give the survey the best form, must be continued to its last intersection with the said river or other navigable water; and from said last intersection of the line so continued, you will make the connection with the corresponding corner on the opposite bank, and if it is found that the error exceeds the limits before specified for the closing of a whole Section, you will make the required correction in the manner before pointed out in these instructions.

[34.]

Water Courses, Stone Quarries, &c., &c., to be noted on lines.

All rivers, creeks, springs and smaller streams of water, with their width and the course they run in crossing the lines of surveys, and whether navigable, rapid or otherwise; also, all swamps, ponds, stone quarries, coal beds, peat or turf grounds, mounds, precipices, caves, rapids, cascades or falls of water, minerals, ores, salt springs, salt licks, and fossils,

prairies, hills and mountains, towns, villages and settlements, forges, factories and cotton gins; also, all uncommon, natural or artificial productions, which may come to your knowledge, are to be particularly regarded and noted in your Field Book. You will likewise note when the lines enter and when they leave creek or river bottom.

[35.]

Land, Timber and Undergrowth—Inundated bottoms—Names of Station and Line Trees, to be written in full.

At the end of every mile, in running Section or Township lines, and at the end of the meanders of each fractional Section, you will give a particular description of the face of the country; whether level, hilly or mountainous; of the quality or rate of the soil, and whether the bottom land is liable to inundation or not; and if so, state, also, to what depth, so far as that circumstance may come to your knowledge, whether from observation of the water marks upon the trees, or any other source of information; and note the kinds and quality of timber and undergrowth, naming the different sorts in the

order in which they predominate. The description of each mile must be full and complete in itself, and not refer to any previous description. The names of all bearing or witness trees, and station or line trees, must be written out in full, and not abbreviated; nor must any word which relates to the course or length of a line, or any object noted thereon, or in the establishment of a corner, be abbreviated, except in stating the courses to the witness trees from the corners, the course of meanders, and the bearing or direction of small streams, mountains, &c., when they are not to the cardinal points; in these cases, the capital letters N., S., E. and W., plainly and distinctly made, will be used.

[36.]

Sketches returned to exhibit all objects noted, such as Water Courses, Roads, &c., &c.

The plots or sketches which you are to return, will exhibit, as accurately as practicable, from careful occular observations (in addition to the measurements on the line,) to be made by you, and noted in your Field Book, the true situation of all objects noted, including the courses and connection of all rivers and other water courses, and travelled roads or tracks, denoting the principal places to which they lead, and the enchainment and direction of remarkable hills or mountains.

[37.]

Field Books and entries therein.

Your Field Books for your original notes will be of such a size as you may deem most convenient; they will be of the best quality of paper; and the original Field Notes, which are to be returned to this office, together with a fair and correct copy thereof, must be kept in a pain and intelligible manner, in the form hereafter prescribed in these instructions.

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Every entry must be so specific as not to admit of a doubt as to what is intended thereby, or a possibility of a misconstruction of your meaning. The said notes must be entered in the same order, from day to day, as the work is executed on the ground, including all re-surveys and corrections, and the date must follow each day's work.—[See Article 81.]

[38.]

Chains of two and four Poles.

Although your lines are to be measured with a chain of two poles, you are to keep your reckonings in chain of four poles, or one hundred links each; and all entries in your Field Books, and all plans and calculations, and to be made according to the decimal measure of a chain.

[39.]

Courses and Distances.

The courses and distances on your lines must be placed in the margin of your Field Book, on the left hand, (for which purpose it should be large,) and your remarks on the right.

[39.] B.

Copies of Field Notes—Form prescribed by the office.

The books in which you copy your Field Notes will be according to a form prescribed by this office.

[39.] C.

Horizontal Measurement.

In all measurements, the level or horizontal length is to be taken, and not that which arises from measuring over the surface of the ground, when it happens to be uneven or hilly.

[40.]

Form for keeping Field Notes of exterior Boundary Line of Townships, viz:

Suppose the line to be surveyed is the East boundary of Township 21 North, Range 6 East of the 4th principal meridian, and that the corner to Sections 1, 6, 31 and 36, of Townships 20 and 21 North, Range 6 and 7 East, had been established by another surveyor, and that you were furnished with a description thereof from this office. You will commence your Field Note as follows, viz:—

If first book, oaths of chain-men, axe-men and flag-men.

A. B., *hind chain-man,*
C. D., *fore chain-man,*
E. F., *flag-man,*
G. H., *axe-man.*

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Measuring chain compared with the standard chain, and found to be of the right length.

Took the variation of the needle last night, (27th of September, 1832,) about five chains South-West of the corner to Townships 20 and 21 North, Ranges 6 and 7 East of the 4th principal meridian, and found it to be 8° and 20 min. East. I therefore adjust my compass to that variation, and commence at the corner to Sections 1, 6, 31 and 36, of Townships 20 and 21 Norh, of Ranges 6 and 7 East of the 4th principal meridian, which agrees with the description furnished me by the Surveyor's Office, viz:—A post, from which a white oak, 6 inches diameter, bears S. 67° East, 372 links; a hickory, 14 inches diameter, bears North 25° East, 13 links; and a white oak, 13 inches diameter, (stated to be 11 in the description furnished me) bears North 62° West, 135 links. The other witness tree (an ash, 16 inches diameter) has fallen down; I therefore mark, with the proper number of Section, Township and range, a black walnut, 24 inches diameter, which bears South 83° West, 127 links distant, and run from said Township corner.

[41.]

East Boundaries of Townships.

North Chains	
	Along the East boundary of Section 36, Township 21, North of the base line, Range 6 East of the 4th principal meridian.
14.70	A brook, 25 links wide, with a rapid current, runs southwesterly about 10 chains, then turns to the N. W.
27.60	Left the creek bottom, and entered hills.
29.40	A white oak, 15 inches diameter.
33.70	A hickory, 24 inches diameter.
40.00	Set a quarter Section corner post on the top of a ridge, bearing northeasterly and south-westerly; from which post, a white oak, 24 inches diameter, bears S. 28° W. 197 links, and a poplar, 18 inches diameter, bears N. 56° W., 14 links distant.
49.07	A white oak, 8 inches diameter.
64.08	A walnut, 36 inches diameter.
80.00	Set a post, corner to Sections 25 and 36, from which a hickory, 17 inches diameter, bears South 57° West, 127 links; and a white oak, 13 inches diameter, bears North 23° West, 72 links distant. Land, too hilly and broken for cultivation, although the soil is rich; timber, hickory, white oak and walnut; undergrowth, pawpaw and spice.

[42.]

North Chains	
	Along the East boundary of Section 25, Township 21 North, Range 6 East of the 4th principal meridian.
13.80	Left the hills, and entered river bottom.
14.90	A burr oak, 36 inches diameter.
40.00	Set a quarter Section corner post, from which an elm, 13 inches

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	diameter, bears north 85° West, 18 links, and a pin oak, 12 inches diameter, bears South 74° West, 39 links distant.
49.50	An impassable swamp. Set a post, from which a hickory, 12 inches diameter, bears South 76° West, 18 links; and a white oak, 13 inches diameter, bears South 85° East, 14 links. This swamp lies mostly West of the line; it extends in a southwesterly direction about 25.00 chains. Offset around said swamp, as follows, viz:
	East 4.50 chains,
	North 7.60 chains,
	East 6.70 chains,
	North 8.50 chains,
	West 7.50 chains,
	North 3.20 chains,
	West 3.70 chains—regained the line on the East boundary of Section 25, Township 21 North, Range 6 East, in advance of the swamp; I therefore run South 3.72 chains and intersected the North-west margin of the swamp, where set a post, from which an ash, 12 inches diameter, bears North 17° West, 18 links, and an elm, 13 inches diameter, bears North 12° East, 45 links distant. Thence continued the line North along the East boundary of Section 25, Township 21, North, Range 6 East; counting the distances from the corner of Sections 25 and 36, the distance across the swamp, on the line, being 15.58 chains.
72.54	A white oak, 18 inches diameter.
80.00	Set a post, corner to sections 24 and 25, from which a white oak, 18 inches diameter, bears South 18° West 32 links; and a gum, 24 inches diameter, bears North 27° West, 34 links distant. The land is low, wet bottom, unfit for cultivation; generally subject to overflow from 7 to 10 feet, as appears by the water marks on the trees, and as I am informed by H_____J_____, who lives in the vicinity thereof. Timber, gum, swamp maple and pine oak; undergrowth, spice, vines and green briars.
	September 28, 1832.
	Proceed in a similar manner along the East boundary of Sections 24, 13 and 12; then along the East boundary of Section 1, as follows, viz:

[43.]

North Chains	
	Along the East bounday of Section 1, Township 21, North Range 6 East of the 4th principal meridian.
17.52	A road between Holmin's Ferry to the South-west, and Princeton to the North-east.
18.76	A white oak, 16 inches diameter.
19.75	A creek, generally called White Water, but by some Crooked Creek, 200 links wide, runs North-east—gentle current, not

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	navigable. This creek is crossed by the road noted above, at about 5 chains to the South-west.
32.50	A hickory, 15 inches diameter.
33.00	Left the timber and entered prairie—bears South-east and North-west.
40.00	Raised a mound, in which set a post for quarter section corner.
59.32	Left the prairie and entered timber—bears North-east and South-west.
63.73	A white walnut, 16 inches diameter.
80.00	Set a post, corner to Sections 1, 6, 31 and 36, of Townships 21 and 22 North, Ranges 6 and 7 East of the 4th principal meridian, from which a hickory, 17 inches diameter, bears South 56° East, 18 links; a white oak, 24 inches diameter, bears North 77° East, 36 links; a white oak 14 inches diameter, bears North 27½° West, 35 links and a black Walnut, 24 inches diameter, bears South 75° west, 137 links distant. Land moderately rolling; soil good and fit for cultivation; timber, white oak, black oak, hickory and walnut; undergrowth, sassafras and hazel.
	September 29, 1832.

[44.]

Random Township Lines.

	Suppose that the corner to Townships 21 and 22 North, of Range 5 and 6 East, had been established, you would then proceed as follows:—Measuring chain compared with the standard Chain and found to be correct.
West Chains	On a random line along the south boundary of Section 36, Township 22 North, Range 6 East of the 4th principal meridian.
40.00	Set a temporary quarter Section corner post.
80.00	Set a post for temporary corner to Section 35 and 36.—[*See Article* 74 *and* 78.]
West Chains	On a random line, along the south boundary of Section 35, Township 22 North, Range 6 East of the 4th principal meridian.
21.00	A remarkable fine spring, about 30 links to the North, runs North-easterly.
40.00	Set a temporary quarter Section corner post.
69.00	A quarry of excellent lime stone.
80.00	Set a post for temporary corner to Sections 34 and 35.
	September 30, 1832.

[45.]

	Continue in this manner along the South boundary of Sections 34, 33 and 32, and then run
	On a random line, along the South boundary of Section 31,

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West Chains	
	Township 22 North, Range 6 East of the 4th principal meridian.
00.57	The South-east bank of a navigable lake, which lies mostly to the North of the line, it being about two miles in a

North-eastern direction to the northern end thereof; I therefore off-set around the South end, as follows, viz:
South 10.00 chains,
West 15.00 chains,
South 11.00 chains,
West 12.00 chains,
North 21.00 chains, regained the random line along the South boundary of Section 31, in advance of the lake, and continue West, counting the distances from the temporary corner post to Sections 31 and 32.

40.00 Set a temporary quarter Section corner post.

64.00 A coal bed, in the West bank of Bear Grass creek, which is 40 links wide and runs South.

82.75 Intersected the Range line 326 links South of the corner to Sections 1, 6, 31 and 36, of Townships 21 and 22 North, Ranges 5 and 6 East.

[46.]

True Lines of Townships.

East Chains Then, from said Township corner, run
On a true line along the South boundary of Section 31, Township 22 North, Range 6 East of the 4th principal meridian.

00.32 A branch, 7 links wide, runs South-east.

17.50 A white oak, 18 inches diameter.

18.00 Bear Grass creek runs South.

33.75 A hickory, 12 inches diameter.

42.75 Set a quarter Section corner post, from which a persimmon, 12 inches diameter, bears N. 26° W., 163 links, and a white oak, 24 inches diameter, bears N. 42° E., 18 links distant.—[*See Article* 75.]

57.60 Intersected the North-west bank of the navigable lake, (noted on the random line,) where set a post, corner to fractional Sections 6 and 31, of Townships 21 and 22 North, Range 6 East, from which post a hackberry, 18 inches diameter, bears N. 23° W., 18 links; and a white oak, 15 inches diameter, bears S. 65° W., 8 links.
Thence offset around the lake as follows, viz:
West 4.00 chains wth the marked line on the South boundary of Section 31.
South 16.00
East 28.00—parallel to the South boundary—
North 16.00 chains, regained the true line on the South boundary of Section 31, 25 links East of the South-east margin of the lake; I therefore blazed the line back,
West 25 links

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to the South east bank of the lake, where set a post for corner to fractional Sections 6 and 31, Townships 21 and 22 North, Range 6 East, 81.35 chains East of the corner to Townships 21 and 22 North, Ranges 5 and 6 East. From said post, a hickory 12 inches diameter, bears north 23° E., 13 links; and an elm, 14 inches diameter, bears South 27° East 54 links distant.
Then continue the line East along the South boundary of Section 31, counting the distances from the Township corner.

81.90 A burr-oak, 48 inches diameter.

82.75 Set a post for corner to Sections 31 and 32, from which a sycamore, 18 inches diameter, bears north 25° East, 32 links; and a white oak, 18 inches diameter, bears North 28° West, 13 links distant. Land, level and wet; soil, poor, not fit for cultivation; timber, white oak, burr-oak and sycamore.

September 31, 1832.

[47.]

Continue in this manner along the south boundaries of Sections 32, 33, 34 and 35, and then run

East Chains

14.50 On a true line along the South boundary of Section 36, Township 22 North, Range 6 East of the 4th principal meridian.
Entered a field of about 40 acres, bearing North-east and

20.17 South-West; it lies mostly south of the line.
A spring branch runs South-East, and empties into a creek in about 10 chains.
The spring is about 5 chains in the North-western

30.00 direction, and is outside the field.

33.09 Left the field, bearing North-East and South-West.

40.00 A white oak, 28 inches diameter.
Set a post for quarter Section corner, from which a

Chains

42.10 hickory, 17 inches diameter, bears North 18° West, 14 links and a white oak, 15 inches diameter, bears North 27° East, 42 links distant.
A creek, 50 links wide, runs North 80° East; the current is rapid. About 5 chains up stream, in a South-westerly direction, is a mill seat, there being rock on both banks,

47.20 and a fall of of about 50 feet in 20.00 chains.

59.60 Diggings for lead, called New Design.

5.82 A smelting furnace, owned by J_____ H_____
A wagon road, leading from Kingston and Holmes' Ferry

80.00 to Galena, bears North-west and South-east.
The corner to Townships 21 and 22 North, Ranges 6 and 7 East.
Land, rolling; soil good, and fit for cultivation; timber hickory, walnut and white oak; undergrowth, briers and hazel.

October 1, 1832.

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[48.]

Subdivision Lines.

Form of Field Notes in sub-dividing a Township (say Township 21 North, Range 6 East of the principal meridian,) after the outlines shall have been surveyed.
A. B., Hind chain-man.
C. D., Fore chain-man.
E. F., Flag or fore vane-man.
G. H., Axe-man.
Measuring chain compared with the standard chain, and adjusted thereto, it having been found 1-4 of an inch too long. Last night (14th of April, 1845) about 20.00 chains North-west of the corner to Townships 20 and 21 North, Ranges 6 and 7 East, I ascertained the variation of the needle, by polar observations, to be 8° 35 min. E; I therefore adjust my compass at that variation; and, to determine the course of the East boundary of the township, commence at the corner of Townships 20 and 21 North, Ranges 6 and 7 East, and run—Thence North on a blank line; at 40.04 chains, fell 15 links West of the quarter Section corner; at 79.96 chains, fell 36 links West of the corner to Sections 25 and 36, Township 21 North, Range 6 East; then from said corner to Sections 25 and 36, run North (on the blank line,) 39.97 chains, fell 18 links West of the quarter Section corner; 80.05 chains fell 37 links West of the corners to Sections 24 and 25,—therefore, to run parallel to said East boundary of Township 21 North, Range 6 East, I adjust my compass to a variation of 8° 20 min. East; which is 15 minutes less than the true variation, and commence at the corner to Sections 35 and 36, on the South boundary of the Township, and run—Thence

[49.]

North Chains

17.62 Between Sections 35 and 36, Township 21 North, Range 6 East of the 4th principal meridian.

27.60 A sugar maple, 18 inches diameter.
A creek, called White Oak creek, 40 links wide, gentle
40.00 current, runs North-west.
Set a post for quarter Section corner, from which a Walnut, 20 inches diameter, bears South 16° East, 18 links; and a white oak, 18 inches diameter, bears North
40.32 23° West, 184 links.—[*See Article* 76.]
47.50 Entered river bottom; bears E. and W.
The right bank of White river, a navigable stream, at an Eastern bend thereof, runs North. Set a post, corner to fractional sections 35 and 36, from which a white oak, 18 inches diameter, bears South 25° W., 18 links; and a hickory, 17 inches diameter, bears South 15° East, 39 links distant. The line will run down the river, and leave it again on the

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right side, without crossing over to the left; I, therefore, meander down stream on the right bank of said river, along fractional Section 36, from the before described corner of fractional Sections 35 and 36, as follows, viz:

N. 27° E. 16.00 chains,
N. 14° E. 4.00 chains,
N. 3° W 2.00 chains,
N. 39° W. 12.93 chains,—regained the line between Sections 35 and 36, on the right bank of White river, where set a post, corner of fractional Sections 35 and 36, of Township 21 North, Range 6 East of the 4th principal meridian, from which a burr oak, 10 inches diameter, bears South 85° East, 27 links, and a hickory, 18 inches diameter, bears North 27° West, 134 links distant. This corner is 77.79, chains North of the corner to Sections 35 and 36, on the South boundary of the Township. The river here runs north-westerly. I continue the line North between Sections 35 and 36, counting the distances from the corner on the South boundary of the
80.00 Township.
Set a post, corner to Sections 25, 26, 35 and 36, from which a white oak, 14 inches diameter, bears North 17° East, 18 links; a white oak, 12 inches diameter, bears South 25° West, 13 links, and a walnut, 14 inches diameter, bears South 58° East, 32 links distant. There is no tree within a reasonable distance in Section 26.

[50.]

East
Chains
40.00 On a random line, between Sections 25 and 36, Township 21
80.18 North, Range 6 East of the 4th principal meridian.
Set a temporary quarter Section corner post.
West Intersected the East boundary of the Township 37 links
Chains South of the corner to Sections 25 and 36, from which corner I run.
17.60 On a true line between Sections 25 and 36[1], Township 21
20.40 North, Range 6 East of the 4th principal meridian.
40.09 A white oak, 15 inches diameter.
A branch, 26 links wide, runs South-west.
Set a quarter section corner post, from which a pine, 17 inches diameter, bears South 32° East, 49 links; and a
40.15 pine, 27 inches diameter, bears North 42° West, 132 links distant.—[*See Article* 77 *and* 78.]

1. When the Notes of a TRUE East and West SUBDIVISION line follow IMMEDIATELY AFTER those of the random line, between the same Sections, as in the above case of the line between Sections 25 and 36, you MAY leave out the Township, Range and Meridian, in the Notes of the TRUE LINE, and instead of which, write after the words, "from which corner I run."

65.17 Left hills and entered bottom; bears North-west and South-east.
80.18 A walnut, 36 inches diameter.
The corner to Sections 25, 26, 35 and 36.
April 15, 1833.

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[51.]

West On a true line between said Sections 25 and 36.

[52.]

North
Chains Between Sections 25 and 26, Township 21 North, Range 6
27.62 East of the 4th principal meridian.
29.34 A white oak, 12 inches diameter.
Intersected the right and Southerly bank of White river, a navigable stream; runs Easterly. Set a post, corner of fractional Sections 25 and 26, from which a burr oak, 17 inches diameter, bears South 17° East, 30 links, and a black oak, 13 inches diameter, bears South 25° West, 142 links distant. Sent my flag-man over the river, and caused the flag to be set on the left bank thereof, on the line between Sections 25 and 26; I then offset from the before described corner to fractional sections 25 and 26 West, 5.00 chains, to a point from which the flag, set as before said, on the left bank of the river, and on the line between Sections 25 and 26, bears North 24° East, making the distance across the river 11.23 chains; therefore, at (29.34 more 11.23) equal to.
40.57 Set a post on the left and North bank of White river, for corner to fractional Sections 25 and 26, from which a hickory 13 inches diameter, bears North 65° East, 125 links; and a white oak, 17 inches diameter, bears North 72 degrees West, 19 links distant. The place of the quarter Section corner is in the river; it cannot therefore be established.
74.39 A black oak, 14 inches diameter.
79.16 A black oak, 14 inches diameter.
80.00 Set a post, corner of Sections 23, 24, 25 and 26, from which a white oak, 17 inches diameter, bears North 23° West, 27 links; a black oak, 14 inches diameter, bears North 62° East, 113 links; and a black oak 14 inches diameter, bears South 36° East, 39 links. There is no tree within a reasonable distance in Section 26.

[53.]

East On a random line, between Sections 24 and 25, Township 21
Chains North, Range 6 East of the 4th principal meridian.
21.32 Intersected the left bank of White river, a navigable water course; runs north-easterly; set a post corner of fractional Sections 24 and 25, from which a hickory, 17 inches diameter, bears South 39 West, 18 links; and a white oak, 18 inches diameter, bears North 85° West, 132 links distant.
Not knowing that this line would intersect a navigable stream, when I commenced the survey thereof, I run it on a random line; I therefore, from this fractional Section corner, run and blazed.

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[54.]

West On a true line between Sections 24 and 25, Township 21 N.,
Chains Range 6 East.
4.06 A black oak, 13 inches diameter.
21.32 The corner of Sections 23, 24, 25 and 26.
April 16, 1833.

[55.]

Measuring chain compared with the standard chain and found to be 1 inch too long; made it of the proper length, and commenced at the corner of Sections 24 and 25, on the East boundary of the Township, and run—Thence

West On a true line, between said Sections 24 and 25, Township
Chains 21 North, Range 6 East of the 4th principal meridian.
17.60 A white oak, 8 inches diameter.
32.40 A brook, 15 links wide, runs South-west.
40.00 Set a post for quarter Section corner, from which a white oak, 13 inches diameter, bears North 32° West, 18 links; and a black oak, 15 inches diameter, bears South 35° East, 14 links distant.
45.38 Intersected the right and South-easterly bank of White river, which runs North-easterly; set a post, corner to fractional Sections 21 and 25, from which a white oak, 14 inches diameter, bears North 80° East, 17 links; and an elm, 14 inches diameter, bears South 17° East, 45 links distant. The post, corner to fractional Sections 24 and 25, established on the left bank of Whiteriver, at 21.32 chains East of the corner to Sections 23, 24, 25 and 26, [See Article 53 of this book,] bears South 87 1-4° West; I then run South 65 links to a point from which the aforesaid post, corner to fractional Sections 24 and 25, on the left Bank of White river, bears West. Section 25, therefore, closes within the limits specified in my instructions.

[56.]

North Between Sections 23 and 24, Township 21 North, Range 6
Chains East of the 4th principal meridian.
0.62 Left bottom and entered upland.
3.20 Entered prairie, bears N. E. and S. W.
40.00 Raised a mound, in which set a quarter Section corner post.
62.00 A branch 6 links wide, runs East.
80.00 Deposited 2 quarts of charcoal, 3 inches below the natural surface of the earth, and over said charcoal erected a mound, in which set a post, corner to sections 13, 14, 23 and 24.

[57.]

East On a true line, between Sections 13 and 24, Township 21

-Page 22-

Chains North, Range 6 East of the 4th principal meridian.
7.00 Left the prairie and entered timbered land.
29.35 Intersected the left bank of White river, (runs northeasterly;) set a post, corner of fractional Sections 13 and 24, from which a white oak, 18 inches diameter, bears South 17° West, 183 links; and a hickory, 18 inches diameter, bears North 74° West, 14 links distant.
I then commence at the corner of Sections 13 24, on the East boundary of the Township, and run thence.

[58.]

West On a true line between said Sections 13 and 24, Township 21
Chains North, Range 6 East of the 4th principal meridian.
17.84 Intersected the left bank of White river; runs South-east. Set a post, corner to fractional Sections 13 and 24, from which an elm, 8 inches diameter, bears South 42° East, 18 links; and a gum, 13 inches diameter, bears North 46° 15 min. East, 73 links. Determined the distance across the river by causing my flag to be set on the opposite or right bank thereof, due west from this corner, on the line between Sections 13 and 24, and runs South 3.78 chains to a point under the bank of the river; from which the flag, set as aforesaid on the opposite, bank, bears North 73 1-2° West, which gives 12.76 chains the distance across the river West from the post, corner of fractional Sections 13 and 24, on the left bank, 17.84 chains West of the corner on the East, boundary of the Township; therefore, at 17.84 more 12.76 chains, equal to
30.60 West of the aforesaid corner to Sections 13 and 24, on the East boundary of the Township, set a post, corner to fractional Sections 13 and 24, Township 21 North, Range 6 East, on the right bank of White river, from which a white oak, 16 inches diameter, bears North 57° West, 19 links; and a hickory 15 inches diameter, bears South 69° West, 13
37.54 links. Intersected the right bank of White river, runs North-east, where set a post, corner to fractional Sections 13 and 24, from which a red elm, 18 inches diameter, bears South 16° East, 79 links; a pin-oak, 15 inches diameter, bears North 87° East, 19 links. From this corner, the corner to fractional Sections 13 and 24, on the left bank of white river, 29.35 chains East of the corner to Sections 13, 14, 23 and 24, bears South 87° West—I run thence South 72 links to a point from which the aforesaid corner of fractional Sections 13 and 24, on the left bank of of the river, bears West. Section 24, therefore, closes within the prescribed limits.

[59.]

North Between Sections 13 and 14, Township 21 North, Range 6
Chains East of the 4th principal meridian.

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00.16 Entered prairie.
40.00 Raised a mound, in which set a post for quarter Section corner.
80.00 Placed three lime stones in the ground, the top of the uppermost one 4 inches below the natural surface thereof; and the other two, successively, and immediately below it. The upper stone is 8 inches long, 6 inches wide at one end, 5 inches wide at the other end, and 3 1-4 inches thick; the stone next below it, is 5 inches square and 4 thick; and the lowermost stone is 6 inches square and 3 inches thick; over said stones raised a mound, in which set a post corner to Sections 11, 12, 13 and 14.

April 17, 1833.

A. B., Hind chain-man.
C. D. Fore chain-man.

[60.]

A. B. quits work on account of sickness—I have supplied his place with C. D., my former fore chain-man, and employed J. K. as fore chain-man.
[J. K.'s oath to be entered here.]

[61.]

Proceeded in this manner between Sections 12 and 13, 11 and 12, and 1 and 12;—Then run

North Between Sections 1 and 2, Township 21 North, Range 6 East
Chains of the 4th principal meridian.
40.00 Raised mound, in which set a post for quarter Section corner. Left prairie and entered timber.
49.50 A creek 50 links wide, not navigable, runs North-east;
62.00 rapid current.
Intersected the South boundary of township 22 North, Range
80.79 6 East, 37 links West of the corner to Sections 35 and 36; and at said intersection set a post, corner to sections 1 and 2, Township 21 North, Range 6 East, from which a white oak, 14 inches diameter, bears South 26° East, 14 links, and a hickory, 13 inches diameter, bears South 42° West,

April 18, 1833.

[62.]

North
Chains
40.00 Between Sections 34 and 35, Township 21 North, Range 6 East of the 4th principal meridian.
Raised a mound, in which set a post for quarter Section corner.
80.00 Set a lime stone, which is 16 inches long, 14 inches wide at one end, 12 inches wide at the other end, and 4 inches thick,

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with the widest end 10 inches in the ground, for corner to Sections 26, 27, 34 and 35.

[63.]

East
Chains
40.00 On a true line between Sections 26 and 35, of Township 21 North, Range 6 East of the 4th principal meridian.
Raised a mound, in which set a post for quarter Section corner.
46.17 Left the prairie and upland, and entered timbered bottom land.
60.32 Intersected the left bank of White river, which runs North-west, where set a post for corner to fractional Sections 26 and 35, from which a hickory, 17 inches diameter, bears South 65° West, 13 links; and a black walnut, 16 inches diameter, bear, North 72° West, 142 links distant.

[64.]

Then commence at the corner to Sections 25, 26, 35 and 36° and run

West
Chains
5.61 On a true line, between Sections 26 and 35, Township 21 North, Range 6 East of the 4th principal meridian.
Intersected the right and easterly bank of White river, at said intersection set a post, corner to fractional Sections 26 and 35, from which an elm, 18 inches diameter, bears South 85° East, 13 links; and a white oak, 14 inches diameter, bears North 27° East, 14 links distant. Search for the corner of fractional Sections 26 and 35, on the opposite bank of the river, and find it to be at least 5 chains further South than the before described corner to the fractions of said Sections 26 and 35 on the right bank. Section 35 does not close within the limits specified in my instructions. I therefore proceed forthwith to ascertain in what line or lines the error was committed, and to make the required correction: As the line between Sections 25 and 36 closed within the proper limits, the presumption is that the error is in the line between Sections 34 and 35. I commence at the corner to said Sections, on the South boundary of the Township, and run—Thence.

[65.]

North
Chains
With the line already surveyed between Sections 34 and 35, Township 21 North, Range 6 East of the 4th principal meridian, [See Article 62 of this book.]
40.13 The quarter section corner. There is no error, therefore, in this half mile, the 13 links being not more than a reasonable difference in measurement; so I continue the line north, and count the distance from the corner on the South boundary of the Township, adopting 40.00 chains as the length of that part of the line which lies South of the quarter Section corner.

-Page 25-

The corner established by me for sections 26, 27, 34 and 35. I therefore remove the stone, corner to said Sections, and at

74.65
80.00 Set it for the corner to Sections 26, 27, 34 and 35, said stone being as described in Art. 62, viz: 16 inches long, 14 inches wide at one end, 12 inches wide at the other end, and 4 inches thick, and is set with the widest end 10 inches in the ground.

[66.]

Then run

East
Chains
40.00 On a true line between Sections 26 and 35, Township 21 North, Range 6 East of the 4th principal meridian.
Raised a mound, in which set a post for quarter Section corner; then go to the quarter Section corner established by me on the line erroneously surveyed between Sections 26 and 35, and described on page 21 of this book, and destroy it by leveling the mound and removing the post, and return to the above described quarter Section corner, and continue the line East between Sections 26 and 35, counting the distances from the corner to Sections 26, 27, 34 and 35.
49.57 Entered timber.
61.17 Intersected the left andwesterly bank of White river, *(establish the corner and make the connection with the opposite corner.)*—Then destroy the corner to fractional Sections 26 and 35, established by me on the left bank of White river, at the intersection therewith of the erroneous line between said Sections 26 and 35 described on page 21 of this book, by removing the post and defacing the marks on the witness trees.

[67.]

Between Sections 26 and 27, Township 21 North, Range 6 East of the 4th principal meridian.

North
Chains
40.00 Raised a mound, in which set a post for quarter Section corner.
80.00 The middle of a ravine, which runs South-west. I therefore select the most suitable plot of ground in the vicinity, and deposit three quarts of charcoal, 4 inches below the natural surface of the ground, and over it erect a mound, in which set a post as a witness point to the corner of Sections 22, 23, 25 and 27; said witness point bears North 26° West 144 links from the true place of said corner to said Sections

April 19, 1833.

[68.]

Continue in this manner until you get to the Western range of Sections, and after having established the corner to Sections 29, 30, 31 and 32, run

West
Chains
On a true line between Sections 30 and 31, Township 21 North, Range 6 East of the 4th principal meridian.

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72.00 Raised a mound, in which set a post for quarter Section corner.
80.42 Entered timber—bears North-east and South-west.
Intersected the East boundary of Township 21 North, Range 5 East, 62 links South of the corner to Sections 25 and 36, and at said intersection set a post, corner to Sections 30 and 31, Township 21 North, Range 6 East, from which a burr oak, 17 inches diameter, bears South 25° East, 18 links, and a white oak, 17 inches diameter, bears North 27° East, 184 links distant.

April 27, 1833.

[69.]

In running East and West RANDOM LINES, in the INTERIOR of a Township, where there are not navigable streams, or other obstructions:—Supposing for example

	the line between Sections 27 and 34—your notes will be kept as follows:
East Chains	
40.00	On a random line between Sections 27 and 34, Township 21
79.92	North, Range 6 East of the 4th principal meridian.
	Set a temporary post.
	To a point 32 links North of the corner to Sections 26, 27, 34 and 35, from which corner I run, &c.

[70.]

[Form of keeping Field Notes of the meanders of a navigable river, or other water course.]

Commence at the corner to fractional Sections 25 and 26, Township 21 North of the base line, Range 6 East of the 4th principal meridian, on the right and south-easterly bank of White river, and run thence down stream, with the meanders of the right bank of said river, along fractional section 25, Township 21 North, Range 6 East, as follows:

Chains

N. 36° E., 14.00—Thence

N. 25° E., 17.20 to the mouth of a spring branch, 6 links wide, comes from the South-east—Thence

N. 40° E., 30.00—Thence

N. 18° E., 00.40—To the corner of fractional Sections 24 and 25, on the right bank of White river.

Land, high, rich bottom, fit for cultivation; timber, walnut, cherry and white oak; undergrowth, spicewood and vines.

Thence from said corner to fractional sections 24 and 25, down stream with the meanders of the right and south-easterly bank of White river, along fractional Section 24, Township 21 North, Range 6 East of the 4th principal meridian, as follows:

Chains.

N. 13° E., 5.00; Thence

N. 3° E., 48.00; Thence

N. 9° E., 27.53; To the corner of fractional Sections 13 and

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24, on the right bank of White river, and 37.54 chains West of the corner on the East boundary of the Township.

Land, high, rich bottom, fit for cultivation; timber, walnut, cherry and white oak; undergrowths spicewood and vines.

In all cases where there are two or more fractional corners of like denomination on the same bank of a river, distinguish them in your meandering notes, by stating their course and distance from the proper Section corner.

Your Field Book, containing your original notes, will be signed by each of your chain-men, axe-men, and flag-men, and they, and the copies thereof, will be certified by yourself, the certificate to be in conformity with the requirements of your contract, which will be according to the following form, or to so many of the facts therein stated as may be applicable.

[71.]

[Form of certificate for your original Field Notes.]

I certify, that the foregoing notes on pages 1 to 362, inclusive, are the original Field Notes of the survey of [*here state the surveys described on said pages*] as executed by me in the months of _____ 184__, under my contract with, and instructions from _____, Surveyor of Public Lands in Illinois and Missouri, bearing date the _____ day of _____ 184__. And I do further certify, that the marks, descriptions, courses, and distances, specified in said notes, are correct, and also that the said notes were all set down at the time when, and in the order in which, the work was performed on the ground; that each of the witness trees to Township and Section corners was marked with a blaze and notch facing the corner post; that the notch on each tree was at the lower end of the blaze; that the blaze was neatly made; and that there was marked, in a plain, distinct and permanent manner, with a marking iron, on the blaze of each witness tree, and above the notch, the letter S, with the number of the Section; and over it the letter T, with the number of the Township; and over this the letter R., with the number of the Range, in which the said trees respectively stand; that each Section and Township corner post was inserted two feet in a hole dug in the ground, and that they were securely rammed in with earth, and also with stone, when convenient; that the said posts were of the most durable wood that could be had in the vicinity; that the Township corner posts were 5, and the Section corner posts 4 inches diameter; that they were neatly squared at the top, and placed with the corners to the cardinal points, and that the several sides were marked with the number of the Section which they faced; also, that the corners of Township corner posts were marked with 6 notches each; that two of the corners of Section corner posts on Township boundary lines, were marked with as many notches, facing the proper cardinal points, as said posts are miles from the nearest Township corners; and that the corners of the Section posts, in the interior of a Township, were marked with as many notches as the posts stand miles from the Township boundaries; that the witness trees to quarter Section corners were marked with a

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blaze and notch facing the post; and that 1-4 S. was marked on the blaze above the notch; and also, that 1-4 S. was marked on each corner post, and that the posts were at least three inches diameter, and placed firmly in the ground. That the mounds were reveted or faced with sod, laid horizontally and in successive layers on each other, each layer having an offset inwards, corresponding to the general slope of the face of the mound; and that the mounds at Township corners were 5 feet square at the base, 2 feet square at the top, and 3 feet high; that the mounds, at Section corners were 4 feet square at the base, 2 feet square at the top, and 2 feet 6 inches high; and that the mounds at quarter Section corner, were 3 feet 6 inches square at the base, 1 foot 6 inches square at the top, and 2 feet high. That where stones were used for corners, they were, in all cases, inserted endways in the ground, to the depth of 7 or 8 inches, with their edges North and South, on

the North and South lines; and East and West, on East and West lines. That the said stones were marked in a plain and distinct manner, with a pick (or chisel) as follows: Township corner stones, each with 6 notches on each side and edge; Section corner stones on Range and Township lines, with as many notches on the edges as they stand Sections distant from the nearest Township corners, Section corner stones in the interior of a Township, with as many notches on South edges and East sides, as they stand Sections distant from the South and East boundaries of the Township. Stones at the corners of subdivisional intersections with the North boundary of a Township, with 6 notches on the South edge. At the subdivisional intersections with the West boundary of a Township, with 6 notches on the East edge. The side stones at the aforesaid intersections, with both the North and West boundaries, were also marked with as many notches on the East or South sides as they stand Sections from the N. E. or South W. corners of the Township. That each of the quarter Section corner stones were marked "1-4" on the West side, on North and South lines, and on the North side on East and West lines.

And if there are any exceptions on account of re-surveys, or corrections, or any other cause whatever, they must be intelligibly and accurately specified in the proper place of the certificate.

The certificate to the copy will be similar to that to the original, with the necessary variation; such as, I certify, that the foregoing notes on page 1 to 375 inclusive, are correctly transcribed from the original Field Notes, &c.

[72.]

The foregoing instructions are (with the exception of the numbering of, and the captions to, the several Articles) copied from the "General Instructions to Deputy Surveyors," issued by the Surveyor General of Illinois and Missouri, in the year 1841. The following are in addition thereto, and may be adopted hereafter as the form of keeping Field Notes of surveys, executed under the authority of this office, whenever found convenient.

At the head of each page of your Field Book you will enter the number

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of the Township and range in which the surveys are made, and also the number of the Meridian, in the following manner:—

[73.]

East boundary of Township 21, North of the base line of Range 6 East of the 4th principal meridian.

North Chains	Along the East boundary of Section 36, At a variation 7° 35 East.
14.70	A branch 25 links wide, rapid current runs south-westerly for about 10.00 chains, then turns to the North-west.
27.60	Leave the creek bottom and ascend a rocky bluff; bears North-east and South 25° West.
29.40	A white oak, 15 inches diameter.
33.70	A hickory, 24 inches diameter, on the top of the bluff.
35.45	An Indian mound, about 50 links long, 30 links wide, and 25 links in height, with the large trees growing over it.
40.00	Set a post for quarter Section corner. Bearings { A white oak, 24 in. di. bears S. 28° W. 197 links. A poplar, 18 in. di. bears N. 56° W. 14 links.
49.07	A white oak, 8 inches diameter.
64.08	A black walnut, 36 inches diameter.
80.00	Set a post for corner to Sections 25 and 36. Bearings { A hickory, 17 in. di. bears S. 57° W. 127 links. A white oak, 13 in. di. bears N. 23° W. 72 links.
	Here describe the land, timber and undergrowth, in the same manner as in Article 41. Then continue along the East boundaries of Sections 25, 24, 3, 12, and 1, and establish the corner to Townships 21 and 22 North, Ranges 6 and 7 East, in the usual way.

[74.]

The South boundary of Township 22 North, Range 6 East of 4th principal meridian.

West Chains	On a random line, along the South boundary of Section 36— At a variation of 7° 35 min. East.
40.00	Set a post for temporary quarter Section corner.
80.00	Set a post for temporary corner to Sections 35 and 36.
	Then continue the random line in the same manner pointed out in Article 44 and 45, except that the water courses, ponds, and swamps, &c., &c. (see Article 34) are to be noted only on

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the true line. The land, timber and undergrowth is to be described at the end of each mile of the *true* line.
After connecting the random line along the South boundary of Section 31 with the Tonwship corner, you will calculate the true bearing of the South boundary of the Township, and adjust your compass thereto, and commence at said Township corner, and run—Thence

[75.]

East Chains	On a true line, along the South boundary of Section 31, At a variation of 7° 12 min. East.—[*See Article* 46.]
10.50	A pond, about 3.00 chains diameter, cross about the middle.
28.25	A coal bed in the West bank of a creek, 40 links wide, runs South.
36.20	Leave bottom and ascend a steep hill; bears North and South.
42.75	Set a post for quarter Section corner. Bearings { A black oak, 15 in. di. bears N. 27° W. 62 links. A hickory, 18 in. di. bears N. 40° E. 53 links
50.20	A hackberry, 24 inches diameter.
61.80	A branch, 10 links wide, runs south-east.
82.75	Set a post for corner to Sections 31 and 32. Bearings { A burr oak, 36 in. di. bears N. 47° W. 22 links. An ash, 14 in. di. bears N. 17° E. 43 links.
	Land, 36.50 chains West, part level rich bottom, some parts rather wet, not subject to inundation, and the most of it fit for cultivation. Timber, burr oak, black walnut and pin oak. Undergrowth, spice, prickly ash and vines. Upland, rolling and broken, too poor for cultivation. Timber, post oak, black jack and hickory; no undergrowth. Then continue the true line along the South boundary of Sections 32, 33, 34, 35 and 36, establishing quarter Section and Section corners at every 40.00 chains.

[76.]

Subdivision of Townships.

	Township 21 north of the base line, Range 6 East of the 4th principal meridian.
North 17.62	Between Sections 35 and 36—at a variation of 7° 35 East. A sugar maple, 28 inches diameter.
	-Page 31-
27.60	White Oak creek, 40 links wide, gentle current, runs North-west.
40.00	Set a post for quarter Section corner.
	Bearings { Black walnut, 20 in. di. bears S. 16° E. 18 links. Honey locust, 16 in. di. bears N. 23° W. 184 links.
55.30	A white walnut, 14inches diameter.
80.00	Set a post, corner to Sections 25, 26, 35 and 36.
	Bearings { A sugar maple, 26 in. di. bears S. 40° E. 27 links. A hickory, 12 in. di. bears N. 27° E. 41 links. A black oak, 20 in. di. bears N. 62° W. 110 lks. A black walnut 16 in. di. bears S. 53° W. 81 lks. [*See Article* 49.]
	[Here describe the land, timber and undergrowth.]
	[77.]
East Chains	On a random line, between Sections 25 and 36. At a variation of 7° 35 min. East. Then proceeded as directed in Article 50, except that in describing the quarter Section corner (if in timber) you will describe the bearing or witness trees, as follows: Bearings { A pine, 17 inches di. bears S. 32° E. 40 links. A pine, 27 inches di. bears N. 42° W. 132 links And after closing the true line to the Section corner, you will describe the land, timber and undergrowth.

[78.]

Field Notes of Township lines.

On East and West Township lines, and on East and West subdivision lines, the distances to water courses, the points at which you enter or leave timber or prairie, swamps, ponds, or other objects which are required to be noted in your Field Book, are to be noted *only* on the true lines; you will, however, in running the random line, give the distances to the temporary Section and quarter Section posts—the length of each line, and falling from the corner run for.

[79.]

At the top of each page of your Field Book of Township boundaries you will describe the line which you are surveying, or about to run, as in Articles 73 and 74; after which the Township, Range, and meridian, need not be repeated on that page, unless the Township corner which you run from, or close on, are to be particularly described.

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[80.]

Field Notes of Subdivision Lines.

In your Field Notes of subdivisions, you will give the Township, Range, and meridian, at the top of the page, as in Article 76, after which they need not be repeated on that page.

[81.]

Copies of Field Notes.

If your original Field Notes are plainly written, according to the printed form, not too much disfigured by blots, interlineations, &c., and your work shall be in every other respect unobjectionable, no copy will be required.—[*See Articles* 37 *and* 39.—*B*.

[82.]

Original Field Notes, Ink, Paper, &c.

The original Field Notes of your surveys are to be written with good durable black ink; and the paper in your Field Books, must be of a good quality, of uniform size, and put together so as to form one or more volumes, which are to be paged accordingly.

[83.]

Blank Pages for oaths.

At the end of the Field Notes of each Township, or fractional Township, you will leave one or two blank pages for the oath, required by the 2d Section of the Act of Congress of the 8th of August, 1846, for which see the 3d page of the triplicate contract, to be retained by you. The oath is to be according to a form which will be furnished to you by this office.

[84.]

Impassable Lakes, Swamps, or Ponds, to be meandered.

In all cases, where your township boundaries, or subdivision lines, intersect impassable lakes, swamps or ponds, which may have to be meandered, you will at each intersection establish a fractional Section corner, and meander the banks or margins of such lakes, &c., so far as they may lie in any Township you may subdivide, or so far as they may be impassable. The lines of meanders are to be connected with the fractional Section corners in the same manner as the meanders of a navigable stream. It is, however, not to be understood, that you are to meander a lake,

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swamp, or pond, *merely* because it should be impassable at a particular place where you happen to intersect it, but might be easily passed in other places.—[*See Section* 24.]

[85.]

Survey of Islands in Rivers, Lakes, or Swamps.

Islands are to be surveyed in the following manner, viz: Ascertain first the corner of the surveys on the main shore which is nearest to the Island; then prolong the line which that corner closes, across the arm of water to the edge of the Island, where establish a Township or Section corner, (as the case may be,) thence extend the line across the island to the opposite edge of the same, where set a corner, establishing on the line Township, Section, or quarter Section corners, (as the case may be) on the Island in the same position that they would occupy were there no river, lake or swamp in the way. And then meander around the Island, noting carefully the corners as you pass them.

[86.]

If the Island is so situated that no Section or Township line will run through it, you will connect the most convenient point on the edge of the Island nearest to the main shore, with the nearest corner on the said shore; at that point on the Island establish a meander corner, and then meander around the Island until you reach this corner again. In the same way you may connect a small Island in the vicinity, with another Island on which regular corners for Sections or Townships have been established. Also a group of small Islands may likewise be surveyed by connecting one Island with another by means of meander corners.

[87.]

No Payment will be made until the Work is Completed.

No payment will be made for the surveying of a Township until it is completed, so far as the lakes, swamps or ponds will admit of.

[90.]

Your attention is also directed to the following Act of Congress, entitled, "An Act to protect the Surveyors of the Public Lands of the United States, and to punish persons guilty of interrupting and hindering, by force, Surveyors in the discharge of their duty."

Be it enacted by the Senate and House of Representative of the United States of America, in Congress assembled, That any person who shall

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hereafter, in any manner, by threats or force, interrupt, hinder, or prevent, the Surveying of the Public Lands of the United States, or of any private land claim, which has, or may be confirmed by the United States, or the authority thereof, by the persons authorized to survey the same, in conformity with the instructions of the Commissioner of the General Land Office, or the principal Surveyors in any of the districts in any State or Territory, shall be considered and adjudged to be guilty of a misdemeanor, and upon conviction in any District or Circuit Court of the United States, in any State or Territory having jurisdiction of the same, shall be fined a sum not less than fifty dollars, nor more than three thousand dollars, and be imprisoned for a period of time not less than one, nor more than three years.

SEC. 2. *And be it further enacted,* That whenever the President of the United States shall be satisfied that forcible opposition has been offered, or will likely be offered, to any Surveyor or Deputy Surveyor, or Assistant Surveyor, in the discharge of his or their duties, in surveying the Public Lands of the United States, it shall and may be lawful for the President to order the Marshal of the State or District, by himself or deputy, to attend such Surveyor, deputy, or assistant Surveyor, with sufficient force to protect such officer in the execution of his duty as Surveyor, and to remove force, should any be offered.

Approved, May 29, 1830.

[91.]

Your attention is also directed to the following Section of an Act of Congress, approved August 8th, 1846, entitled, "An Act to equalize the compensation of the Surveyors General of the Public Lands of the United States, and for other purposes."

SEC. 2. *And be it further enacted,* That the Surveyors General of the Public Lands of the United States, in addition to the oath now authorized by law to be administered to deputies on their appointment to office, shall require each of their deputies, on the return of his surveys, to take and subscribe an oath or affirmation, that those surveys have been faithfully and correctly executed according to law and the instructions of the Surveyor General; and on satisfactory evidence being presented to any Court of competent jurisdiction, that such surveys, or any part thereof, had not been thus executed, the deputy making such false oath or affirmation, shall be deemed guilty of perjury, and suffer all the pains and penalties attached to that offense; and the District Attorney of the United State for the time being, in whose district any false, erroneous, or fradulent surveys have been executed, shall, upon the application of the proper Surveyor General, immediately institute suit upon the bond of such deputy; and the institution of such suit shall act as a lien upon any property owned or held by such deputy or his sureties, at the time such suit was instituted.

Approved, August 8th, 1846.

INSTRUCTIONS,

ESPECIALLY FOR

SURVEYING PRIVATE CONFIRMED CLAIMS.

In the execution of the surveys of private confirmed claims, you will, in all respects, be governed by the foregoing instructions, wherever they are applicable, and in addition thereto, will observe the following instructions:

All trees on each side of the lines, and near thereto, except on random lines, and those trees hereafter excepted, must be marked with two spots, or blazes, diagonally, or quartering towards the line.

Trees which have thereon plain marks of an old line which you are running anew, must not be re-blazed; but on lines of this description, only such trees will be blazed as have not good evidence of having been marked of old; and when any old corner trees, or witness trees to old corners, are cut into for the purpose of identifying the corner, all the particulars relating thereto must be entered in the field notes.

All corners where witness trees are convenient, will be perpetuated in the following manner:

1st. When a tree is at the exact place of any corner, it will be marked with three notches, in the direction of each line which runs therefrom.

2nd. When there is no tree at the exact place of a corner, you will plant a post, of the most durable wood that can be had in the vicinity, the said posts must not be sharpened, and driven into the earth as stakes, but must be cut off square or nearly so at the bottom, and be set in the ground, by digging a hole to admit them two feet deep, and be very securely rammed in with earth, and also with stone, when convenient; they must be at least five inches diameter, and must be neatly squared off at top, or faced otherwise, as the case may require, and placed at the corners of private surveys, so that the corners of the posts will correspond to the lines which run therefrom; and at the fractional sectional corners, so that the corners of the posts will correspond with the cardinal points; and the letters P S will be marked on the several sides of the posts fronting private surveys; and the letter S, with the proper number of section, on a side fronting each fractional section.

3rd. Or, when there is no tree at the exact place of a corner, you may, instead of a post, insert endways into the ground, to the depth of seven or eight inches, a stone which shall not be less than 12 inches wide, 14 inches long, and 3 inches thick, hich stone will be marked with a cross, thus—X; and you will particularly describe in your field

notes the kind of stone used, together with its shape and dimensions, and the manner and depth it is set in the ground, and the mark put thereon.

You will ascertain and state in your field notes, the course and distance from the several corner posts, trees, and stones, to a tree in each private survey and fractional section for which they stand as a corner; each of said trees you will mark with a notch and blaze, facing the corner post, tree, or stone; the notch to be at the lower end of the blaze; and on the blaze, which must be neatly made, you will mark, with a marking iron, in a plain, distinct and permanent manner, on each witness tree within a private survey, the letters P S; and each witness tree on the public land, the letter S, with the number of the section, and over it the letter T, with the number of the township; and above this the letter R, with the number of the range in which they respectively stand. And in all cases where there is no tree in any private survey or fractional section, within a reasonable distance of a corner on which to mark the number of section, township, or range, or the letters P S, that fact must be stated in your field notes.

Corners in a prairie, or other situation, where bearing or witness trees are not at hand, will be perpetuated by depositing in the ground, and at least 6 inches beneath the natural surface thereof, a portion of charcoal, (the quantity to be specified in your field notes,) not less than 2 quarts, at the place of such corners, which you will cover with 3 inches of dirt; and on this you will set a post around which you will erect a mound of earth three feet high, five feet square at the base, and two feet square at the top; the sides whereof must be reveted or faced with sods, laid horizontally, and in successive layers, on each other; each of said layers having an offset inwards, corresponding to the general slope of the face of the mound. The posts will be of the dimensions and marked, as directed, at the corners where witness trees are convenient; all of which will be noted in the description of the corner. Or, in lieu of charcoal or stone, (to be deposited as before stated,) you may perpetuate the corner by inserting endways into the ground, and to the depth of seven or eight inches, a stone, which you will mark on the top with a cross, thus—X, and which stone shall not be less than 12 inches wide, 14 inches long, and 3 inches thick, over which no mound need be erected; but the kind of stone used, together with its shape and dimensions, and the manner in which it is set, and the mark put thereon, must be particularly described in your field notes.

The corner posts, where mounds are not made, must rise at least three feet above the surface of the ground; and where corner posts are placed in mounds, they must rise at least one foot above the top of the mound.

If a corner, where bearing or witness trees are not to be found within a reasonable distance therefrom, shall fall within a ravine, or in any other situation, where the nature of the ground or the circumstances of its locality shall be such as may prevent or prove unfavorable to the erection of a mound, you will perpetuate such corner by selecting, in the immediate vicinity thereof, a suitable plat of ground as a site for a

bearing or witness mound, and erect thereon a mound of earth in the same manner, and conditioned in every respect with charcoal deposited beneath, as before described, for a corner; and determine and state in your field notes the distance and course of the bearing or witness mound, so placed and erected, from the place of the corner.

If the claimants of any surveys wish their corners more permanently established than is herein required, and will

furnish the additional materials and labor, you will establish the said corners in the manner they may request, and with the materials they may furnish:—their consent, however, will not authorize you to establish a corner of a less permanent character than is required in these instructions.

At the intersections of the several lines of private surveys with the lines of the public surveys, corners must be established for the proper fractional sections, (in the manner heretofore directed for establishing corners,) and the course and distance therefrom to the nearest corner on the line of the public survey, and outside of the private survey, must be determined and entered in the field book.

Also, when one private survey corners on a line of another private survey, or intersects it and continues across into the survey of which the line so intersected is a boundary, and the adjoining land is public, the course and distance therefrom to the nearest corner on the line of the private survey upon which you are cornering, and outside the survey you are executing, must be determined and entered in the field book.

When a line of one private survey continues across, or into another confirmed private survey, or block of surveys, the points of intersection with the several lines thereof, when there is no public land adjoining, will be perpetuated in the manner of establishing corners, except that each witness tree will be marked with only a blaze, and notch facing the post or stone set to perpetuate the aforesaid point of intersection; and the relative position of the points of intersection thus perpetuated, and of the corners on the lines intersected, must be determined and entered in the field book.

And when public land adjoins the point of intersection, the said point will be perpetuated as a fractional section corner, by marking a tree on the public land, as before directed, for marking witness trees to fractional section corners, and by marking one other witness tree on the private land, with a blaze and notch, facing the corner tree, post, or stone.

Whenever the terms *"public surveys"* and *"public land,"* or terms of similar import are used in these instructions, you are to understand that they comprehend all land surveyed as public land, which has not been included in the survey of private claims subsequently executed, and all lines run as public lines, notwithstanding the United States may have parted with the land by public or private sale.

The survey of claims which are confirmed unconditionally according to a former survey, will conform thereto, regardless of any excess or deficiency in quantity, provided, the old lines and corners can be found,

and properly identified; in which event, the old corners will be run to, and the true courses and lengths of the several lines according to your operations will be correctly stated in the field notes; and if the old lines and corners cannot all be found, you will conform to the old survey as near as practicable, by running the courses and distances called for, or to the intersection of the proper lines as may be required, making the necessary allowance for the difference in the variation of the needle.

The re-surveys of claims which are confirmed according to an old survey, but are restrictive in quantity, will be surveyed as above directed for those not restricted, except that if there is any excess or deficiency, it will be thrown off or taken in by a line parallel to that old line of the survey which the claimant may direct; or if he fails, or declines, to give directions, throw off the excess, or take in the deficient quantity on the side which you may think will best promote his interest; being careful to note all the particulars relating thereto, in your field book, and give the position of the old lines and corners which may be abandoned, because of the excess or deficiency in quantity. Claims which are confirmed according to the concession, and have been legally surveyed in conformity therewith, except as to exactness in quantity, will be re-surveyed as the class of cases last above mentioned.

If the survey heretofore executed of a claim which is confirmed according to a concession, whether the concession is or is not special as to the locality, but is special as to the direction of the lines, the proportional length of the different sides, or the figure of the survey to be made in virtue thereof, does not conform to these requirements of the concession, the said survey will be altogether disregarded, except so far as it may be useful in cases where the concession is not special as to locality, in identifying the situation of the land intended to be confirmed, unless the survey was executed and approved by the proper Spanish officer prior to the transfer of the country to the United States, in which event the survey will be considered as evidence of the changed intention of the authority making the concession, and will be taken as a part and parcel thereof.

Claims which are confirmed according to special concessions, and which have not been surveyed, you will survey in strict accordance with the terms of the concessions; always bearing in mind that where there are no special requirements in the concession, it was the general practice under the government with which the claims originated, to run them either in squares, or in right angled parallelograms of 1-5.10, or some intermediate or greater number of arpents, by 40 or 80, according to the size of the tract, or double as long as wide, unless some other survey or grant intervened, and rendered a departure from this rule unavoidable, in which case the rule was only so far departed from as was necessary to get rid of the interference with the prior surveys.

Settlement claims which were legally surveyed before the confirmation, and sanctioned by the surveyor general, will be re-surveyed as nearly conformable to the old survey as practicable, departing therefrom only so far as may be necessary to include the exact quantity confirmed, unless the old survey of a newly confirmed tract interferes with a legal-

ly executed and approved survey of an old confirmation, in which event, the survey under the new confirmation, must be so made as to avoid all such interference by taking in such of the adjoining public lands as will make the survey in as compact and regular form as practicable.

Settlement claims which were not surveyed and sanctioned by the surveyor general before the confirmation, will be surveyed as near in squares as may be, so as to include the improvements, and not interfere with prior claims. You will allow the claimant, or his authorized agent, in these cases, to designate the land to be taken in, by conforming, as near as practicable, to the section lines, and the divisional lines of

sections: that is, you will not make a division of more than one quarter section by a line not recognized by law as creating a legal subdivision. If, however, the improvement, in virtue of which a settlement claim is confirmed, is within a survey of an old confirmed claim, the survey of said settlement right must interfere with said old survey, so much as may be necessary to include the improvement upon which it is founded.

Information given to you by a claimant, or his agent, relating to the situation of a claim, will govern your operations; provided, you believe, from all the circumstances which come to your knowledge, that such information is correct; and provided, also, that it does not contradict the papers with which you may be furnished.

The position of any point or place called for in a concession, and also of the settlement or improvement in virtue of which a settlement claim is confirmed, must be determined in the field notes.

Whenever the line of a survey is intended to conform to the legal subdivision line of a section, either in part, or to its whole extent, said subdivision line must be run in conformity with the principles established by law for surveying and laying off the public lands of the United States.

And when the line of a survey runs with the legal subdivision line of a section, with a section line, or with the line of another private survey, you will call in your field notes for running with said line, and call for all old corners which you may pass, and state distinctly their position, condition and general appearance, and whether the evidence thereof found upon the ground agrees with the description of it furnished you from this office; and if the evidence so found, should not agree with the description, state at large in your field notes how you determined its position, and what induced you to believe it to be the place of a corner, the description of which as furnished you did not agree with the evidance found upon the ground, in order that this office may be enabled to decide upon the sufficiency of your reasons for adopting it as the true position of a corner.

If the description of corners furnished by this office shall be insufficient for properly connecting with a claim with the adjoining surveys, or shall be in any way whatever defective, you will give immediate notice thereof, and cease opperations on all lines that may be affected therby, until you are furnished with a proper description; and you are to distinctly understand that no omission of oversight of this office in furnishing in the first instance papers of this kind, will be considered a

sufficient excuse for defective and improper connections with the adjoining or interfering surveys, public or private; this may frequently happen, because the very indefinite calls of many confirmations renders it extremely uncertain what ground the survey will cover, and consequently what corners may be wanted to connect with; you must therefore, in all such cases, after ascertaining what additional descritions will probably be wanted, apply therefor, and wait until they shall be furnished.

Old corners of the public or private lands in the United States surveys on which you close or measure to, or that become corners of a survey you are executing, and which have been destroyed, may be renewed by you without further instructions from this office; provided, the necessary contiguous corners can be found and properly identified. The position of said destroyed corners will be determine in the following manner:

1st. When at the intersection of two lines, by ascertaining the precise intersection of said lines.

2d. When at the average distance between two other corners, by determing said average distance.

3d. When at a legal subdivisional distance from a section corner, and a given fractional distance from some other corner, re-establish it at the like proportional distance from each of said corners, according to your operations.

4th. When between two fractional corners, and at a given fractional distance from each, re-establish the corner at the place from which your measure to one of said fractional corners will have the same ratio to your measure to the other fractional corner, that the former measures had one to the other.

If in tracing an old line, the corners at each extremity thereof can be found, and the line is blazed evenly between the said corners, the old blazes will be followed throughout; if, however, the blazed way from one corner to another varies from a straight line, it will not be followed in its windings, but new marks will be made on a direct line from corner to corner; unless some other survey or surveys on the opposite side of the line to your operations, corners on the said blazed way out of a direct line between the corners of the survey you are executing, in which event you will run straight between the several corners you may find on the blazed way, and report the true length and course of each division into which the boundary may be cut by reason of the said intervening corners.

When a corner cannot be found, and properly identified, and the contiguous corners cannot be found to establish it in one of the four ways above authorized, the surveyor may at his own risk of having the work approved, adopt such measures as to him may seem best, from all the circumstances within his knowledge, to re-establish the corner, and report everything relating thereto to this office, to enable a proper decision to be made upon his plan of operations; or he may report all the facts connected with the case, and await further instructions.

You must always recollect that the relations of a deputy surveyor to

this office are of a highly confidential character; that to his discretion, as well as to his fidelity, and skill, much is necessarily entrusted; for it is evident that no instructions, however elaborate and detailed, can possibly anticipate and provide for every emergency which may occur upon the ground; and that the deputy surveyor, when there, is the only representative of the public interest; he should therefore act to the best of his understanding, and constantly bear in mind that the instructions issued by this office, are designed, and have no other aim than to fully accomplish the objects of the law, the most important of which are to perform the work accurately on the ground, to establish the lines and corners in the most

permanent and durable manner, and to describe the whole operations in the field book, plainly, fully, and distinctly in such a way that the meaning cannot possibly be mistaken or misunderstood.

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The following is a comparative statement heretofore adopted by this office, of the land measures of the United States, and the French measures, formerly used in the late province of Louisiana, and will be considered in all surveys as the true proportion between said measures:

LINEAR MEASURE.

French Feet.		U.S. Feet.
72	are equal to	77
Perches.		Poles.
6		7

CHAINS.	LINKS.
1	0 29 166
2	0 58 333
3	0 87 5
4	1 16 661
5	1 45 833
6	1 75
7	2 04 166
8	2 33 333
9	2 62 5
10	or 1 arpent
lineal,	2 91 666
2	5 83 333
3	8 75
4	11 66 666
5	14 58 333
6	17 50
7	20 41 666
8	23 33 333
9	26 25
10	29 16 666
100	291 66 666
1000	2916 66 666
12	35

Side of a league square.

84	245

Side of a mile square.

Arpents.		Perches.
27	4	2-7 80

SUPERFICIAL MEASURE.

Arpents.		Acres.
288 are equal to		245
1		0 85 07
2		1 70 14
3		2 55 21
4		3 40 28
5		4 25 35
6		5 10 42
7		5 95 49
8		6 80 56
9		7 65 625
10		8 50 69
100		85 06 94
1000		850 69 44
10000		8506 94 44
Arpents.	Perches.	Acres.
1	17 551	1
2	35 102	2
3	52 653	3
4	70 204	4
5	87 755	6
7	05 306	6
8	22 857	7
9	40 804	8
10	57 959	9
11	75 510	10
117	55 102	100
1175	51 020	1000
11755	10 204	10000

A league square contains

Arpents.	Acres.
7056	6002 50

A mile square contains

Arpents.	Perches.
725	32 64 640

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Form of keeping Field Notes.

If first book, or if there are any new hands employed, their oaths will become foremost.

A. B., hind chain-man.
C. D., fore chain-man.
E. F., flag-man.
G. H., Axe-man.

Measuring chain compared with the standard and found correct.

Compass adjusted to the line between sections 25 and 26, township 89 north, range 72 west, of the 5th principal meridian—variation 8′ and 30′ east.

Survey a tract of 800 arpents equal to 680 56/100 acres of land, granted to J. K. on the 20th day of March, 1803, by Carlos Dehault Delassus, Lieutenant Governor of Upper Louisiana; surveyed by Antoine Soulard, Surveyor General of the same province, on the 3d of July, 1801; recommended for confirmation according to the concession by the late board of commissioners on the 17th of August, 1834, decision No._____, and confirmed according to the said decision of the commissioners by an act of Congress, approved 4th of July, 1836.

Begin at the old south-western corner, a black oak 36 inches diameter, with marks thereon, and which I mark with three notches in the direction of each line of this survey which runs therefrom; from said black oak a hickory 16 inches diameter, marked P. S., bears N. 20° E. 45 links, and a white oak marked R. 72 W., T. 89 N—see 26 bears S. 33, W. 14 links.

Thence S. 82° E.	With the old marked line.
Chains	
14.52	A walnut 17 inches diameter.
19.36	A road leading to J. K.'s mill bears N. W.
46.30	Enter a field bears N. W. and S. E.
72.30	Intersect the line between sections 25 and 26, township 89 north, range 72 west, where set a post in the field for corner to fractional sections 25 and 26, from which a poplar 18 inches diameter bears S. 61° E., 13 links and a hickory 24 inches diameter bears S. 45°, W. 43 links; measured south 3 chains and 24 links to the quarter section corner on said line.
75.00	Leave the field bears N. E. and S. W.
79.00	A creek 50 links wide runs north.
90.00	Leave timber and enter prairie bears N. W. and S. E.
116.67	Deposit two quarts of charcoal 6 inches beneath the natural surface of the earth, covered the charcoal with three inches of dirt, and set thereon a post 8 inches diameter, and 4½ feet long, around which I erect a mound of earth 3 feet high, 5 feet square at the base, and 2 feet square at the top, the sides whereof are reveted, or faced with sods laid hori-

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	zontally, and in successive layers on each other, each layer having an offset inwards, corresponding to the general slope of the face of the mound, for corner of the survey and fractional section 25. Land rolling, good soil, timber, hickory and white oak, no undergrowth.
Thence N. 8° E.	Intersect the line between sections 24 and 25, township 89 north, range 72 west, where for corner to fractional sections 24 and 25, set a lime stone 22 inches long, 14 inches wide, and 4 inches thick endways into the ground to the depth of 8 inches; marked said stone distinctly with a cross, thus X, on the east side, the wide way facing east.
Chains.	
13.40	Measured east on the line between sections 24 and 25, 30 chains and 32 links to the corner of sections 24 and 25 on the range line.
58.33	Set a post in the prairie for corner to this survey and fractional section 24, from which a lone white oak 16 inches diameter bears N. 17° E. 35 links—no other tree convenient.
	September 17, 1836.
Thence N. 82 W	
Chains	
16.00	Enter timber bears N. E. and S. W.
17.48	A white oak 28 inches diameter corner to P. Y.'s survey, No. 29582 for 160 acres.
38.00	Another corner of said survey No. 29582, one of the old witness trees, a black oak 17 inches diameter, bears No. 20° E., 17 links distant—the other witness tree has fallen down, I therefore mark in fractional sections 24, a walnut 18 inches diameter, which bears N. 47° W. 82 links distant.
52.80	Intersect the line between sections 23 and 24, 17 chains and 93 links south of the quarter section

	corner, set a post for corner to fractional sections 23 and 24, from which a white oak 16 inches diameter bears N. 25° E. 18 links, and a white oak 88 inches diameter bears N. 32° W. 18 links.
60.15	A hickory 18 inches diameter.
72.13	Enter bottom land of river Ohaha, bears N. E. and S. W.
95.14	Intersected the right and east bank of Ohaha river, runs northeasterly, set a post for corner to fractional section 23, from which a hickory 15 inches diameter bears N. 26° E. 14 links, and a birch 24 inches diameter bears S. 72° E. 72 links.
101.00	The left and west bank of Ohaha river set a post corner to fractional section 23, from which an elm 18 inches diameter bears N. 18° W. 13 links and a white oak 15 inches diameter, bears S. 62° W. 13 links distant, here enter hills.
116.66	Set a limestone 16 inches long, 14 inches wide, and 4 inches thick, endways into the ground, to the depth of 8 inches,

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	marked said stone distincly with a cross, thus X, on the S. E. side, the wide way facing S. 82° E., and from said stone a hickory 18 inches diameter, bears N. 27, W. 32 links, and a black Walnut 20 inches diameter, bears S. 24° E. 13 links.
Thence S. 8° W.	On a random and closing line.
Chains	
14.28	The left and northerly bank of Ohaha river runs easterly.
21.00	The right bank of the river.
58.25	Intersect the southern boundary of the survey, 27 links S. 82° E. of the beginning corner tree, from which beginning corner tree I correct the line.
N. 8¼ E.	
Chains	
14.32	Enter river bottom bears E. and W.
23.00	Intersect the line between sections 23 and 26, 11 chains and 17 links east of the corner to sections 22, 23, 26 and 27 set a post, &c., [*here describe the corner.*]
37.25	The right bank of Ohaha river, set a post &c., [*here describe the corner.*]
43.47	The left bank of the river, where set a post, &c., [*here describe the corner,*] enter hills here.
58.25	The north-western corner of the survey.

Then to meander the Ohaha river through J. K.'s survey, and through the adjoining fractional section, I begin at the corner to fractional section 22 and 23, towhship 89 north, range 72 west, on the right bank of the Ohaha river, and meander down the right bank of said river through said fractional section 23, as follows:

N. 82° E. 7.20 chains, at 2 chains the mouth of a branch 8 links wide comes from the S. E.

N. 74½° E. 6.80 chains, to the corner at the intersection of the western boundary of J. K.'s survey with the right bank of the Ohaha river.

Thence with the meander of the said right bank of the Ohaha river through J. K.'s survey, as follows:

N. 70° E. 10.00 chains—at 4 chains a ferry landing.

N. 63° E. 12.45 chains—at 7.50 chains, the mouth of J. K.'s mill creek 150 links wide, comes from the S. E.

The mill is on the left side of the creek, and about 25 chains in south-easterly direction.

N. 22° E. 9.70 chains—to the corner at the intersection of the northern boundary of J. K.'s survey, with the right bank of the Ohaha river.

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Thence down the right bank of the Ohaha river through fractional section 23, township 89 north, range 72 west, as follows:

	Chains.
N. 25° E	25.50
N. 50° E	2.00
N. 14° E	30.00,

to the corner to fractional sections 4 and 23.

[Then meander the left bank of the river; and your field work for this survey, and its connections with the public surveys, will be completed.]

Separate instructions will be furnished for making the plat and description of the survey.

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APPENDIX.

[1.]

Numerous and repeated applications having been made to the Surveyor General, by county and United States deputy Surveyors and others interested in the Public Surveys within the District of Illinois and Missouri, for information and directions as to the proper method of making re-surveys, renewing missing corners formerly established, and subdividing Sections, regular, anomalous, and fractional, the answers to which would occupy much time and delay other public business, it is deemed advisable to publish, for the information of those concerned, a brief statement of the system adopted by the General Land Office for the surveys of the public lands, together with such other information as the records show to be most needed by those engaged in the re-tracing of old surveys, or dividing the public lands according to the sales made thereof by the officers of the United Stats; and more especially necessary since it is known that a large portion of the early surveys, both in Illinois and Missouri, were carelessly, and, in some cases, erroneously executed.

In the incorrect surveys above alluded to, the Township lines are not always straight, the measure frequently being more or less erroneous, and it is impossible to frame instructions so minute in detail as to meet every case, and enable a deputy or county Surveyor to do equal and exact justice to all parties concerned. After all that might or could be said, much will depend upon the judgment and experience of the Surveyor on the ground.

It is not intended, by what is here recommended for renewing missing corners or subdividing Sections, to give any *positive directions* to county Surveyors. This office has no control over them whatever, but it is believed that the information here given will enable the Surveyor in most cases to do justice to the parties interested, without any further correspondence with the Surveyor General on the subject.

[2.]

Systems of Surveys.

Under the provisions of the several Acts of Congress in relation thereto, the Public Lands of the United States are surveyed into rectangular tracts, bounded by North and South, East and West lines, all having reference to some established East and West Base Line and North and South Meridian, are are designated by numbers accordingly.

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[3.]

Base and Standard, or Correction Lines.

The Surveyor General first establishes some known parallel of latitude as a Base Line; North and South of which, other lines running due East and West are surveyed by deputy Surveyors, to which, surveys of the Townships or larger tracts are afterwards connected. These last mentioned lines are usually run thirty miles apart, and in the District of Illinois and Missouri are designated *Standard Lines*; their object being the correction of the surveys as extended to them from the established Base Line. In other Surveying Districts, the Standard Lines are known as *Correction Lines*, and are numbered from the Base Line for that District. Standard or Correction Lines are run *East* or *West* from the Principal Meridian, and quarter Section and Section corners established at every 40.00 chains for the Sections *North* of said line, but not for the Sections on their *South* sides.

Standard or Correction Lines compensate the error arising from the convergency of the Meridians as they proceed northwardly, and arrest inaccuracies arising from incorrect measurement. They form the Base for the Townships on their North until the occurrence of the next Standard or Correction Line, which in its turn becomes a Base for the next tier of Townships; and for each Township this Base Line is extended sufficiently to meet the convergency for a given distance.

[4.]

Principal Meridians.

In like manner are selected and established certain Meridian Lines, East and West of which the surveys of Townships are numbered and referred.

The Base and Meridian Lines in this District were formerly run with a common compass, and in many instances are far from being correct, or following a parallel of latitude as intended, which will account for the many inaccuracies to be met with in the older surveys of Townships. These inaccuracies have led to the adoption by the General Land Office, wherever practicable, of the use of *Burt's Solar Compass*, an astronomical instrument, operating independently of the magnetic needle, admirably adapted to the purpose, and with which other surveys may also be made. In the surveys hereafter to be made in this District, the Surveyor General would recommend the use of this instrument in preference to the Theodolite or common Compass, in running Township and Range Lines; the Compass to be used only in the subdivisions of a Township into Sections.

[5.]

Meridians and Base Lines, in Illinois.

The Public Surveys in the State of Illinois are connected with, or extended from, the 2d, 3d and 4th Principal Meridians, the 1st *Principal Meridian* being in the State of Ohio.

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The 2d *Principal Meridian* is a line running due North from the mouth of little Blue river, in the State of Indiana.

The 3d *Principal Meridian* is a line running due North from the mouth of the Ohio river, and is terminated at its intersection with the State line between Illinois and Wisconsin.

The 4th *Principal Meridian* commences in the centre of the channel and at the mouth of the Illinois river, but immediately crosses to the East shore, and passes up on that side to a point in the channel in the river, 72 miles from its mouth. Here the *Base Line* for this Meridian commences and extends due *West* to the Mississippi river. The 4th Meridian is then continued North to a curve in the Mississippi, where it crosses and passes up on the West side of that river fifty-three miles, recrosses into Illinois and passes through the town of Galena to the North boundary of the State. It then continues through the State of Wisconsin,and terminates at a point on the Southern shore of Lake Superior, about 10.00 chains West of the mouth of Montreal river. That part of this Meridian lying on the West side of the Mississippi river is considered as a blank line only.

The *Base Line* for both the 2d and 3d Meridians commences at Diamond Island, in the Ohio river, and runs due West to the Mississippi river.

[6.]

Meridian and Base Line, in Missouri.

The Public Surveys in the State of Missouri are connected with, or extended from the 5th *Principal Meridian.*

This line commences at the mouth of the Arkansas river, in the State of Arkansas, and runs due North, crossing the Mississippi river in Township 53 North, near Clarksville. Thence continuing up the East side of the river, in the State of Illinois, about one hundred and forty miles; it then re-crosses the Mississippi into Iowa, in T. 77 N., and is continued through that State, terminating on the right bank of said river, in T. 91 N. The surveys in the State of Iowa are connected with this Meridian. The *Base Line* to this Meridian commences in the mouth of the St. Francis river, and runs due West across the State of Arkansas. That part of this Meridian lying on the East side of the Mississippi river is considered as a blank line only.

[7.]

Division of Public Lands.

The United States Lands are surveyed by deputy Surveyors, appointed and commissioned by the Surveyors General. These deputy Surveyors divide the lands into tracts

called *Townships*, each of which is six miles square, except when they are anomalous or fractional, as hereinafter explained. They subdivide each of these Townships into thirty-six equal squares, called *Sections*. The Township and Section lines being all run and marked, and the corners of all the tracts being established on the ground, as hereinafter explained.

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[8.]

Description of Public Lands.

Tiers of Townships lying *East* and *West* of each other are known as being parallels of latitude *North* or *South* of the established Base Line, according to their numbers; and tiers of Townships lying *North* and *South* of each other are known as being in Meridian Ranges East or West of the established Principal Meridian, according to their numbers, and are named as in Townships and Ranges accordingly, for the purpose of facilitating the descriptions of their localities, as by a combination of these numbers any part of a Township maybe described and known by reference to the particular Range, Township, Section, quarter Section and Lot, or part of quarter Section in which it lies, as for instance "The South half of the North-East quarter of Section 3, in Township number 1 North of the Base Line, and in Range number 1 East of the 3d Principal Meridian, being Lot number 1, containing 80 acres of land," may be designated as in Diagram No. 3, as follows:— S. 1-2 of N. E. 1-4 Sec. 3, T. 1 N., R. 1 E. of the 3d P. M. No. 1, 80a.

[9.]

RANGES.

Ranges of Townships are numbered, as the case may be, *East* or *West* from the established Principal Meridian of the Surveying District in which they lie. Range Lines are run *North* or *South* from the Base Line, and corners for Sections and quarter Sections are established thereon at every mile and half mile or 80 and 40 chains, for the Sections and quarter Sections, on the *West* side of the line, *but not for those on the East side.*

[10.]

TOWNSHIPS.

Townships, when regularly surveyed, contain areas of six miles square and are numbered as the case may be, *North* or *South* from the established Base Line for the surveys of the District in which they lie. Township lines are run *East* or *West* on a random line, and corrected back towards the *West* or *East*, as the case may be, and in establishing this corrected line, the Section and quarter Section corners are established on the *true line*, at every 80 and 40 chains, for the Sections and quarter Sections on the *North* side of the line, *but not for those on the South side.* The excess of all East and West Township lines over 5 miles and 40.00 chains is always thrown into the South boundary of Section 31 *West* of the quarter section corner.

[11.]

ANOMALOUS TOWNSHIPS AND SECTIONS.

When the surveys of Townships have been connected with Standard

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Lines or other surveys, and the surveys of Sections connected with the Northern and Western boundaries of the Township, thus giving to such Townships or Sections areas greater than the regular legal quantities, they are then called *Anomalous Townships* or Sections as the case may be.

[12.]

FRACTIONAL TOWNSHIPS AND SECTIONS.

When in like manner the surveys of Townships or Sections are connected with, or when the surveys of such tracts are limited or intersected by, a navigable stream or lake, the shores of which require to be meandered, thus giving to a Township or Section less than the legal areas as established by law, they are called *Fractional Townships* or Sections, as the case may be.

[13.]

SECTIONS.

Sections, when not anomalous, or fractional, contain 640 acres each, and are numbered from East to West, and from West to East, progressively, commencing with the North-East corner Section, or No. 1, and ending with the South-East or No. 36, as is shown in the Diagram No. 1, representing the subdivision of a Township into Sections.

[14.]

PLATS OF SURVEYS.

After the surveys are made by the Deputy Surveyor, and their Field Notes properly sworn to and returned to the Surveyor General, proper Plats each Township are made out in triplicate, one of which is recorded in the office of the Surveyor General, subject to the examination of the public; another is sent to the Register of the Land Office in whose District the land may be, and is there filed subject to examination, and upon which plat the sales are made; the third is forwarded to the Commissioner of the General Land Office for the archives of the Government. Subdivision plats of parts of the Townships as may be required, are made out and returned to the Registers and Commissioner of all those quarter Sections within the Northern and Western tiers of Sections bordering upon the Northern and Westen boundaries of the Township, and of those lying along the margin of a navigable lake, or bank of a navigable river; and also, those adjoining an Indian or State Boundary Line, or the boundary lines of any private survey or confirmed land claim.

TOWNSHIP PLAT,

Not bounded by a navigable Lake or River.

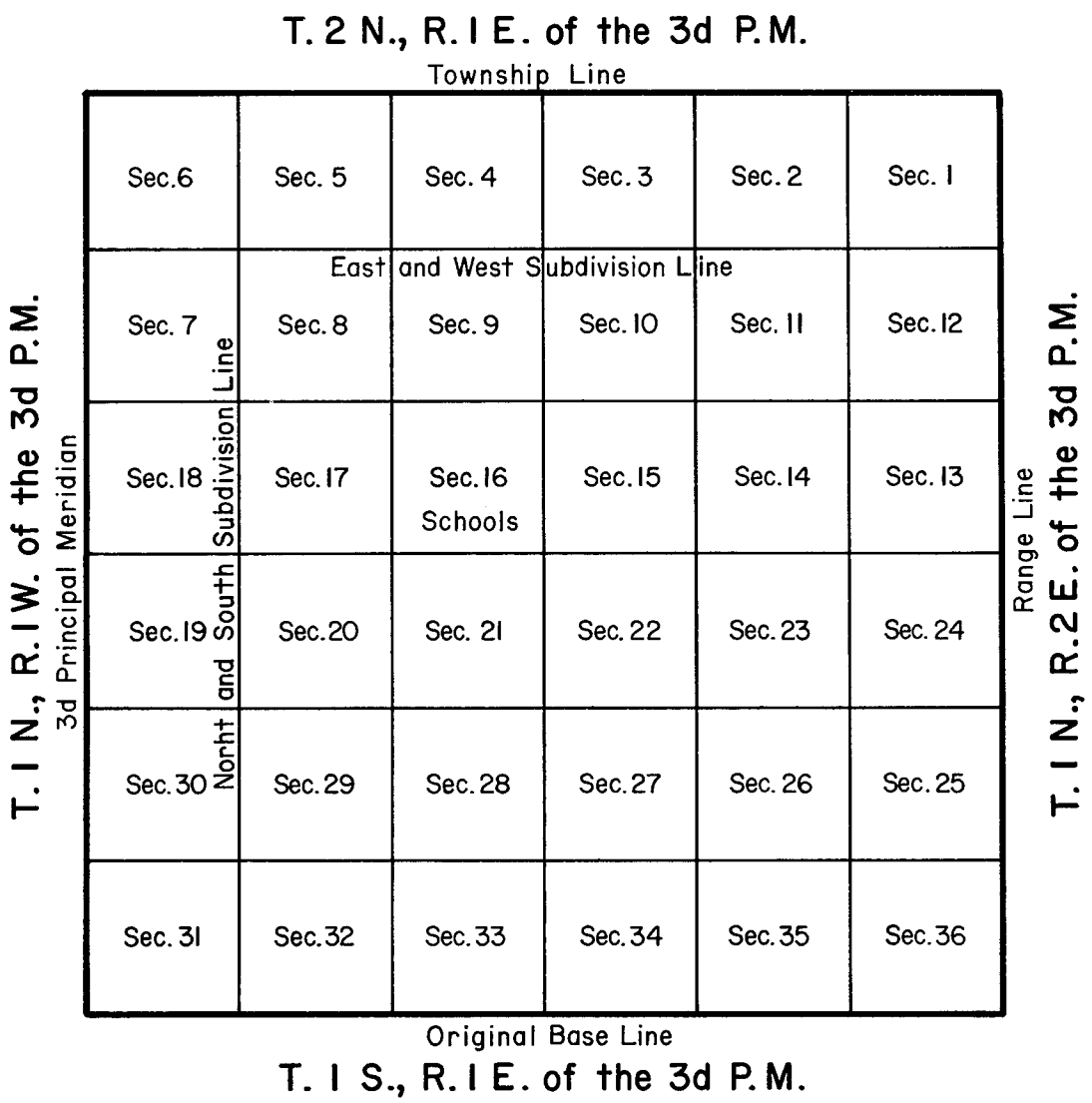
The following Diagram, No. 1, is an example to show how a Township is subdivided, either regular, anomalous, or fractional, so long as the Township contains the 36 Sections, either in whole or in part, and is not bounded by a navigable stream or lake. It also gives the names of the several boundary lines of the Township selected, with the designations of the surrounding Townships, showing how they lie North and South of the Base Line, and East and West of the 3d Principal Meridian in Illinois:—

[16.]

DIAGRAM No. 1.

ILLINOIS TOWNSHIP PLAT,

Of Township 1 North of the Base Line, Range 1 East of the 3d Principal Meridian.



Fractional Township Plat

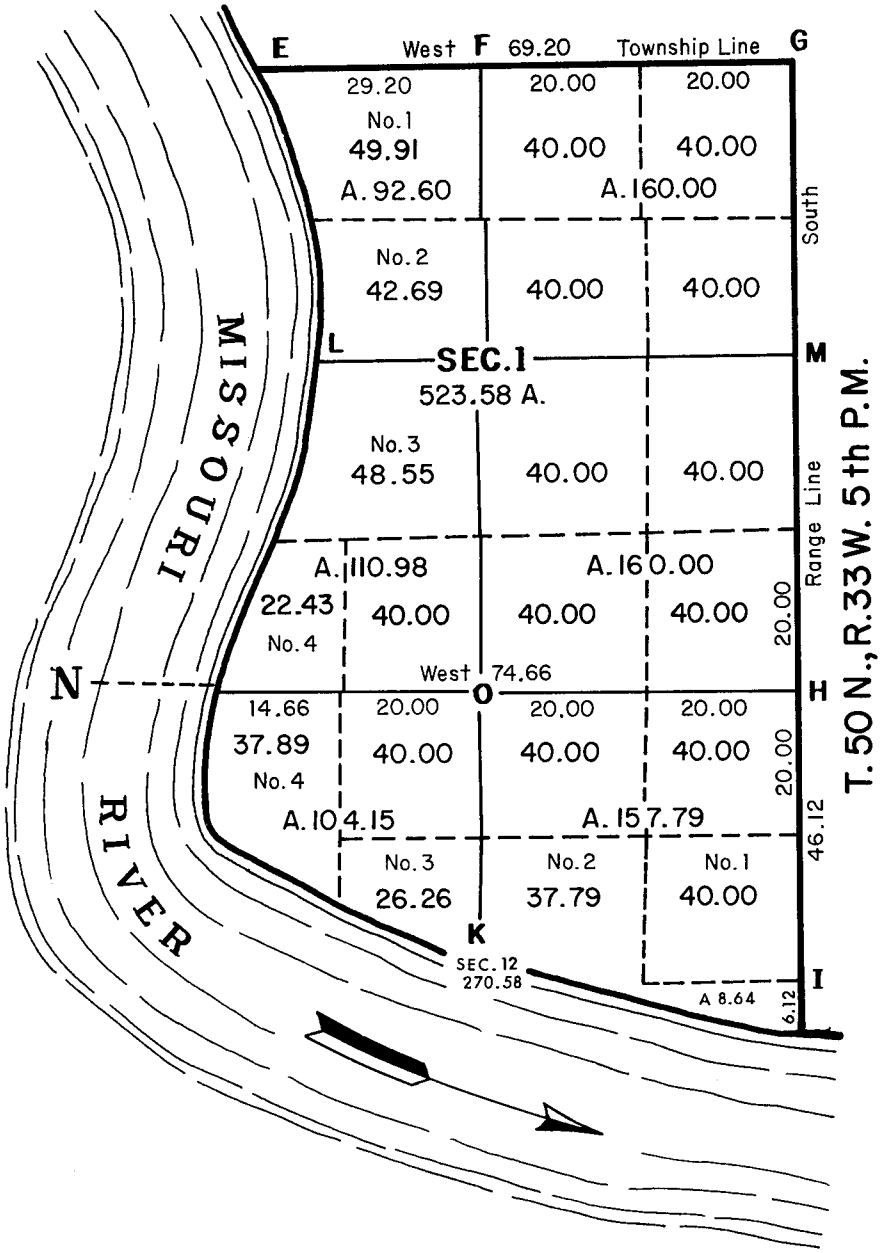
Diagram No. 2 is an example selected to show a fractional Township, made so by a navigable river, and contains only parts of two Sections North of the Missouri river, giving the names of the boundary lines, and the designation of the surrounding Townships on the North side of the river, showing how they lie North of the Base Line and West of the 5th Principal Meridian in Missouri.

[18.]

DIAGRAM No. 2.

MISSOURI FRACTIONAL TOWNSHIP PLAT,

Of Fractional Township 50 North of the Base Line, Range 34 West of the 5th Principal Meridian.



[19.]

Subdivision of Sectional Areas.

When Sections are neither anomalous or fractional, the Registers of the Land office may, to suit the applicants for the purchase of the Public Lands, subdivide the quarter Sections into halves or quarters, or 80 or 40 acre Lots. In the calculations of the areas of interior Sections they are always taken to contain 640 acres, and the subdivisions designated as containing 160, 80 and 40 acres, respectively, whether the same be more or less, except where the northern or southern boundary lines of the Sections are 150 links greater or less than 80 chains, in which case the areas of the divisions are calculated and returned to the Registers as containing the quantities of land respectively so determined. But all those tiers of quarter Sections adjoining the Northern and Western boundaries of a Township, or lying on the shores of a navigable river or lake, and all the North and west tiers of Sections within an anomalous Township, or such fractional Sections as exceed 60 acres in area, should be subdivided according to the circumstances of the case, to the best advantage by the Surveyor General, and a certified plat of the subdivisions sent to the Register previous to any sale of such lands being made. These subdivisions are shown in Diagram N. 4.

[20.]

Merged Areas.

Tracts smaller than 60 acres in extent, may, according to the circumstances of the case, and the judgment of the Surveyor General, be reported to the Register with a separate area, or may be attached by him to an adjoining tract for sale, and its area merged into that of the tract to which it is attached, which should always be shown on the plat by peculiar marks drawn across the division lines.

[21.]

Former Subdivisions of Sections.

Previous to 1828 the Deputy Surveyors were required to return, with their field notes, plats of all the Townships which they surveyed, and to calculate the area of the fractional Sections on the navigable rivers and lakes, and in the North and West tier of quarter Sections in a Township. These plats were rudely constructed, and, in many cases, the areas put down upon them were erroneous. When this fact was ascertained before the land was sold, a recalculation was made in the Surveyor General's Office, and the Register of the Land office, in whose district the land laid, was furnished with a correct plat thereof, as a substitute to the one formerly sent to him.

In making the calculations of the area of the North and West tier of quarter Sections in a Township, some of the deputies considered the

quarter Section corners on the Township and Range lines as common to the Sections on both sides of the line, whilst others adopted the method now in use and partiularly explained in Diagrams Nos. 4 and 5.

At one time, some of the Deputy Surveyors, in subdividing a Township through which a navigable stream passed, ran a random line *East* between the proper Sections, and corrected it *West*, making the corner to the Fractional Sections on both banks of the river and on the true line; others pursued the method as now required.

[22.]

The areas in many quarter Sections appear to have been put down without any calculation whatever, and it is therefore impossible to adopt any rule which will apply in all cases.

The experienced Surveyor will generally be able to determine which of the foregoing methods was used in making the calculation of the area of a quarter Section, and he should make subdivisions accordingly in replacing lines formerly run by Deputy Surveyors of the United States.

[23.]

Present Subdivision of Sections.

None of the Acts of Congress, in relation to the Public Lands, make any special provision in respect to the manner in which the subdivisions of Sections should be made by Deputy Surveyors.

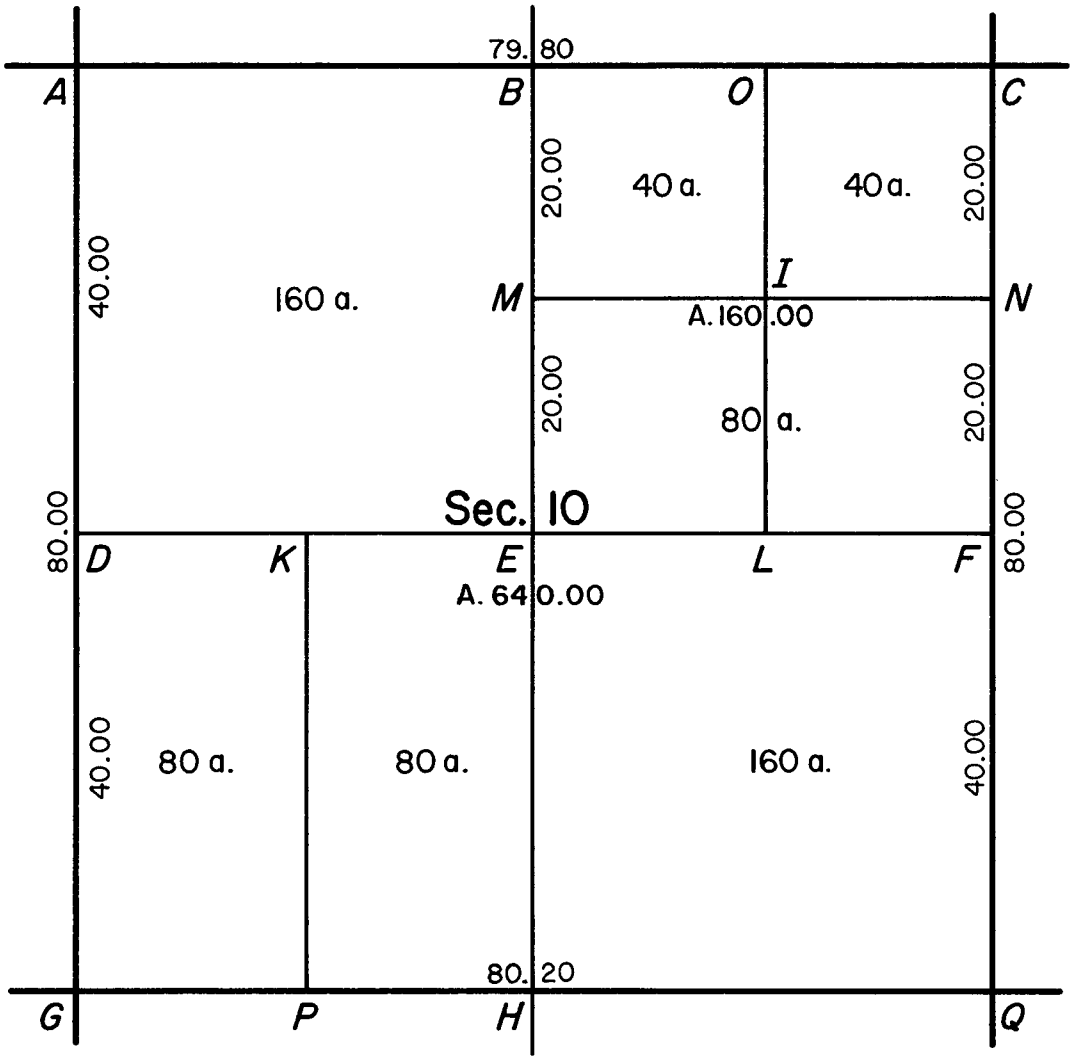
The following plan may, however, be safely adopted in respect to all Sections, excepting those adjoining the North and West boundaries of a Township, where the same is to be re-surveyed.

[24.]

Subdivision of interior Sections.

DIAGRAM No. 3.

REGULAR SECTION.



[25.]

The Surveyor should have descriptions of all the established corners of the Section to be subdivided, in order to identify them, and find the place where each corner post, stone or mound, had been set. Then begin at a quarter Section corner, on a North and South line, say at D, from which run east on a random line, set a temporary post at 40.00 chains, note the distance to the point where said line intersects the East boundary of the Section, and the distance it falls North or South of the quarter Section corner at F. Then, by means of offsetts from the random, run a true line from the corner at F to that at D, and at equidistance between them establish the corner E. Then, by first running randoms as aforesaid, make a straight line from E. to B, and from E to H, and you have the Section divided into quarters. But should it be necessary to subdivide any of the quarters, say, for example, the N. E. quarter, into four 40 acre lots, and the S. W. quarter into two equal parts, then, in running the random line East from D to F, temporary posts should be set at 20 and 60 chains, to mark the points lettered K and L, and the corners should be established on the true *true* line, from F. to D, so as to place the corner L at average distance between F and E, and the corner K at average distance between E and D. In like manner the corner at M should be equi-distant between E B; O equi-distant between B C; N equi-distant between C F, and I

equi-distant between M. N, and straight lines run from I to O, and I to L. The corner at P. should be equi-distant between G. H, and a straight line run between P and K.

[26.]

This method of first running a line from D to F is considered preferable to basing the work on the North and South line H to B, for the reason that the corners at D and F are on the North and South lines, all of which, except those intersecting the North boundary of a Township, are 80.00 chains in length, and have the quarter section corners thereon precisely at 40.00 chains; whereas, what are called East and West lines, excepting those in the West tier of Sections, are never *due* East and West, at the variation assumed, unless a random line, which has to be first run, happens to strike the corner run for.

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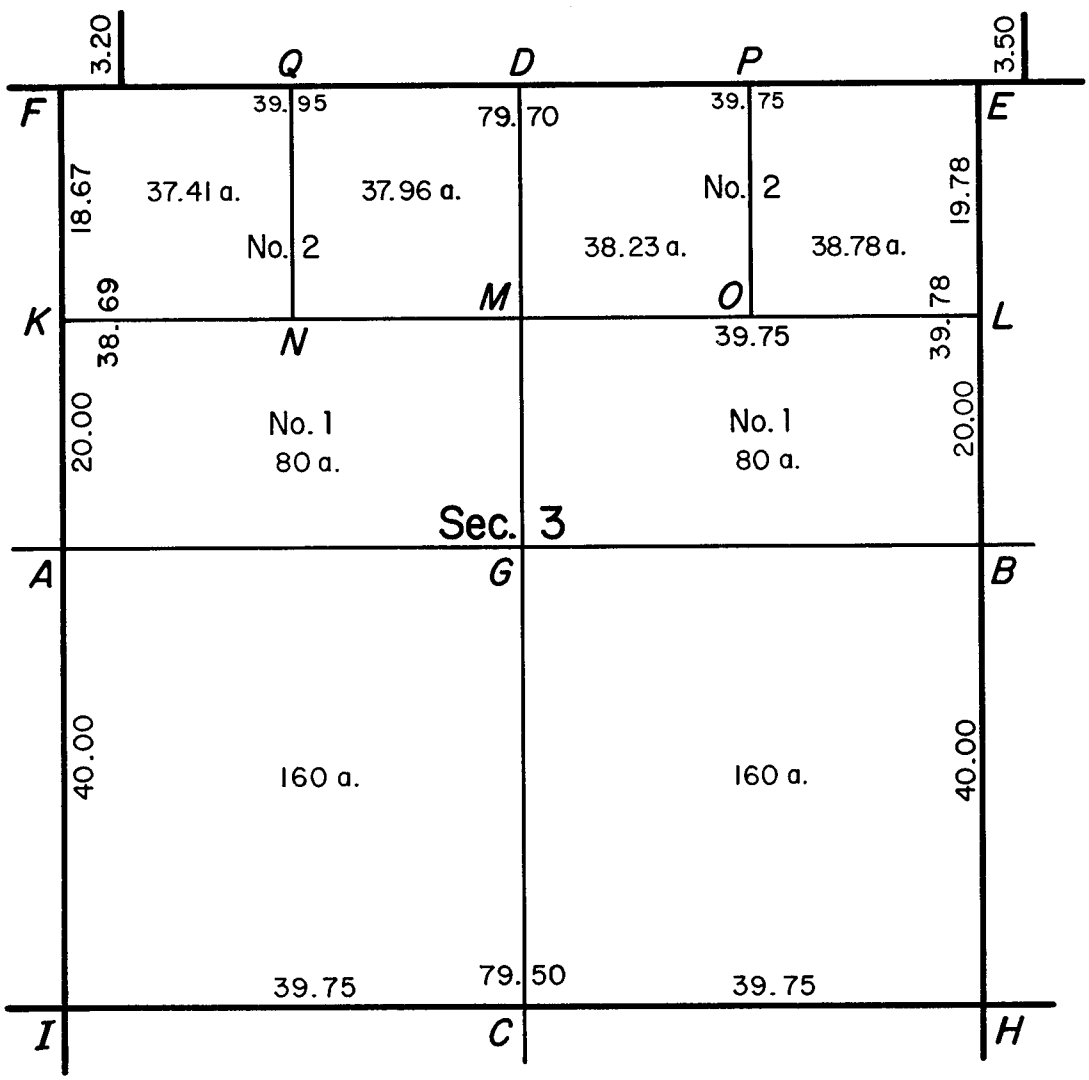
[27.]

Subdivision of Sections adjoining the North boundary of a Township.

DIAGRAM No. 4.

FRACTIONAL SECTIONS.

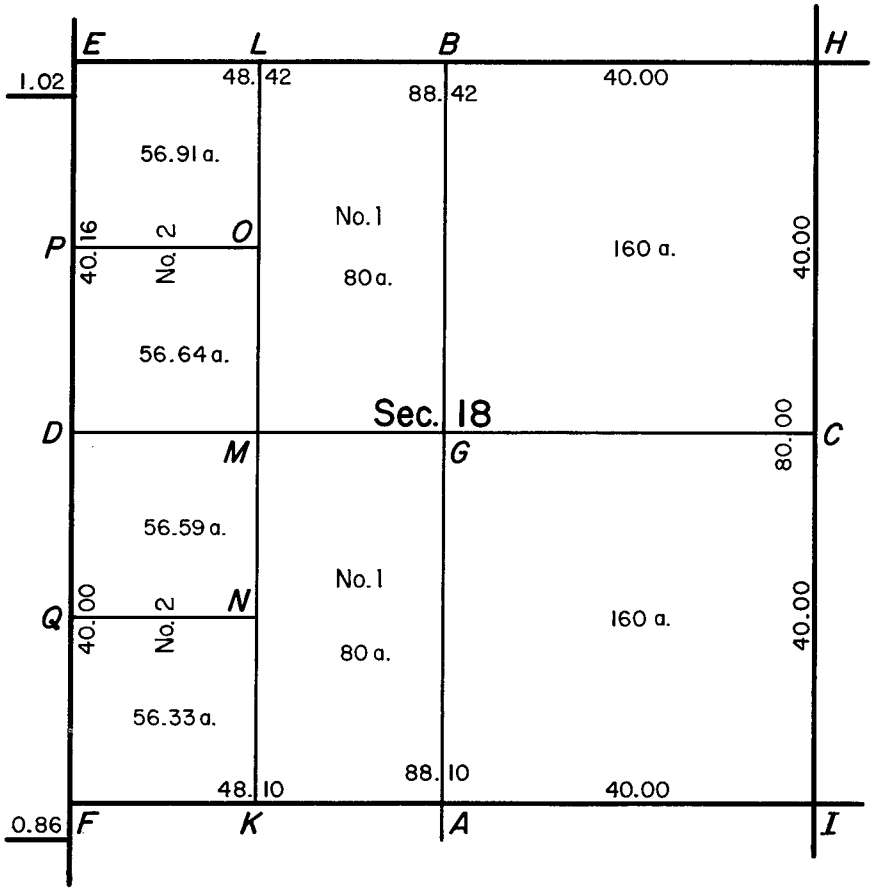


In this case there can but one rule for the subdivision to make it agree with the manner in which the several areas are calculated. You will observe that the line I H is 79.50 chains, and that the one half of it, 39.75, is assumed as the distance from E to D, which last distance, 39.75, is deducted from 79.70, the length of the line E F, leaving 39.95 chains between the points F. D; consequently, the line C D must be *exactly* parallel to the line H E, without paying any respect to the quarter Section corner near D, which belongs entirely to Section 34, of the Township on the North. Run the line A B in the same manner as that of D F, on Diagram No. 3, except, that the corner G is to be established at the point where the line A. B intersects the line C D. After surveying thus far, if the S. E. and S. W. quarters are to be subdivided, it can be done in the same manner as in Section 10, Diagram 3. In this case, to subdivide the N. E. and N. W. quarters, the line K L must be parallel to A B; the two lines *ought* to be 20 chains apart, the corner M made where K L is intersected by C D. But as two surveyors seldom agree *exactly* as to distances, there might be found an excess, or deficiency in the contents of the N. E. and N. W. quarters; if so, the line K L should be just so far from A B as to apportion the excess or defficiency between the lots 1 and 2, not equally, but in proportion to the quantities sold in each. If the Lots numbered 2 are divided on the Township plat by North and South lines, then, that of the North-west quarter must have its South end equi-distant between K M, and its north end equidistant between F D. The North-east quarter will be subdivided by a line parallel to M D, and L E, and exactly half way between them.

Subdivision of Sections adjoining the West boundary of a Township.

DIAGRAM No. 5.

ANOMALOUS SECTION.



[30.]

These Sections, like those adjoining the North boundary of a Township, must be subdivided in a particular manner to suit the calculations of their several areas. Their East boundaries, except that of Section 6, are all 80 chains long, with the quarter Section corner at half that distance. Their North and South boundaries are all run due West; quarter Section corners are established thereon at 40 chains, and Section corners established where they intersect the Range line on the West. The lengths of the West boundaries are found by the distances, the North and South boundaries fall from the corners on the Range line previously run. The West boundaries of the S. W. quarters are always taken for 40.00 chains. For example, the West boundary of Section 18, Diagram No. 5, is according to the fallings of its north and south boundaries 80.16 chains in length. '40.00,' is therefore set down

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as the distance along the South-west quarter, and "40.16" along the North-west quarter. Therefore, the subdivision must be made by making the line C D exactly parallel to F I, paying no attention to the quarter Section corner near D, which belongs only to Section 13 of the Township on the West. Run a straight line from A to B, and, at the point where it intersects C D, make the corner G. The North-east and South-east quarters are always considered as 160 acres, and are to be subdivided as mentioned in relation to Section 10.—See Diagram No. 3. The North-west and South-west quarters are subdivided in the same manner, as mentioned in respect to Section 3, Diagram No. 4, except, that in the one case the 80 acre Lots are laid off by East and West lines, with the northern Lot divided when necessary by a North and South line; whilst, in this case, the 80 acre Lots are laid off by North and South lines, with the western Lots divided by East and West lines.

[31.]

When the lines of a Section are found to be badly surveyed, and the corners are somewhat out of their proper places, the corners must nevertheless govern, if they can be identified; and the Surveyor who subdivides such a Section must, in some instances, have to exercise his own judgment, unless the matter can be compromised by the parties interested.

[32.]

For some years past, Deputy Surveyors have been instructed to make corners for the legal subdivision of Sections on all lines intersecting the North and West boundaries of a Township, where their lengths exceed 100 chains, which corners are at every 20 chains North, or West, as the case may be, of the quarter Section corners. These subdivision corners must govern, without regard to quantity. For example, if Section 18, Diagram No. 5, be an *anomalous or long* Section, and corners were established at K and L at 20 chains West of A and B, then there should be a straight line between the corners at K and L, and a corner made at M, as before mentioned.

[33.]

Subdivision of fractional Sections on Rivers and Lakes.

No rules can be given for the subdivision of fractional Sections along the margin of a navigable lake, or the bank of a navigable river, for the reason that the subdivisions are made by the Surveyor General in such a manner as to give the fractional parts of the Section the most convenient shape; and the Surveyor must establish the *lines* representing the subdivision according to the official plat of the Township by which the sales were made. The general plan of such subdivisions may, however, be seen by reference to Diagram No. 2, of a fractional Township in Missouri, which shows the manner of subdividing the Sections

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into tracts or lots suitable to the circumstances of the case. These lots are usually numbered in a series for each Section or quarter Section, and any one of them may be composed of several smaller subdivisions joined, or having their areas merged, as herein before described, on account of the peculiar shape of the smaller tracts, the value of the ground, or other circumstances of the case.

[34.]

For instance, the South-east quarter of Section 12, being a narrow strip lying stretched along the bank of the river in front of Lots numbered 1 and 2, of the North-east quarter of the same Section, and being liable to abrasion from the waters of the river, has been joined to Lots 1 and 2, above mentioned, and the areas calculated and represented on the Diagram as above given. The fact of these small tracts being merged into the areas of the Lots adjoining them on the North, is shown on the Diagram by the two *marks* drawn across the dividing *quarter Section line*, I K between them, which mark is generally adopted on the plats to show that the areas of the adjoining lands have been calculated and reported together as one tract.

[35.]

Establishing Corners.

In surveying the Public Lands, the United States' Deputy Surveyors are required to mark *only* the true lines, and establish on the ground the corners to *Townships* and *Sections*, and *quarter Section corners* on the *Range, Township* and *Sectional lines.*

There are, no doubt, many cases where the corners are not in the right place, more particularly on *East* and *West* Sectional lines, which, no doubt, is owing to the fact that some Deputy Surveyors did not always run the *random* lines the whole distance and close to the Section corner, correct the line back and establish the quarter Section corner on the true line, and at average distance between the proper Section corners; but only ran *East* or *West* (from the proper Section corner) 40.00 chains, and there establish the quarter Section corner.

In all cases where the land has been sold, an the corners can

be found and properly identified according to the original approved Field Notes of the survey, this office has no authority to remove them.

[36.]

When a tree does not happen to occupy the place for a corner, a *stone*, which must be particularly described in the Field Notes, and must not be less than a stone 14 inches long, 12 inches wide, and 3 inches thick, may be used for *any* corner, either in timber or prairie. In all other cases, corners are to be established by setting a post, which must be properly marked, (according to instructions given), in the

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ground, at the point for corner; and if in a situation where bearing or witness trees can be had within a reasonable distance, and the corner is a Township corner common to 4 Townships, or a Section corner in the interior of a Township common to 4 Sections, four bearing or witness trees are taken, (one in each Township or Section). Each of these trees is to be particularly described, and blazed on the side facing the corner stone, tree or post, with letters and figures indicating the particular corner; the bearing and distance taken, and every thing in relation to the establishment of the corner must be entered in the Field Book.

In all cases, except those provided for above, only two witness trees are taken, which are to be described, marked, bearings and distances taken and entered in the Field book.

Township and *Section* corners in a prairie or other situations where witness trees cannot be had within a reasonable distance, are established by setting a post, (which must be properly marked) in the ground, and depositing around the post, 3 inches below the natural surface of the earth, a quantity (which must be specified in the Field Notes, and must not be less than 2 quarts,) of charcoal, stones, gravel, scoria, cinders, or other durable material, and then erecting a mound of sod or earth around the post. Quarter Section corners are established in the same manner as Section corners, only that no deposit is required to be made in the mound.

[37.]

Re-establishing Lost Corners.

Where old Section or Township corners have been completely destroyed, the places where they are to be re-established may be found in timber, where the old blazes are tolerably plain, by the intersections of the East and West with the North and South lines; if in prairie, in the following manner:—See Diagram No. 1. This example is often given. Suppose the corner to Sections 25, 26, 35 and 36, to be missing, and that the quarter Section corner on the line between Sections 35 and 36 to be found. Begin at the said quarter Section corner and run North on a *random line* to the first corner which can be identified, which we will suppose to be that of Sections 23, 24, 25 and 26. At the end of the first 40 chains, set a temporary post, corner to Sections 25, 26, 35 and 36; at 80 chains, set a temporary quarter Section corner post; and suppose, also, that 121.20 chains would be at a point due East or West of said corner to Sections 23, 24, 25 and 26, note the falling or distance from the corner run for and the distance run. Thence from said corner run South on a true line, dividing the surplus, 1.20 chains, equally between the three half miles, viz:—At 40.40 chains, establish a quarter Section corner; at 80.80 chains, establish the corner to Sections 25 and 26, 35 and 36. Thence, to the quarter Section corner on the line between Sections 35 and 36, would be 40.40 chains. The last mentioned Section corner being established, East or West random or true lines can be now run therefrom, as the case may require.

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[38.]

This method will, in most cases, enable the Surveyor to renew missing corners by re-establishing them in the right place. But it may happen, that, after having established the North and South line, as in the above case, the corner to Sections 26, 27, 34 and 35, can be found; also, the quarter Section corner on the line between Sections 26 and 35. In this case, it might be better to extend the line from the corner to Sections 26, 27, 34 and 35, to said quarter Section corner straight to its intersection with the North and South line already established, and there establish the corner to Sections 25, 26, 35 and 36. If this point should differ much from the point where you would place the corner by the first method laid down, it might be well to examine the line between Sections 25 and 36.

[39.]

Previous to the year 1828, only two bearing trees to any corner were described, although at Township and interior Section corners four trees were marked as witness trees. The mounds erected before that time were smaller than those now used, having no deposites in them of any substance whatever, for any kind of corner; indeed, they were sometimes scarcely erected at all, having often been only small collections of sods surrounding a temporary stake set for the corner.

[40.]

But, since 1828, Deputy Surveyors have been required to describe in their Field Notes four bearing trees to Township and interior Section corners, only two being so described for all other corners; and they were directed to increase the size of the mounds erected around corner posts, placing charcoal or other durable material as a witness under the stake placed for the corners of Townships and Sections, but not under the corners returned for quarter Sections. Since that time a general uniform practice has prevailed, with some few exceptions, in the establishment of corners and the marking of lines of the public surveys.

(This copy of the "Oregon Manual" is taken from an original volume now in the possession of the National Archives.)

INSTRUCTIONS TO THE SURVEYOR GENERAL OF OREGON; BEING A MANUAL FOR FIELD OPERATIONS.

WASHINGTON:
GIDEON AND CO., PRINTERS.
1851.

TO THE SURVEYOR GENERAL OF PUBLIC LANDS IN OREGON.

Under the provisions of the third section of the act of Congress "to reorganize the General Land Office," approved July 4th, 1836, it is made the duty of the officer therein styled PRINCIPAL CLERK OF SURVEYS, "to direct and superintend the making of surveys, the returns thereof, and all matters relating thereto, which are done through the offices of the Surveyors General;" and pursuant to such authority, and by direction of the COMMISSIONER OF THE GENERAL LAND OFFICE, the following MANUAL OF INSTRUCTIONS, as to field duties, has been prepared for your own government and that of the DEPUTY SURVEYORS whom you may employ in the surveying service. These embrace three different heads, as illustrated by the accompanying map and diagrams, marked A, B, C.

First. The preparations preliminary to surveying into *townships* of the country between the Cascade mountains and the Pacific coast, after having run and established the principal meridian and base lines, as prescribed by the act of 27th September last, creating your office. And these are by means of lines run, at stated intervals, parallel to the principal base, and which are called standard parallels, as shown by the map C.

Second. The subsequent *division* of the country into townships of six miles *square,* of 23,040 acres, "as nearly as may be." And such division has to be effected in reference to the *true meridian,* by methods which keep in view the convergency on their north of the meridional lines.

Third. The *subdivisional* survey of the townships into the minor tracts of a mile square, called "sections," containing 640 acres; and those of a half-mile square, called "quarter sections," containing a proportional quantity. Also the subdivisional survey of *anomalous lots*, having small *water fronts*, and extending *back* for quantity, as authorized in certain cases by special enactments.

The true position of *boundary corners*, on line, is determined by the accurate measurement of the mile and half-mile stations; and wherever the line is arrested by causes recognised by law, [whether such be navigable streams or public or private boundary lines,] the "legal subdivision," whatever it be, becomes a *fractional* tract of the same denomination it would bear if entire.

The subdivisions of the public lands, which are known to the surveying laws, but the corners of which are *not marked* in the field at the public expense, are those of the "*half quarter* section," of eighty acres, and the "*quarter quarter* section," of forty acres; and also the subdivisions of a certain class of sections termed "*fractional,*" containing 160 acres or over. And these last mentioned are shown by *protraction* on the official plats of survey, and are laid down on them

at distances having relation to the established corner boundaries, which determine their legal position.

The "half section," of 320 acres, comprises *two* "quarter sections," adjoining east and west, or north and south.

The aim of the instructions is to attain—

SIMPLICITY in the work, by dispensing, everywhere, with *double* corners except on the lines termed "standard parallels," which govern the surveys starting from them:

UNIFORMITY, by requiring the *boundary monuments* to be constructed and established according to like methods under like circumstances; and

PERMANENCY, by requiring those monuments to be so evidenced by collateral testimony, that in case the principal should be destroyed by time or accident, its legal witnesses, of unmistakeable import, *shall be there.* Thus the place of a township or section boundary POST, must be evidenced by *four* "bearing trees," if to be had, (one in *each* adjoining township or section, as the case may be,) whose course and distance, kind and diameter, *all* are to be given in the notes. The place of a boundary MOUND is to be evidenced by a *quadrangular trench* about its base, whose *angles* are to the cardinal points, where the corner is common to four; and whose *sides* are to face the points where the corner is common to two; besides which are the *four* PITS, (outside the trench,) from whence the *earth is dug* to form the mound. The earth spaded from the trench is to be thrown up on to its outer *edge,* so as to form a

continuous elevated margin, which will tend to make the work conspicuous, and, when covered with grass, will be enduring. And, in view of all possible causes of its decay or destruction, by time or accident, the mound will be evidenced *internally,* (and as a last resort for *legal* purposes,) by the deposit, *beneath* the earth's surface, at the precise *point* of the corner, of a *stone,* or a small portion of *charcoal,* or a small *charred stake.* Such deposit will occupy but a few moments of time in making it, and is to be identified with the corner by an appropriate citation in the notes.

The prescribed process for constructing mounds, however tedious it may suggest itself from the minute description, will, nevertheless, on practice, be found comparatively simple and easy. The mound is designed by law to perform an *enduring* office, and time *must* be taken to make it fulfil its legal intention. The *conscientious* DEPUTY, and his *faithful* ASSISTANTS, however remote and secluded from the eye of human surveillance, will, nevertheless, ever keep in view the USES, extending into the indefinite *future,* which *their* daily toil is designed by the laws of their country to accomplish for the *public* good, present and prospective; never losing sight of the important fact that their field work is destined *always* to remain identified with their respective NAMES and REPUTATION in their own field notes; and that the RECORD of their *fidelity* or their *falsity* will be one of their own composing; and, moreover, SEALED with the sanctity of their respective OATHS or affirmations,—two in each case—the first, for their faithful *intent* to execute their official trust before

entering upon duty; the second, (per act of August, 1846, herein quoted,) for having discharged that trust according to law and instructions, after returning from the field of operations.

This manual has been prepared amidst the pressure of other commanding duties, and its imperfections must hereafter be corrected. It is particularly regretted that, for want of time, the illustrative diagrams could not be lithographed to accompany it. The diagrams A and B will therefore have to be copied at your office for the use of your deputies.

A suggestion will be found, under the appropriate head, that, at MOUND corners, at least, the *seeds* of fruit trees might be planted, with the hope that, in a few brief years, *fruit bearing trees* may mark the place of the corner; and, indeed, the same might be done with advantage at *all* other corners. Your surveying corps will travel over some fields rarely, if ever before, trodden by the white man; and to the extent that such experiment could be made, successfully, in advance of the progressing settlements, would be to confer a benefit to civilization whilst performing a professional duty; and those engaged in the work might, themselves, not unreasonably, expect to reap some of its acceptable results.

I have the honor to be, sir,

Your obedient servant,
JOHN M. MOORE.
Principal Clerk of Surveys.

GENERAL LAND OFFICE,
March 3d, 1851.

Approved:

J. BUTTERFIELD,
Commissioner.

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SYSTEM

OF

RECTANGULAR SURVEYING.

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1. The public lands of the United States are ordinarily surveyed into rectangular tracts, bounded by lines conforming to the cardinal points.

2. The public lands are laid off, in the first place, into bodies of land of six miles square, called *Townships,* containing as near as may be 23,040 acres. The Townships are subdivided into thirty-six tracts called *Sections,* of a mile square, each containing, as near as may be, 640 acres. Any number or series of contiguous townships, situate north or south of each other, constitute a *Range.*

The law requires that the lines of the public surveys shall be governed by the true meridian, and that the townships shall be *six miles square,*—two things involving in connexion a mathematical impossibility—for, strictly to conform to the meridian, necessarily throws the township out of square, by reason of the convergency of meridians, and hence, by adhering to the true meri-

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dian, results the necessity of departing from the strict requirements of law as respects the precise area of townships, and the subdivisional parts thereof, the township assuming something of a trapezoidal form, which inequality developes itself, more and more as such, the higher the latitude of the surveys. It is doubtless in view of these circumstances that the law provides (see Sec. 2 of the act of May 18, 1796,) that the sections of a mile square shall contain the quantity of 640 acres, as nearly as may be; and, moreover, provides (see Sec. 3 of the act of 10th May, 1800,) in the following words: "And in all cases where the exterior lines of the townships, thus to be subdivided into sections or half sections, shall exceed, or shall not extend six miles, the excess or deficiency shall be specially noted, and added to or deducted from the western or northern range of sections or half sections in such township, according as the error may be in running the lines from east to west, or from south to north; the sections and half sections bounded on the northern and western lines of such townships shall be sold as containing only the quantity expressed in the returns and plats, respectively, and all others as containing the complete legal quantity."

The accompanying diagrams marked A & B, will serve to illustrate the method of running out the exterior lines of Townships as well on the *north* as on the *south* side of the base line, and also on the *east* and *west* sides of the meridian; and also shewing the method to be pursued in subdividing the townships into sections and quarter sections. The method here presented is de-

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signed to ensure as full a compliance with all the requirements, meaning, and intent of the surveying laws as, it is believed, is practicable.

In order to throw the excesses or deficiencies, as the case may be, on the *north* and on the *west* sides of a township according to law, it is necessary to survey the *section* lines from *south* to north on a true meridian, leaving the result in the northern line of the township to be governed by the convexity of the earth and the convergency of meridians, as illustrated in the diagram marked B.

3. The Townships are to bear numbers in respect to the base line either north or south of it; and the tiers of townships, called "Ranges," will bear numbers in respect to the meridian line according to their relative position to it, either on the east or west.

4. The thirty-six sections into which a township is subdivided are numbered, commencing with number *one* at the *northeast* angle of the township, and progressing west to number six, and thence progressing east to number twelve, and so on, alternately, until the number thirty-six in the southeast angle.

5. STANDARD PARALLELS (usually called correction lines), are established at stated intervals to provide for or counteract the error that otherwise would result from the convergency of meridians; and because the public surveys have to be governed by the true meridian, such lines serve also to arrest error arising from inaccuracies in measurements, which, however, must ever be studiously avoided. Such lines, when lying north of the principal base, themselves constitute a *base* to the sur-

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veys lying on the north of them; and where lying south of the principal base, they constitute the base for the surveys lying south of them.

7. In the portion of country in Oregon lying *north* of the Columbia river, it is proposed to have standard parallels run at distances of every *four townships,* or twenty-four miles; and *south* of that river, it is proposed to have such standard parallels at distances of every *five townships,* or thirty miles. Such standards will be found indicated on the accompanying sketch map.

Departures, under certain circumstances, from the ordinary method of subdividing public lands, have been warranted by law; and such it is designed, where cirstances shall indicate the propriety of so doing, to incorporate into the surveying system to be pursued in OREGON.

These are as follows:

By the second section of the act of Congress, approved March 3d, 1811, entitled "An act providing for the final adjustment of claims to lands, and for the sale of the public lands in the Territories of Orleans and Louisiana, and to repeal the act passed for the same purpose, and approved February sixteenth, one thousand eight hundred and eleven," it is required "that the two principal deputy sur-

veyors of the Territory of Orleans shall be, and they are hereby, authorized, in surveying and dividing such of the public lands in the said Territory, which are or may be authorized to be surveyed and divided, as are adjacent to any river, lake, creek, bayou, or water course, to vary the mode heretofore prescribed by law, so far as relates to the

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contents of the tracts, and to the angles and boundary lines, and to lay out the same into tracts, as far as practicable, of fifty-eight poles in front, and four hundred and sixty-five poles in depth, of such shape, and bounded by such lines, as the nature of the country will render practicable and most convenient."

By the act of Congress approved May 24th, 1824, entitled "An act changing the mode of surveying the public lands, or any river, lake, bayou, or water course," it is declared "that whenever, in the opinion of the President of the United States, a departure from the ordinary mode of surveying land on any river, lake, bayou, or water course, would promote the public interest, he may direct the Surveyor General, in whose district such land is situated, and where the change is intended to be made, under such rules and regulations as the President may prescribe, to cause the lands thus situated to be surveyed in tracts of two acres in width, fronting on any river, bayou, lake, or water course, and running back the depth of forty acres; which tracts of land, so surveyed, shall be offered for sale entire, instead of in half quarter sections, and in the usual manner, and on the same terms, in all respects, as the other public lands of the United States."

In those localities where it would best subserve the interests of the people to have fronts on the navigable streams, and running back into the uplands for quantity and timber, the principles of the act of May 24th, 1824, may be adopted, and you are authorized to enlarge the quantity, so as to embrace four acres front by forty in depth, forming tracts of one hundred and sixty

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acres. But in so doing it is designed only to survey the lines *between every four lots,* (or 640 acres,) but to establish the boundary posts, or mounds, *in front* and *in rear,* at the distances requisite to secure the quantity of 160 acres to each lot, either rectangularly, when practicable, or at oblique angles, when otherwise. The angle is not important, so that the principle be maintained, as far as practicable, of making the work to square in the rear with the regular sectioning.

Thus, whenever, in consequence of bends in the course of streams, the rear lines of the lots so formed will not be identical in one prolonged line, such, nevertheless, ought to be, and must be, wherever practicable, lines of right angles to the regular work in the rear. The form and figure of such lots will be fully delineated on your official maps, by platting their side lines. Circumstances may, however, exist where the rear lines cannot be at right angles to the square work.

The numbering of all anomalous lots will commence with No. 37, to avoid the possibility of conflict with the numbering of the regular sections.

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OF MEASUREMENTS, CHAINING, AND MARKING.

1. Where uniformity in the variation of the needle is not found, the public surveys must be made with an instrument operating independently of the magnetic needle. Burts' *improved solar compass,* or other instrument of equal utility, must be used of necessity in such cases; and it is deemed best that such instrument should be used under all circumstances. Where the needle can be relied on, however, the ordinary compass may be used in sub-dividing and meandering.

2. The township lines, and the sub-division lines, will usually be measured by a two-pole chain of thirty-three feet in length, consisting of fifty links, and each link being seven inches and ninety-two hundredths of an inch long. On uniform and level ground, however, the four-pole chain may be used. The deputy surveyor must also have with him a measure of the standard chain, wherewith to compare and adjust the chain in use from day to day with punctuality and carefulness; and must return such standard chain to the surveyor-general's office for examination when his work is completed.

3. The very best *marking tools* adapted to the purpose must be provided, to be used for marking, *neatly* and *distinctly,* all the letters and figures required to be made at corners.

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OF TALLY PINS.

4. You will use eleven tally pins made of steel, not exceeding fourteen inches in length, weighty enough towards the point to make them drop perpendicularly, and having a ring at the top, in which is to be fixed a piece of red cloth, or something else of conspicuous color, to make them readily seen when stuck in the ground.

PROCESS OF CHAINING.

5. In measuring lines, every *five* chains are called *"a tally,"* because at that distance the last of the ten tally pins with which the forward chainman set out will have been stuck. He then cries "tally;" which cry is repeated by the other chainman, and each registers the distance by slipping a thimble, button, or ring of leather, or something of the kind, on a belt worn for that purpose, or by some other convenient method. The hind chainman then comes up, and having counted in the presence of his fellow the tally pins which he has taken up, so that both may be assured that none of the pins have been lost, he then takes the forward end of the chain, and proceeds to set the pins. Thus the chainmen alternately change places, each setting the pins that he has taken up, so that one is forward in all the odd, and the other in all the even tallies. Such procedure, it is believed, tends to ensure accuracy in measurement, facilitates the recollection of the distances to objects on the line, and renders a mis-tally almost impossible.

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LEVELLING THE CHAIN AND PLUMBING THE PINS.

6. The length of every line you run, is to be ascertained by precise horizontal measurement, as nearly approximating to an air line as is possible in practice on the earth's surface. This all important object can only be attained by a rigid adherence to the three following observances:

1. Ever keeping the chain *stretched* to its utmost degree of tension on even ground.
2. On uneven ground, keeping the chain not only stretched as aforesaid, buy horizontally *levelled*. And when ascending and descending steep ground, hills, or mountains, the chain will have to be *shortened* to one-half its length, (and sometimes more) in order accurately to obtain the true horizontal measure.
3. The careful plumbing of the tally-pins, so as to attain precisely *the spot* where they should be stuck. The more uneven the surface, the greater the caution needed to set the pins.

MARKING LINES.

7. All lines on which are to be established the legal corner boundaries, are to be marked after this method, viz: Those trees which may intercept your line, must have two chops or notches cut on each side of them without any other marks whatever. These are called *"sight trees,"* or *"line trees."*

A sufficient number of other trees standing nearest to your line, on either side of it, are to be *blazed* on two sides, diagonally, or quartering towards the line, in order to render the line conspicuous, and readily to be

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traced, the blazes to be opposite each other, coinciding in direction with the line where the trees stand very near it, and to approach nearer each other, the further the line passes from the blazed trees. Due care must ever be taken to have the lines so well marked as to be readily followed.

ON TRIAL, OR RANDOM LINES,

the trees are not to be blazed, unless occasionally from indispensable necessity, and then it must be done so guardedly as to prevent the possibility of confounding the marks of the trial line with the *true*. But bushes and limbs of trees may be lopped, and *stakes set* on the trial, or random line, at every *ten* chains, to enable the surveyor on his return to follow and correct the trial line, and establish therefrom the *true line*. To prevent confusion, the temporary stakes set on the trial, or random lines, must be *pulled up* when the surveyor returns to establish the true line.

INSUPERABLE OBJECTS ON LINE—WITNESS POINTS.

8. Under circumstances where your course is obstructed by impassable obstacles, such as ponds, swamps, marshes, lakes, rivers, creeks, &c., you will prolong the line across such obstacles, by taking the necessary right angle offsets; or, if such be inconvenient, by a traverse or trigonometrical operation, until you regain the line on the opposite side. And in case a north and south, or a true east and west, line is regained in advance of any such obstacle, you will prolong and mark the line back to the obstacle so passed, and state all

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the particulars in relation thereto in your field book. And at the intersection of lines with both margins of impassable obstacles, you will establish a *Witness Point*, (for the purpose of perpetuating the intersections therewith,) by setting a post, and giving in your field book the course and distance therefrom, to two trees on opposite sides of the line, each of which trees you will mark with a blaze and notch facing the post; but on the margins of navigable water courses, or navigable lakes, you will mark the trees with the proper number of the frational section, township, and range.

ESTABLISHING CORNER BOUNDARIES.

To procure the faithful execution of this portion of a surveyor's duty is a matter of the last importance. After a true coursing, and most exact measurements, the corner boundary is the consummation of the work, for which all the previous pains and expenditure have been incurred. If, therefore, the corner boundary be not perpetuated in a workmanlike manner, the *great aim* of the surveying service will not have been attained. A boundary corner, in a timbered country, is to be a *tree*, if one be found at the precise spot; and if not, a *post* is to be planted thereat; and the position of the corner post is to be indicated by trees adjacent, the angular bearings and distances of which from the

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corner are facts to be ascertained and registered in your field book. (See article, "Bearing trees.")

In a region where stone abounds the corner boundary will be a small *monument of stones* along side of a single marked stone for a township corner—and a single stone for all other corners.

In a region where timber is not near, and stone not found, the corner will be a *mound of earth*, of prescribed size, varying to suit the case.

The following are the different points for perpetuating corners, viz:

1. For township, boundaries at intervals of every six miles.
2. For section, boundaries at intervals of every mile, or 80 chains.
3. For quarter section, boundaries at intervals of every half mile, or 40 chains.

[The half quarter section boundary is not marked in the field, but is regarded by the law as a point intermediate between the half mile or quarter section corners. See act of

24th April, 1820, entitled "An act making further provision for the sale of the public lands," which act refers to the act of Congress passed on the 11th of February, 1805, entitled "An act concerning mode of surveying the public lands of the United States, for the manner of ascertaining the corners and contents of half quarter sections.

MEANDER CORNER POSTS are planted at all those points where the township or section lines intersect the banks of such rivers, bayous, lakes, or islands, as are by law directed to be meandered.

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The courses and distances on meandered, navigable streams, govern the calculations wherefrom are ascertained the true areas of the tracts of land (sections, quarter sections, &c.) known to the law as *fractional*, and binding on such streams.

MANNER OF ESTABLISHING CORNERS BY MEANS OF POSTS.

Township, sectional, or mile corners, and quarter sectional or half mile corners, will be perpetuated by planting a post at the place of the corner, to be formed of the most durable wood of the forest at hand.

The posts must be set in the earth by digging a hole to admit them, *eighteen inches* deep, and must be very securely rammed in with earth, and also with stone, if any be found at hand. The portion of the post which protrudes above the earth must be *squared off* sufficiently smooth to admit of receiving the marks thereon, to be made with appropriate marking irons, indicating what it stands for. Thus the sides of *township corner posts* must square at least *three* inches, (the post itself being *four* inches in diameter,) and must protrude *two feet* at least above the ground; the sides of *section corner posts* must square at least *two* and a *half inches,* (the post itself being *three* and a *half* inches in diameter,) and protrude *eighteen* inches from the ground; and the *quarter section corner posts* and *meander corner posts* must be *three* inches wide, presenting *flattened* surfaces, and protruding *eighteen* inches from the ground.

Where a township post is a corner common to four

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townships, it is to be set in the earth diagonally, thus: N W ◇ E S, and the cardinal points of the compass are to be indicated thereon by a cross line, or wedge, (one-eighth of an inch deep at least,) cut or sawed out of its top, thus: N W ⊕ E S

On each surface of the post is to be marked the number of the particular township, and its range, which it *faces*. Thus, if the post be a common boundary to four townships, say *one* and *two,* south of he base line, of range *one,* west of the meridian; also to townships *one* and *two*, south of the base line of range *two*, west of the meridian, it is to be marked thus:

From N. to E.	R. 1 W. T. 1 S. S. 31		from E. to S.	1 W. 2 S. 6
From N. to W.	2 W. 1 S. 36		from W. to S.	2 W. 2 S. 1

These marks are not only to be distinctly but *neatly* cut (chiselled) into the wood, at least the eighth of an inch deep; and to make them yet more *conspicuous* to the eye of the anxious explorer, the faithful deputy must apply to all of them a *streak of red chalk*. The *number* of the *sections* which they respectively *face,* will *also be marked* on the township post.

Section or mile posts, being corners of sections, and where such are common to *four* sections, are to be set *diagonally* in the earth, (in the manner provided for township corner posts,) and with a similar cross cut in the top, to indicate the cardinal points of the compass;

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and on each side of the squared surfaces (made smooth, as aforesaid, to receive the marks) is to be marked the appropriate *number* of the particular one of the *four sections*, respectively, which such side *faces*; also on one side thereof are to be *marked* the numbers of its *township* and *range*; and to make such marks yet more *conspicuous*, (in manner aforesaid,) a streak of *red chalk* is to be applied.

In the case of an isolated township, subdivided into thirty-six sections, there are twenty-five interior sections, the southwest corner boundary of each of which will be *common* to four sections. On all the extreme sides of an isolated township, the outer tiers of sections have corners *common* only to *two* sections then surveyed. The posts, however, must be planted precisely like the former, and presenting two *vacant* surfaces to receive the appropriate marks when the adjacent survey may be made.

A quarter section or half mile post is to have no other mark on it than ¼ S., to indicate what it stands for.

NOTCHING CORNER POSTS.

Township corner posts are to be notched with *six* notches on each of the four angles of the squared part set to the cardinal points.

All mile posts on *township lines* must have as many notches on them, on two opposite *angles* thereof, as they are miles distant from the township corners, respectively. Each of the posts at the corners of sections in the *interior* of a township must indicate, by a number of notches on each of its four corners directed to the cardinal points, the corresponding number of miles that it

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stands from the *outlines* of the township. The four sides of the post will indicate the number of the section they respectively *face*. Should a tree be found at the place of any corner, it will be marked and notched, as aforesaid, and answer for the

corner in lieu of a post—the kind of tree and its diameter being given in the field notes.

BEARING TREES.

The position of all corner posts, or corner trees, of whatever description, which may be established, is to be perpetuated in the following manner, viz: From such post or tree the courses shall be taken, and the distances measured, to two or more adjacent trees, in opposite directions, as nearly as may be, which are called *"bearing trees,"* and are to be blazed near the ground, with a large blaze facing the post, and have one notch in it, neatly and plainly made with an axe, square across, and a little below the middle of the blaze. The kind of tree and the diameter of each are facts to be distinctly set forth in the field book.

On each bearing tree the letters B. T., to denote the fact of its being a bearing tree, must be distinctly cut into the wood, in the blaze, a little above the notch, or on the bark, with the number of the range, township, and section.

At all township corners, and at all section corners, on range or township lines, *four* bearing trees are to be marked in this manner, one in each of the adjoining sections.

At interior section corners *four* trees, one to stand

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within each of the four sections to which such corner is common, are to be marked in manner aforesaid, if such be found.

A tree supplying the place of a corner post is to be marked in the manner directed for posts; but if such tree should be a beech, or other *smooth bark* tree, the marks may be made on the *bark*.

From quarter section and meander corners two bearing trees are to be marked, one within each of the adjoining sections.

Where the requisite number of "bearing trees" is not to be found at convenient and suitable distances, such as are found are to be marked as herein directed; but in all such cases of deficiency in the number of bearing trees, (unless, indeed, the boundary itself be a tree,) a *quadrangular trench*, with sides of *five* feet, and with the angles to the cardinal points, must be spaded up outside the corner, as a centre, and the earth carefully thrown on the inside, so as to form a range of earth, which will become covered with grass, and present a small square elevation, which in aftertime will serve to mark, unmistakeably, the spot of the corner.

CORNER STONES.

Where it is deemed best to use STONES for boundaries, in lieu of posts, you may, at *any* corner, insert endwise into the ground, to the depth of 7 or 8 inches, a stone, the number of cubic inches in which shall not be less than the number contained in a stone 14 inches long, 12 inches wide, and 3 inches thick—the edges

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of which must be set north and south, on north and south lines, and east and west, on east and west lines—the dimensions of each stone to be given in the field notes at the time of establishing the corner.

MARKING CORNER STONES.

Stones at township corners (a small monument of stones being alongside thereof) must have *six* notches cut with a pick or chisel on each edge or side towards the cardinal points; and where used as section corners on the range and township lines, or as section corners in the interior of a township, they will also be notched by a pick or chisel, to correspond with the directions given for notching posts similarly situated.

Stones, when used as quarter section corners, will have ¼ cut on them—on the west side on north and south lines, and on the north side on east and west lines.

MOUNDS.

Whenever bearing trees are not found, mounds of earth, or stone, are to be raised *around posts* on which the corners are to be marked in the manner aforesaid. Wherever a mound of earth is adopted, the same will present a conical shape; but at its base, on the earth's surface, a *quadrangular trench* will be dug; by the "trench" (here meant) is to be understood a *spade deep* of earth thrown up from the four sides of the line, *out side* the trench, so as to form a *continuous elevation along outer edge*. In mounds of earth, common to *four* townships or to *four* sections, they will present the angles of the quadrangular trench *(diagonally)*

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towards the cardinal points. In mounds, common only to *two* townships or *two* sections, the *sides* of the quadrangular trench will *face* the cardinal points. The sides of the quadrangular trench at the base of a township mound are to be *six* feet, the height of mound *three* feet.

At section, quarter section, and meander corners, the sides of the quadrangular trench at base of mounds are to be *five* feet, and the conical height *tmo and a half feet.*

Prior to piling up the earth to construct a mound, there is to be dug a spade full or two of earth from the corner boundary point, and in the *cavity*, so formed, is to be deposited a *stone*, or a portion of *charcoal*, (the quantity whereof is to be noted in the Field Book;) or in lieu of charcoal or stone, a *charred stake* is to be driven twelve inches down into such centre point; either of those will be a *witness* for the future, and whichever is adopted the fact is to be noted in the Field Book.

When mounds are formed of *earth*, the spot from which the earth is taken is called the *"Pit,"* the centre of which ought to be, wherever practicable, at a uniform distance and in a uniform direction from the centre of the mound. There is to be a "pit" on *each* side of every mound, distant eighteen inches outside of the trench. The trench may be expected hereafter to be covered by tufts of grass, and thus to indicate the place of the mound, when the mound itself may have become obliterated by time or accident.

At meander corners the "pit" is to be directly on the line, *eight links* further from the water than the mound. Wherever necessity is found for deviating

from these rules in respect to the "pits," the course and distance to each is to be stated in the Field Books.

Perpetuity in the mound is a great desideratum. In forming it with light alluvial soil the surveyor may find it necessary to make due allowance for the future settling of the earth, and thus making the mound more elevated than would be necessary in a more compact and tenacious soil, and increasing the base of it. In so doing, the relative proportions between the township mound and other mounds is to be preserved as nearly as may be.

The earth is to be pressed down with the shovel during the process of piling it up. Mounds are to be *covered* with sod, grass side up, where sod is to be had; but, in forming a mound, sod is never to be wrought up with the earth, because sod decays, and in the process of decomposing it will cause the mound to become porous, and therefore liable to premature destruction.

POSTS IN MOUNDS

Must be squared, and show above the top of the mound some ten or twelve inches, and if the mound be a township or section corner common to *four* townships, or common to *four* sections, or if the same be a corner common to *two* townships or to *two* sections, the post therein must be planted, marked, and notched, in mode and manner prescribed for ordinary *posts* in similar situations.

In quarter section mounds the posts will bear the designation ¼ S.

MOUND MEMORIALS.

Beside the *charcoal, stone,* or *charred stake,* one or the other of which must be lodged in the earth at the point of the corner, the deputy surveyor is specially enjoined to plant *midway* between each pit and the trench, seeds of some tree, (those of fruit trees adapted to the climate being always to be preferred,) so that, in course of time, should such take root, a small clump of trees may possibly hereafter note the place of the corner. The facts of planting such seed, and the kind thereof, are matters to be truthfully noted in the Field Book.

WITNESS MOUNDS TO TOWNSHIP OR SECTION CORNERS.

If a township or section corner, in a situation where bearing or witness trees are not found within a reasonable distance therefrom, shall fall within a ravine, or in any other situation where the nature of the ground, or the circumstances of its locality, shall be such as may prevent, or prove unfavorable to, the erection of a mound, you will perpetuate such corner by selecting, in the immediate vicinity thereof, a suitable plot of ground as a site for a bearing or *witness mound* and erect thereon, a mound of earth in the same manner and conditioned in every respect, with *charcoal, stone,* or *charred stake,* deposited beneath, as before directed; and measure and state, in your Field Book, the distance and course from the position of the true corner of the bearing or witness mound so plased and erected.

DOUBLE CORNERS ON STANDARD PARALLELS.

One being called "Standard Corners" and the others "Closing Corners."

Such corners are to be found nowhere except on the Standard Parallels or Corrrection lines, whereon are to appear both the corners which mark the intersections of the lines which close thereon, and those from which the surveys start in the opposite direction. Those lines are to be parallels to the principal base line, and therefore parallels of latitude. On those lines, and at the time of running the same, the township, mile, and half-mile, corners are to be planted, and each of these is a corner common to *two,* [whether township or section corners,] and must be so marked. [As remarked under the proper head, the quarter sectional corner is to be a *flattened* post protruding two feet from the surface with no other mark than ¼ S.]

The corners which are established on the standard parallel, at the time of running it, are to be known as *"Standard Corners,"* and, in addition to all the *ordinary* marks, (as herein prescribed,) they will be marked with the letters S. C.

The standard parallels are designed to be run *in advance* of the contiguous surveys, but circumstances may exist which will *impede,* or temporarily delay, the *due* extension of the standard; and when, from uncontrollable causes, the *contiguous townships* must be surveyed in advance of the time of extending the standard, in any such event, it will become the duty of the deputy who shall afterwards survey any such standard

lying *north* of the principal base line, to plant thereon the *double sett* of corners, to wit, the standard corners to be marked S. C., and the closing ones which are to be marked C. C.; and to make such measurements as may be necessary to connect the closing corners, and complete the unfinished meridional lines of such contiguous and prior surveys, on the principles herein set forth, under the different heads of "Exterior or Township Lines," and "Description of the mode of laying off and surveying Interior or Section Lines."

You will recollect that the corners, (whether township or mile corners,) which are *common to two,* (two townships, or two sections,) are not to be planted *diagonally* like those which are common to *four*, but with the flat sides facing the cardinal points, and on which the marks and notches are made as usual. This, it will be perceived, will serve yet more fully to distinguish the standard parallels from all other lines

THE MEANDERING OF NAVIGABLE STREAMS.

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1. Standing with the face looking down stream, the bank on the *left* hand is termed the "left bank," and that on the *right* hand the "right bank." These terms are to be universally used to distinguish the two banks of a river or stream.

2. Both banks of *navigable* rivers are to meandered by taking the courses and distances of their sinuosities, and the same are to be entered in the "*meander* field book."

At those points where either the township or section lines intersect the banks of a navigable stream, POSTS, or, where necessary, MOUNDS of *earth or stone*, are to be established at the time of running these lines. These are called "meander corners;" and in meandering you are to commence at one of those corners on the township line, coursing the banks, and measuring the distance of each course from your commencing corner to the next "meander corner," upon the same or another boundary of the same township; carefully noting your intersection with all intermediate meander corners. By the same method you are to meander the opposite bank of the same river.

When establishing the MEANDER CORNERS on one

bank of a *navigable* stream, *sight must be taken across* to determine the *precise spot* for planting corresponding corners in *line*, on the *opposite* bank thereof; and such spot must be signalized by a substantial, *temporary* STAKE, square across at top; and whenever, at any subsequent period, the surveyor shall meander the opposite bank of such stream, a permanent POST or MOUND, as already prescribed, will then and there be planted, in lieu of such temporary stake.

When surveying to *the river*, in the opposite fraction of same township, such *pre-established* meander corner must be reached by first running a random line thereunto, ascertaining the amount of its deviation from the corner, and correcting accordingly.

The crossing distance *between* the MEANDER CORNERS, on same line, is to be ascertained by triangulation, in order that the river may be protracted with entire accuracy. The particulars to be given in the field notes.

3. You are also to meander, in manner aforesaid, all *lakes* and deep ponds of the area of twenty-five acres and upwards; also navigable bayous; *shallow* ponds, readily to be drained, or likely to dry up, are not to be meandered.

You will notice all streams of water falling into the river, lake, or bayou you are surveying, stating the width of the same at their mouth; also all springs, noting the size thereof and depth, and whether the water be pure or mineral; also the head and mouth of all bayous; and all islands, rapids, and bars are to be noticed, with intersections to their upper and lower points to establish their exact situation. You will also

note the elevation of the banks of rivers and streams, the heights of falls and cascades, and the length of rapids.

4. The precise relative position of islands, in a township made fractional by the river in which the same are situated, is to be determined trigonometrically—sighting to a flag or other fixed object on the island, from a special and carefully measured base line, connected with the surveyed lines, on or near the river bank you are to form connexion between the meander corners on the river to points corresponding thereto, in direct line, on the bank of the island, and there establish the proper meander corners, and calculate the distance across.

5. In meandering lakes, ponds, or bayous, you are to commence at a meander corner upon the township line, and proceed as above directed for the banks of a navigable stream. But where a lake, pond, or bayou lies entirely within the township boundaries, you will commence at a meander corner established in subdividing, and from thence take the course and distance of the entire margin of the stream, noting the intersection with all the meander corners previously established thereon.

6. To meander a pond lying entirely within the boundaries of a section, you will run and measure *two* lines thereunto from the nearest section or quarter section corner on *opposite* sides of such pond, giving the courses of such lines. At *each* of the points where such lines shall intersect the margin of such pond, you will establish a *witness* point, by fixing a post in the ground, and

raising a mound around it, and taking bearings to any adjacent trees. The relative position of these points being thus definitely fixed in the section, the meandering will commence at one of them, and be continued to the other, noting the intersection, and thence to the beginning. The proceedings are to be fully entered in the field book.

7. In taking the connexion of an island with the main land, when there is no meander corner in line, opposite thereto, to sight from, you will measure a special base from the meander corner nearest to such island, and from such base you will triangulate to some fixed point on the shore of the island, ascertain the distance across, and there establish a *special* meander corner, wherefrom you will commence to meander the island. When surveying on the opposite side of such river, you will there take another connexion with the island, but no corner need be planted.

8. Your field notes of meanders in any one township are to follow immediately after the notes of the subdivision thereof. They are to state and describe particularly the meander corner from which they commenced, each one with which they close, and are to exhibit the meanders of each fractional section separately; following, and composing a part of such notes, will be given a description of the land, timber, depth of inundation to which the bottom is subject, and the banks, current, and bottom of the stream or body of water you are meandering.

9. No blazes or marks of any description are to be made on the lines meandered beteen the established

corners, but the utmost care must be taken to pass no object of topography, or *change therein*, without giving a particular description thereof in its proper place in your meander notes.

OF FIELD BOOKS.

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1. The FIELD NOTES afford the elements from which the plats and calculations in relation to the public surveys are made. They are the source wherefrom the description and evidence of locations and boundaries are officially delineated and set forth. They, therefore, must be a faithful, distinct, and minute record of every thing officially done and observed by the surveyor and his assistants, pursuant to instructions, in relation to running, measuring, and marking lines, establishing boundary corners, &c.; and present, as far as possible, a full and complete *topographical description* of the country surveyed, as to every matter of useful information, or likely to gratify public curiosity.

These notes must be plainly and neatly written out; be free from blurs, blots, and interlineations; the language precise and clear; the figures, letters, words, and meaning, unmistakeable.

2. There will be sundry separate and distinct field books of surveys, as follows:

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Field notes of the MERIDIAN and BASE lines, showing the establishment of the *township, section* or mile, and *quarter section* or half mile, boundary corners thereon; with the crossings, of streams, ravines, hills, and mountains; character of soil, timber, minerals, &c. These notes will be arranged, in series, by *mile stations,* from number *one* to number _____.

The mile stations will include the operations at the intermediate half mile stations or quarter section corners, and those will be designated ¼ S. Within each mile station will be shown (or, otherwise, be referred to in another book, to be called the *geodetic* field book) *all* the operations appertaining to the station; and each station will exhibit the operations therein, *complete* in *itself,* either by insertion or reference.

[1]Wherever the *levelling* station on line is not the *regular* mile or half mile station, such will be designated alphabetically, *a, b, c, &c.* The levelling operations, triangulations from legal stations, and the angles of altitude and depression of the points triangulated to, will be set forth, in full detail, in the geodetic field book.

3. Field notes of the "STANDARD PARALLELS, or correction lines," will show the establishment of the township, section, and quarter section corners, besides exhibiting the topography of the country on line, as required on the base and meridian lines.

4. Field notes of the EXTERIOR lines of TOWNSHIPS, showing the establishment of the corners on line, and the topography, as aforesaid.

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5. Field notes of the SUBDIVISIONS of TOWNSHIPS into sections and quarter sections; at the close whereof will follow the notes of the MEANDERS of navigable streams. These notes will also show, by *ocular* observation, the estimated rise and fall of the land on the line. A description of the timber, undergowth, surface, soil, and minerals, upon each section line, is to follow the notes thereof, and not to be mixed up with them.

[1]6. The GEODETIC FIELD BOOK will comprise all the operations in ascertaining the width of the streams; the lateral triangulations to remote and distinguishing objects; the angles of apparent altitude or depression of points triangulated to, from the base and meridian lines, or other objects viewed from line. In the same book will be shown the operation and results of the *levelling* on line, at each mile or half mile station, or special station *a, b, c, &c.*; and therein will also appear the barometrical observations in determining the elevation of hills and mountains. From the LINE FIELD BOOKS, and at the appropriate stations, specific references to matters not affecting surface measurements on line, will be made to a corresponding place or page in the "GEODETIC FIELD BOOK" for the full exhibition of the former in all necessary details. Therein will be noted, station by station, in *series,* as they occur, [and at necessary intermediate special stations *a, b, c,* as respects levelling,] all matters of geodesy with which the regular field book will not be encumbered. Each entry in this book will

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be *complete in itself*—separated by a black line from every other—be arranged by stations in series, with cross references between each one to the corresponding entry in the other.

The field notes must, in all cases, be taken precisely in the order in which the work is done on the ground, and the *date* of each day's work must follow immediately after the notes thereof. The *variation of the needle* must always occupy a *separate line* preceding the notes of measurements on line.

The exhibition of every mile of surveying, whether on township or subdivisional lines, must be *complete in itself,* and be separated by a black line drawn across the paper.

The description of the Surface, Soil, Minerals, Timber, Undergrowth, &c., on *each mile* of line, is to follow the notes of survey of such line, and not be mixed up with them.

No abbreviations of words are allowable, except of such words as are *constantly* occurring, such as *"sec."* for *"section;" "in., diam.,"* for *"inches, diameter;" "chs."* for *"chains;" "lks."* for *"links;" "dist."* for *"distant,"* &c. Proper names must never be abbreviated, however often their recurrence.

The nature of the subject matter of the field book is to form its first and title page, showing the State or Territory where the survey lies, by whom surveyed, the date of commencement and date of completion of the work. Between the second and third pages of the line field books a diagram is to be placed, (disconnectedly,) showing the distances on line at the crossings of

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streams of water, and the direction of each by an arrow head pointing down stream; also the intersection on line by Prairies, Marshes, Swamps, Ravines, Lakes, Hills, and all other matters indicated by the notes, to the fullest extent they can be so illustrated. In the field book of SUBDIVISIONS OF TOWNSHIPS the illustrative diagram will show,

1. This book embraces matters treated of in special instructions.

in neat and small figures, the length of the section lines, with all objects set forth in the notes; the outlines of the area occupied by timber, prairies, swamps, &c., to be shown, as nearly as may be, by *dotted* lines.

SUMMARY of objects and data required to be noted:

1. The precise length of every line run, noting all necessary offsets therefrom, with the reason and mode thereof.

2. The kind and diameter of all *"bearing trees,"* with the course and distance of the same from their respective corners; and the precise relative position of WITNESS CORNERS to the true corners.

3. The kind of materials (earth or stone) of which MOUNDS are contructed—the fact of their being conditioned according to instructions—with the course and distance of the *"pits,"* from the centre of the mound, where necessity exists for deviating from the *general* rule.

4. *Trees on line.* The name, diameter, and distance on line to all trees which it intersects.

5. Intersections by line of *land objects.* The distance at which the line first intersects and then leaves every *settler's claim and improvement*; prairie; river, creek, or other "bottom;" or swamp, marsh, grove,

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and wind fall, with the course of the same at both points of intersection; also the distances at which you begin to ascend, arrive at the top, begin to descend, and reach the foot of all hills and ridges, with their courses, and *estimated* height, in feet, above the level land of the surrounding country, or above the bottom lands, ravines, or waters near which they are situated.

6. Intersections by line of *water objects.* All rivers, creeks, and smaller streams of water which the line crosses; the distance on line at the points of intersection, and their *widths on line.* In cases of *navigable streams,* their width will be ascertained between the *meander corners*, as set forth under the proper head.

7. The land's *surface*—whether level, rolling, broken, or hilly.

8. The *soil*—whether first, second, or third rate.

9. *Timber*—the several kinds of timber and undergrowth.

10. *Bottom lands*—to be described as wet or dry, and if subject to inundation, state to what depth.

11. *Springs of water*—whether fresh, saline, or mineral, with the course of the stream flowing from them.

12. *Lakes* and *ponds*—describing their banks, and giving their height, and also the depth of water, and whether it be pure or stagnant.

13. *Improvements.* Towns and villages; Indian towns and wigwams; houses or cabins; fields or other improvements; sugar tree groves, sugar camps, mill seats, forges and factories.

14. *Coal* banks or beds; *peat* or turf grounds; *mine-*

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rals and ores; with particular description of the same as to quality and extent, and all *diggings* therefor; also *salt* springs and licks. All reliable information you can obtain respecting these objects, whether they be on your immediate line or not, is to appear in the general description to be given at the end of the notes.

15. *Roads* and *trails*, with their directions, whence and whither.

16. Rapids, cataracts, cascades or falls of water, with the height of their fall, in feet.

17. Precipices, caves, sink-holes, ravines, stone quarries, ledges of rocks, with the kind of stone they afford.

18. *Natural curiosities,* interesting fossils, petrifactions, organic remains, &c.; also all ancient works of art, such as mounds, fortifications, embankments, ditches, or objects of like nature.

19. The *variation* of the needle must be noted at all points or places on the lines where there is found any material *change* of variation, and the position of such points must be perfectly identified in the notes.

20. Besides the ordinary notes taken on line, (and which must always be written down on the spot, leaving nothing to be supplied by memory,) the deputy will subjoin, at the conclusion of his book, such further description or information touching any matter or thing connected with the township (or other survey) which he may be able to afford, and may deem useful or necessary to be known—with a *general description* of the township in the *aggregate*, as respects the face of the country, its soil and geological features, timber, minerals, waters, &c.

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SPECIAL INSTRUCTION RESPECTING THE NOTING OF SETTLER'S CLAIMS.

The law requires that such claims should be laid down temporarily on the township plats; in order to do which, it is indispensably necessary to obtain, to some extent, connexions of these claims with the lines of survey. Under the head of "intersection by line of land objects," the deputy is required to note the *points* in line *whereat* it may be intersected by such claims; but, in addition thereto, there must be obtained at least *one angle* of each claim, with its course and distance, either from the point of intersection, or from an established corner boundary, so that its connexion with the regular survey will be legally determined. If the settler's *dwelling* or barn is visible from line, the bearings thereof should be carefully taken from *two* points noted on line, and set forth in the field notes.

AFFIDAVITS TO FIELD NOTES.

21. At the close of the notes and the *general description* (as above) is to follow an affidavit, a form for which is given below; and, to enable the deputy surveyor fully to understand and appreciate the responsibility under which he is acting, his attention is invited to the provisions of the third section of the act of Congress, approved August 8th, 1846, entitled "An act to equalize the compensation of the Surveyors General of the public lands of the United States, and for other purposes," and which is as follows:

"Sec. 3. That the Surveyors General of the public

lands of the United States, in addition to the oath now authorized by law to be administered to deputies on their appointment to office, shall require each of their deputies, on the return of his surveys, to take and subscribe an oath or affirmation that those surveys have been faithfully and correctly executed, according to law and the instructions of the Surveyor General; and on satisfactory evidence being presented to any court of competent jurisdiction, that such surveys, or any part thereof, had not been thus executed, the deputy making such false oath or affirmation shall be deemed guilty of perjury, and shall suffer all the pains and penalties attached to that offence; and the District Attorney of the United States for the time being, in whose district any such false, erroneous, or fraudulent surveys shall have been executed, shall, upon the application of the proper Surveyor General, immediately institute suit upon the bond of such deputy; and the institution of such suit shall act as a lien upon any property owned or held by such deputy, or his sureties, at the time such suit was instituted."

Following the "general description" of the township is to be "A list of the names of the individuals employed to assist in running, measuring, or marking the lines and corners described in the foregoing field notes of township No. _____ of the BASE LINE of range No. _____ of the WILLAMETTE MERIDIAN, showing the respective capacities in which they acted."

(Here will be inserted their *names* and respective *capacities,* by whatever name such are designated, followed by their)

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CERTIFICATE.

"We hereby certify that we assisted _____, Deputy Surveyor, in subdividing township number _____ of BASE LINE of range number _____ of the WILLAMETTE MERIDIAN, and that said township has been, in all respects to the best of our knowledge and belief, well and faithfully surveyed, and the boundary monuments planted according to the instructions furnished by the Surveyor General."

A. B., *Chainman,*
C. D., *Chainman,*
E. F., *Axeman,*
G. H., *Axeman,*
I. K., *Compassman.*

Subscribed and sworn to by the above named persons, before me, at _____ this _____ day of _____ 185__
_____, *Justice of the Peace,*
Or any other officer authorized to administer oaths.

Following such certificate in every Field Book, is to appear the affidavit of the deputy himself in form as follows:

"I, _____ _____, Deputy Surveyor, do solemnly swear, (or affirm,) that in pursuance of a contract with JOHN B. PRESTON, Surveyor General of public lands of the United States in the Territory of OREGON, bearing date the _____ day of _____ A.D. 185__, and in strict conformity to the laws of the United States,

and the instructions furnished by the said Surveyor General, I have faithfully surveyed
WILLAMETTE MERIDIAN, in the teritory aforesaid, and do further solemnly swear, (or affirm,) that the foregoing are the true and original Field notes of such survey."

_____ _____ *Deputy Surveyor.*

Subscribed by said _____, Deputy Surveyor, and sworn to before me, at _____, this _____ day of _____ 185__.
_____ _____, *Justice of the Peace.*
Or any other officer authorized to administer oaths.

The phraseology of the foregoing forms, (which is adapted to subdivisions of townships,) will be correspondingly modified to suit the circumstances of the surveying work on the base and meridian lines, on standard parallels, and on township exteriors.

FORM OF OATHS BEFORE ENTERING UPON DUTY.

FOR A DEPUTY SURVEYOR.

"I, A. B., having been appointed a Deputy Surveyor of the lands of the United States in the Territory of Oregon, solemnly swear (or affirm) that I will well and faithfully, and to the best of my skill and ability, and according to the laws of the United States, and the instructions of the Surveyor General, perform the duties so confided to me, as I shall answer to God at the great day."

A_____ B_____.

Sworn and subscribed before me, at county of _____, in the Territory of Oregon, this _____ day of _____, A.D. 185__.

E_____ F_____,
Justice of the Peace.

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FORM FOR CHAINMEN.

"I, C. D., having been appointed a chainman in the service of A. B., Deputy Surveyor in Oregon, do solemnly swear, (or affirm,) that in all surveys of public lands or private land claims in which I shall be so employed, that I will level the chain in measuring over uneven ground, and well and truly plumb the tally pins, whether sticking or dropping the same; and that I will report the true distance to all notable objects, and the true length of all lines that I may assist in measuring and will mark correctly and distinctly the letters and numbers of all corners that I may be required to mark; and that I will faithfully act as required by said deputy, from time to time, in planting the corner boundaries, whether the same be posts or mounds, either of earth or stone; together with such other services as I shall be called to perform by said deputy in

the discharge of his surveying duties, to the best of my skill and ability; so help me God."

C_____ D_____.

Sworn and subscribed before me, at _____, county of _____, in the Territory of Oregon, this _____ day of _____, A.D. 185__.

E_____ F_____, or
G_____ H_____,
Justice of the Peace.

The oaths of all others, whether designated as axemen, flagbearers, markers, &c., are to be varied to suit the case; each, however, retaining this general clause, viz: *"and that I will otherwise faithfully act as required by said deputy from time to time, in planting the corner boundaries, whether the same be* POSTS, or MOUNDS *of earth or stone; together with such other services* as I shall be called to perform by said deputy in the discharge of his surveying duties.

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EXTERIORS OR TOWNSHIP LINES.

The principal meridian, the base line, and the standard parallels having been first run, measured, and marked, according to instructions, on true meridians, and true parallels of latitude, the process of running, measuring, and marking the exterior lines of townships will be as follows:

Townships situated NORTH of the base line, and WEST of the principal meridian.

Commence at No. 1, (see the red figures on diagram A,) being the southwest corner of T. 1 N—.R. 1 W.; as established on the base line; thence north, on a true meridian line, four hundred and eighty chains, establishing the mile and half-mile corners thereon, as per instructions, to No. 2, whereat establish the corner of Tps. 1 and 2 N—.Rs. 1 and 2 W.; thence east, on a random or trial line, setting *temporary* mile and half-mile stakes, to No. 3, where measure and note the distance at which the line intersects the eastern boundary, north or south of the *true* or established corner. Run and measure westward, on the true line, (taking care to note all the land and water crossings, &c., as per instructions,) to No. 4, which is identical with No. 2, establishing the mile and half-mile PERMANENT CORNERS on said line, the last half-mile of which will fall short of forty

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chains, about the amount of the calculated convergency per township. Should it ever happen, however, that such random line materially falls short, or overruns in length, or intersects the eastern boundary of the township at any considerable distance from the *true* corner thereon, (either of which would indicate an important error in the surveying,) the lines must be *retraced,* even if found necessary to remeasure the meridional boundaries of the township (especially the western boundary,) so as to discover and correct the error; in doing which, the *true corners* must be established and marked, and the *false ones* destroyed and obliterated, to prevent confusion in future; and *all the facts* must be distinctly set forth in the notes. Thence proceed in a similar manner from No. 4 to No. 5, No. 5 to No. 6, No. 6 to No. 7, and so on to No. 10, the southwest corner of T. 4 N.—R. 1 W. Thence north, still on a true meridian line, establishing the mile and half-mile corners, until reaching the STANDARD PARALLEL or correction line; throwing the *excess* over, or *deficiency* under, *four hundred and eighty chains,* on the *last* half-mile, according to law, and at the intersection establishing the "CLOSING CORNER," the distance of which *from* the standard corner must be measured and noted as required by the instructions. But should it ever so happen that some impassable barrier will have prevented or delayed the extension of the standard parallel along and above the field of present survey, then the deputy will plant, in place, the corner for the township, subject to correction thereafter, should such parallel be extended.

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NORTH of the base line, and EAST of the principal meridian.

Commence at No. 1, (red figure) being the *southeast* corner of T. 1 N—.R. 1 E., and proceed as with townships situated "north and west," except that the *random* or trial lines will be run and measured *west,* and the *true* lines, east, throwing the excess over or deficiency under four hundred and eighty chains on the *west* end of the line, as required by law; wherefore, the surveyor will commence his measurement with the length of the deficient or excessive half section boundary on the west of the township, and thus the remaining measurements will all be *even* miles and half-miles.

SOUTH of the base line, and WEST of the principal meridian.

Commence at No. 1, the *northwest* corner of township 1 S., range 1 W., and proceed *due south* in running and measuring line, establishing and marking the mile, half mile, and township corners thereon, precisely in the method prescribed fr running NORTH and WEST, with the exception that, in order to throw the excess or deficiency [over or under four hundred and eighty chains] of the *western* boundaries of such of those townships as *close on the standard parallel,* on the *south,* upon the most *northern half mile* of the townships, according to law, the proceeding will be as follows, viz:

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THE MODE OF CLOSING ON THE STANDARD PARALLEL.

The western (meridional) boundary line of every township closing on the standard, (being every *fifth* one,) will be carefully run *south,* on a true meridian, until it intersects the standard, planting stakes and making distinctive marks on line trees, in sufficient number to serve as *guides* in afterwards retracing the line *north* with ease and certainty. At the point of the line's intersection of the standard, the surveyor will establish the *"closing"* (southwest) corner of the township, noting in his field book its distance and direction

from the "standard corner." Then starting from such "closing corner," he will proceed *north* on the line identified by the guide stakes and marks, measuring such line, and establishing thereon the *mile* and *half mile* stations, and noting, as he goes, all the land and water crossings, &c., as elsewhere directed. The surveyor, when nearing the standard, should avoid marking any trees south of it, and obliterate any which inadvertently may be made. The guide stakes are to be pulled up as he proceeds north.

SOUTH of the base line, and EAST of the principal meridian.

Commence at No. 1, at the northeast corner of township 1 S., range 1 E., and proceed precisely as with the townships situated "south and west," except that the *random* lines will be run and measured *west*, and the *true* lines *east;* the deficiency or excess of the measurements being, as in all other cases, thrown upon the most western half mile of line.

Description of the mode of laying off and surveying the interior or sectional lines of all townships, however situated in reference to the BASE and MERIDIAN lines.

Commence at No. 1, (see *red figures* on diagram B,) the corner established on the township boundary for sections 1, 2, 35, and 36; thence *north* on a true meridian; at 40 chains setting the half mile or quarter section post, and at 80 chains (No. 2) establishing and marking the corner of sections 25, 26, 35, and 36. Thence east, on a *random* line, to No. 3, setting the temporary quarter section post at 40 chains, noting the measurement to No. 3, and the measured distance of the random's intersection *north* or *south* of the true or established corner of sections 25, 36, 30, and 31, on the township boundary. Thence *correct, west,* on the *true* line to No. 4, setting the quarter section post on this line exactly at the *equidistant point,* now known, between the section corners indicated by the red figures Nos. 3 and 4. Proceed, in like manner, from No. 4 to No. 5, 5 to 6, 6 to 7, and so on to No. 16, the corner to sections 1, 2, 11, and 12. Thence *north,* on a random line, to No. 17, setting a temporary quarter section post at 40 chains, noting the length of the whole line, and the measured distance of the random's intersection *east* or *west* of the true corner of sections 1, 2, 35 and 36, established on the township boundary;

thence *southwardly* from the latter, on a true line, noting the course and distance to No. 18, the established corner to sections 1, 2, 11, and 12, taking care to establish the quarter section corner on the true line, at the distance of 40 chains from said section corner, so as to throw the *excess* or *deficiency* on the northern half mile, according to law. Proceed in like manner through all the intervening tiers of sections to No. 73, the corner to sections 31, 32, 5, and 6; thence *north,* on a true meridian line, to No. 74, establishing the quarter section corner at 40 chains, and at 80 chains the corner to sections 29, 30, 31, and 32; thence *east,* on a random line, to No. 75, setting a temporary quarter section post at 40 chains, noting the measurement to No. 75, and the distance of the random's intersection *north* or *south* of the established corner of sections 28, 29, 32, and 33; thence *west* from said corner, on the true line, setting the quarter section post at the equidistant point, to No. 76, which is identical with 74; thence *west,* on a random line, to No. 77, setting a temporary quarter section post at 40 chains, noting the measurement to No. 77, and the distance of the random's intersection with the western boundary, *north* or *south* of the established corner of sections 25, 36, 30, and 31; and from No. 77 correct *eastward,* on the true line, *giving its course,* but establishing the quarter section post, on this line, so as to retain the distance of 40 chains from the corner of sections 29, 30, 31, and 32; thereby throwing the *excess* or *deficiency* of measurement on the most western half mile. Proceed *north,* in a similar manner, from No. 78 to 79, 79 to 80, 80 to

81, and so on to 96, the southeast corner of section 6, where, having established the corner for sections 5, 6, 7, and 8, run thence, successively, on random lines *east* to 95, *north* to 97, and *west* to 99; and by reverse courses *correct on true lines back* to said *southeast* corner of section 6, establishing the quarter section corners, and noting the courses, distances, &c., as before described.

EXCEPTIONS from the above method, in townships contiguous to standard parallels.

In every township SOUTH of the principal base line, which *closes* on a standard parallel, the deputy will begin at the *southeast* corner of the township, and measure *west* on the standard, establishing thereon the *mile* and *half-mile* corners, and noting their distances from the pre-established corners. He then will proceed to subdivide, as directed under the above head; and,

In the townships NORTH of the principal base line, which *close* on the standard parallel, the sectional lines must be closed on the standard by true meridians, instead of by course lines, as directed under the above head for townships otherwise situated; and the connexions of the closing corners with the pre-established standard corners are to be ascertained and noted. Such procedure does away with any necessity for running the randoms. But in case he is unable to close the lines on account of the standard not having been run, from some inevitable necessity, as heretofore men-

tioned, he will plant a *temporary* stake, or mound, at the end of the *sixth* mile, thus leaving the lines and their connexions to be finished, and the *permanent* corners to be planted, at such time as the standard shall be extended.

[Page -48- is blank.]

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EXAMPLE

OF THE

FIELD NOTES

OF

THE EXTERIOR LINES

OF

AN ISOLATED TOWNSHIP.

Field notes of the Survey of township 25 north, of range 2 west, of the the Willamette meridian, in the Territory of OREGON, by Robert Acres, deputy surveyor, under his contract No. 1, bearing date the 2d day of January, 1851.

Ch. lks.		Feet.
[2]	TOWNSHIP LINES commenced January 20, 1851.	
	Southern boundary variation 18° 41′ E.	
East.	On a random line on the south boundaries of sections 31, 32, 33, 34, 35, and 36. Set temporary mile and half mile posts, and intersected the eastern boundary 2 chains 20 links north of the true corner 5 miles 74 chains 53 links.	
	Therefore the correction will be 5 chains 47 links W. 37.1 links S. per mile.	
[3]	TRUE SOUTHERN BOUNDARY variation 18° 41′ E.	
West	On the southern boundary of sec. 36, Jan. 24, 1851.	
40.00	Set qr. sec. post from which	a 10
	a beech 24 in. dia. bears N. 11 E. 38 lks. dist.	
	a do 9 do do S 9 E. 17 do	
62.50	a brook 8 l. wide, course NW	d 10
80.00	Set post cor. of secs. 35 & 36, 1 & 2, from which	a 5
	a beech 9 in. dia. bears S. 46 E. 8 l. dist.	
	a do 8 do do S. 62 W. 7 do.	
	a W. oak 10 do do N. 19 W. 14 do.	
	a B. oak 14 do do N. 22 E. 16 do.	
	Land level, part wet and swampy; timber beech, oak, ash, hickory, &c	

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.		Feet.
[4] West	On the S. boundary of sec. 35—	
40.00	Set qr. sec. post, with trench, from which	a 10
	a beech 6 in. dia. bears N. 80 E. 8 l. dist.	
	planted SW. a yellow locust seed.	
65.00	To beginning of hill	a 5
80.00	Set post, with trench, cor. of secs. 34 & 35, 2 & 3, from which	a 20
	a beech 10 in. dia. bears S. 51 E. 13 l. dist.	
	Do 10 do do N. 56 W. 9 do.	
	planted SW. a white oak acorn.	
	NE. a beech nut.	
	Land level, rich, and good for farming; timber same, some walnut and poplar.	
[5] West	On the S. boundary of sec. 34—	
40.00	Set qr. sec. post with trench, from which	a 5
	a B. oak 10 in. dia. bears N. 2 E. 635 l. dist.	
	Planted SW. a beech nut.	
80.00	To corner of sections 33, 34, 3 and 4, drove charred	a 10
	stakes raised mound with trench as per instructions, and	
	Planted NE. a W. oak ac'n; NW. a yel. locust seed; SE. a butternut; SW. a beech nut.	
	Land level, rich and good for farming, some scattering oak and walnut.	
[6] West	On the south boundary of section 33—	
40.00	Set qr. section post, deposited one quart of charcoal	d 5
	raised mound with trench as per instructions, and	
	Planted NE. a beech nut; NW. a white oak acorn; SE. a W. O. ac'n; SW. a yel. locust seed.	
62.00	To foot of hill	d 20
80.00	To corner sections 32, 33, 4 and 5, deposited a flint boulder 9 in. diam., raised mound with trench as per instructions, and	d 10
	Planted NE. a hickory nut; NW. a walnut; SE. 4 chesnuts; SW. 4 beech nuts.	
[7] West	On the south boundary of section 32—	
37.50	A creek 20 links wide, course N	d 10
40.00	Set qr. sec. stone, a granite 14 X 4 in. with trench as per instructions, and	a 5
	Planted NE. a walnut; NW. a butternut; SE. a beech; SW. a black oak acorn.	

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.		Feet.
[8] 76.00	To swamp	d 15
80.00	To corner secs 31, 32, 5 & 6, in deep swamp, therefore N. 42° E. 200 links dist., raised	level
	Witness mound with trench as per instructions, and	
	Planted NE. 4 beech nuts; NW. 4 B. oak acorns; SE. 2 beech nuts; SW. 2 beech nuts.	
	Land rich bottom, part wet.	
[9] West.	On the south boundary of section 31—	
50	A brook 10 l. wide, course south	level
11.00	To beginning of bluff	a 30
40.00	Set qr. sec., post from which	a 50
	a sugar 27 in. dia. bears S. 81 W. 42 l. dist.	
	a beech 24 do do S. 71 E. 24 do.	
54.00	To rocky bluff	d 30
57.50	A spring branch NW	d 10
61.00	Enter swamp	level
70.00	Passed do	level
74.73	To township corner 24 and 25 N., Rs. 2 and 3 W., land 1st rate, scattering sugar and beech	level

2. Random tp. S. boundary.
3. Timbered corners.
4. Deficient timbered corners.
5. Mound section corner.
6. Mound corners.
7. Stone corner.
8. Wit. sect. cor's.
9. Pre-established Tp. corner.

[3]	East boundary, var. 17° 51′ E., January 25, 1851.	
North.	On the E. boundary of section 36—	
1.00	A brook 5 l. wide, course NW	d 10
18.00	To foot of hill	a 15
20.00	To rocky bluff	a 50
40.00	Set qr. sec., post from which	a 60
	a beech 13 in, dia. bears N. 36 E. 22 l. dist.	
	a poplar 20 do do S. 39 E. 42 do.	
55.00	To rocky bluff	d 40
72.50	A brook 10 l. wide, course NW	d 20
80.00	Set post cor. sect. 25, 36, 30, and 31, from which	a 15
	a beech 24 in. dia. bears S. 38 E. 12 l. dist.	
	a sugar 12 do do N. 81 W. 25 do.	
	a poplar 15 do do N. 20 E. 40 do.	
	a W. oak 9 do do S. 40 W. 60 do.	
	North ½ mile rich and good for farming, south ¼ mile part wet.	
[3] North.	On the E. boundary of sec. 25—	
6.00	To foot of hill	a 15
40.00	Set qr. sec. stone, a rose quartz 15 X 3 in., from which	a 25
	a poplar 60 in. dia. bears S. 42 W. 11 l. dist.	
	a beech 9 do do N. 40 W. 3 do.	

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.		Feet.
80.00	Set post cor. of secs. 24, 25, 19, and 80, from which	a 20
	a beech 12 in. dia. bears S. 32 W. 26 l. dist.	
	a do 20 do do N. 64 E. 41 do.	
	a W. oak 10 do do N. 30 W. 13 do.	
	a do 11 do do S. 34 E. 48 do.	
	Land nearly first rate; timber, sugar, beech, walnut, elm, &c.	
[3] North.	On the E. boundary of section 24—	
40.00	Set qr. sec. post, from which	d 40
	a buckeye 10 in. dia. bears S. 48 W. 6 l. dist.	
	a do 14 do do N. 39 E. 27 do.	
44.00	To road from Williamsburg to Astoria	d 5
49.00	A creek 150 l. wide, course W	d 20
57.00	A brook 10 l. wide do S.W	level
80.00	Set stone 16 X 2 in., cor. secs. 13 and 24, 18 and 19, from which	a 15
	a walnut 8 in. dia. bears S. 8 W. 5 l. dist.	
	a do 9 do do N. 18 W. 29 do.	
	a beech 6 do do S. 20 E. 40 do.	
	a do 12 do do N. 30 E. 50 do.	
	Land same as on the last mile.	
[3] North.	On the E. boundary of sec. 13—	
14.00	To foot of hill	a 15
40.00	Set qr. sec. post, from which	a 30
	a cherry 10 in. dia. bears N. 35 W. 2 l. dist.	
	a do 10 do do S. 52 E. 21 do.	
80.00	Set post cor. of secs. 12, 13, 7, and 18, from which	a 50
	a sugar 10 in. dia. bears S. 42 E. 23 l. dist.	
	a hickory 20 do do N. 39 W. 38 do.	
	a do 15 do do N. 40 E 14 do.	
	a beech 12 do do S. 36 W. 16 do.	
	Land level, part wet and swampy; timber, oak, beech, lynn, elm, &c.	

3. Timbered corners.

[3] North.	On the E. boundary of sec. 12—	
7.00	To second ledge of hill	a 50
40.00	Set qr. sec. post, from which	a 30
	a W. ash 10 in. dia. bears N. 35 W. 15 l. dist.	
	an elm 10 do do S. 83 E. 2 do.	
68.00	To steep bluff	a 50

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.		Feet.
80.00	Set post cor. of secs. 1, 12, 6, and 7, from which	a100
	a beech 10 in. dia. bears S. 40 E. 6 l. dist.	
	a do 10 do do N. 40 W. 28 do.	
	an elm 12 do do N. 46 E. 30 do.	
	a hickory 10 do do S. 55 W. 40 do.	
	Land similar to last mile.	
[10] North.	On the E. boundary of sec. 1—	
9.00	To steep bluff	d100
40.00	Set qr. sec. post, from which	d 50
	a poplar 9 in. dia. bears N. 76 E. 7 l. dist.	
	a do 9 do do S. 22 E. 15 do.	
44.00	To open prairie	d 30
80.00	To cor. tps. 25 and 26 N., Rs. 1 and 2 W. Drove a charred stake	d 10
	Raised mound with trench, as per instructions, and Planted NW. 4 chestnuts. SW. 2 hickory nuts. NE. 4 cherry stones. SE. 4 W. oak acorns.	
	Land very rich and good for farming; timber 1st half mile, beech, sugar, ash, walnut, &c.; last half mile, prairie.	
[11] East.	Northern boundary, var. 18° 41′ E.— On a RANDOM line on the north boundaries of sections 6, 5, 4, 3, 2, 1, [at 190 c. 09 l. to right bank of Chickeeles river where offset 7 c. 63 l. north, and at 30 c., came back to line at left bank of river,] set temporary mile and half mile posts, and intersected E. boundary at 25 l. N. of true corner of tps. 25 and 26 N., R. 1 and 2 W. 5 m. 76 c. 53 l. Therefore the correction will be 3 c. 47 l. W. 4.2 l. S. per mile.	
[12]	True north boundary, var. 18° 41′ E.	
West.	On the northern boundary of sec. 1, Jan. 27, 1851.	
24.50	A brook 12 l. wide, course N	a 10
40.00	Set qr. sec. post from which	d 10
	a beech 24 in. dia. bears N. 11 E. 38 l. dist.	
	a do 9 do do S. 9 W. 19 do.	
80.00	Set stone (a rose quartz) 12 X 3, from which	d 20
	a buckeye 9 in. dia. bears N. 66 E. 15 l. dist.	
	an elm 36 do do S. 65 W. 8 do.	
	an elm 20 do do N. 4 W. 10 do.	
	a buckeye 10 do do S. 40 E. 20 do.	
	Land level and first rate timber; beech, sugar, walnut, elm, oak, &c.	

3. Timbered corners.

6. Mound corners.

10. Mound with fruit trees.

11. Random township line.

12. Stone cor. with bearing trees.

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Township 25 N., Range W., Willamette Mer.

Ch. lks.		Feet.
[3] West.	On N. boundary of sec. 2—	
40.00	Set qr. sec. post, from which	d 20
	a W. oak 9 in. dia. bears N. 24 E. 28 l. dist.	
	a buckeye 11 do do S. 48 W. 9 do.	
80.00	Set post cor. of secs. 2, 3, 34, and 35, from which	d 15
	a sugar 27 in. dia. bears N. 44 W. 30 l. dist.	
	a do 14 do do S. 30 E. 14 do.	
	a do 15 do do N. 46 E. 15 do.	
	a beech 16 do do S. 35 W. 16 do.	
	Land same as on the last mile.	
[6] West.	On the N. boundary of sec. 3—	
9.00	Enter wet prairie	d 10
17.00	Beautiful spring branch SW	level
22.00	Passed prairie	level
40.00	Set qr. sec. post, from which	a 10
	a W. walnut 6 in. dia. bears N. 64 E. 7 l. dist.	
	a do 12 do do S. 73 W. 31 do.	
75.00	Enter prairie	d 10
80.00	To cor, secs. 3, 4, 33, and 34 drove a charred stake	level
	Raised mound, with trench, as per instructions, and	
	Planted NW. a W. oak ac'n; SW. a wild cherry stone. NE. a beech nut; SE. a butternut.	
	Land same as on last mile.	
[13] West.	On N. boundary of sec. 4—	
2.00	A spring branch 3 l. wide, course N	level
3.50	Passed prairie	a 5
21.50	A spring branch 15 l. wide, course NW	d 5
40.00	A B. walnut 30 in. dia. stands for qr. sec. cor., from which	level
	a buckeye 9 in. dia. bears S. 45 E. 11 l. dist.	
46.44	Set post on left bank of Chickeeles river, from which	level
	an elm 8 in. dia. bears N. 71 E. 5 l. dist.	
	an elm 9 do do S. 19 W. 6 do.	
	The line running in the river, an offset was made due north of 7 c. 63 l.; and at 30 c. came back to true line.	
[14] 76.44	Set post on right bank of river Chickeeles, in John Burton's claim, from which	level
	a cherry 6 in. dia. bears N. 61 E. 17 l. dist.	
	a sugar 23 do do west 20 l.	
80.00	Set post, cor. to secs. 4, 5, 32, and 33, in John Burton's claim, from which	a 20
	a hackberry 7 in. dia. bears N. 67 E. 17 l. dist.	

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.		Feet.
	a sugar 19 in. dia. bears N. 71 W. 43 l. dist.	
	a beech 20 do do S. 20 E. 50 do.	
	a locust 14 do do S. 30 W. 16 do.	
	Land first rate river bottom.	
[15] West.	On N. boundary of sec. 5—	
24.40	A W. oak 16 in dia	a 10
40.00	Set qr. sec. post, from which	a 10
	a hickory 8 in. dia. bears N. 88 E. 40 l. dist.	
	a mulberry 14 do do N. 69 W. 103 do.	
42.73	A B. ash 15 in. dia	a 3
44.58	Intersect lower boundary line of John Burton's claim, 640 acres, as near as could be ascertained; course SE	a 3
80.00	Set post, cor. of secs. 5, 6, 35, and 36, from which	d 10
	a sugar 19 in. dia. bears N. 89 E. 60 l. dist.	
	an elm 14 do do N. 12 W. 24 do.	
	an elm 15 do do S. 14 W. 23 do.	
	a sugar 16 do do S. 15 E. 26 do.	
	Land broken, and first rate; timber, sugar, walnut, and oak, und'gr. elm and spice.	
[16] West.	On the N. boundary of sec. 6	
8.00	To swamp	d 10
13.26	A R. oak 33 in. dia	level
34.30	A hickory 18 in. dia	level
40.00	Set qr. sec. post, from which	level
	a burr oak 27 in. dia. bears N. 49 E. 46 l. dist.	
	a sugar 20 do do N. 56 W. 60 do.	
48.65	A stream 14 l. wide, course S	level
67.40	A W. oak 28 in dia	level
76.53	To established cor. tps. 25 and 26, rs. 2 and 3 W	level
	Land level, second rate; timber, oak and hickory, und'gr. hazel and hickory. Jan. 28, 1851.	
[17]	West boundary, variation 18° 56′ E.	
North.	On the west boundary of sec. 31—	
8.56	Set post on left bank of Willamette river, from which	d 20
	a hackberry 11 in. dia., bears N. 50 E. 11 l. dist.	
	a sycamore 60 do do S. 15 W. 24 do	
34.50	Set post meander cor. on right bank of river in Henry William's claim of 640 acres, from which	level
	a beech 10 in. dia., bears S. 2 E. 12 l. dist.	
	a B. oak 12 do do N. 80 W. 16 do	

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.		Feet.
80.00	Set post corner of secs. 30, 31, 25, and 36 in Henry William's claim	a 20
	a beech 14 in. dia., bears N. 20 E. 14 l. dist.	
	a do 16 do do S. 40 W. 16 do	
	a hickory 9 do do N. 25 W. 12 do	
	a W. oak 10 do do S. 44 E. 20 do	
[18] North.	On west boundary of sec. 30—	
27.73	Set post, meander cor., on right bank of Chickeeles river in H. William's reserve	d 20
	a willow 6 in. dia. bears S. 50 E. 11 l. dist.	
	a do 5 do do S. 65 lks.	
	Then as follows, to Upper river corner of William's claim, S. W. as pointed out— N. 20 W. 2 chs. N. 35 W. 4 chs. N. 25 W. 8 chs. N. 40 W. 10 chs.	
39.00	Set post, meander corner, on left bank of Chickeeles river, from which	level
	a hickory 8 in. dia. bears N. 72 W. 8 l. dist.	

3. Timbered corners.
6. Mound corners.
13. A corner tree.
14. Offset at river.
15. Claim line intersected.
16. Trees on line.
17. Through a claim.
18. Connexion to claim corner.

	a W. oak 8 do do N. 44 E. 17 do	
40.00	Set qr. sec. post, from which	level
	a hickory 9 in. dia. bears N. 16 E. 16 l. dist.	
	a buckeye 10 do do S. 16 E. 18 do	
80.00	Set post cor. of secs. 19, 30, 24, and 25, from which	a 20
	a sugar 15 in. dia. bears N. 49 W. 4 l. dist.	
	an elm 6 do do N. 82 E. 25 do.	
	an do 9 do do S. 42 W. 30 do.	
	a sugar 10 do do S. 55 E. 45 do.	
	Land rich, and good for farming.	
[19]North.	On the W. boundary of sec. 19—	
32.50	A hackberry 20 in. diam. at the meander cor. on left bank of Chickeeles river	d 20
40.00	Qr. sec. corner in river, from which	level
	a beech 12 in. dia. N. 40 E. 95 l. dist.	
	a do 14 do S. 55 E. 120 do.	
51.80	Set post at meander corner on right bank of Chickeeles river, from which	level
	a lynn 15 in. dia. bears N. 28 W. 32 l. dist.	
	a poplar 15 do do S. 61 W. 78 do	
80.00	Set post cor. of sec. 18, 19, 13, and 24, from which	a 20
	a R. oak 27 in. dia. bears S. 26 W. 20 l. dist.	
	a W. oak 17 do do N. 64 W. 18 do.	
	a do 18 do do N. 55 E. 24 do.	
	a R. oak 15 do do S. 29 E. 40 do.	
	Land rolling, 2d rate; timber oak, hickory; un'gr. oak and sassafras.	

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.		Feet.
North.	On the W. boundary of sec. 18—	
21.88	A R. oak 20 in. dia.	a 10
38.60	A W. oak 24 do	a 18
40.00	Set qr. sec. post, from which	a 2
	a W. oak 23 in. dia. bears S. 28 W. 92 l. dist.	
	a do 22 do do N. 27 W. 26 do	
68.37	A B. walnut 21 in. dia.	a 15
80.00	Set post cor. secs. 7, 18, 12, and 13, from which	a 5
	a buckeye 16 in. dia. bears S. 40 W. 55 l. dist	
	a do 8 do do N. 53 W. 40 do.	
	a R. oak 10 do do S. 44 E. 50 do.	
	a W. oak 12 do do N. 55 E. 68 do.	
	Land level, 1st rate; timber walnut, buckeye, and sugar; und'gr. sugar and elm.	
[20]North.	On W. boundary of sec. 7—	
15.18	A W. oak 15 in. dia.	d 10
30.26	A do 21 do	d 5
40.00	Set qr. sec. post, from which	d 5
	a W. oak 12 in. dia. bears S. 13 W. 60 l. dist.	
	a do 15 do do N. 35 W. 55 do.	
68.37	A B. walnut 21 in. dia	d 10
80.00	Set post cor. of secs. 6, 7, 1, 2, from which	d 15
	a W. oak 18 in. dia. bears S. 52 W. 20 l. dist.	
	a do 18 do do N. 54 W. 51 do.	
	a do 16 do do N. 58 E. 60 do.	
	a hickory 14 do do S. 64 E. 42 do.	
	Land gently rolling, 2d rate, timber oak, hickory; und'gr. hazel and oak.	
[21]North.	On W. boundary of sec. 6—	
3.00	Enter stoney barrens and swamp	d 10
40.00	Set qr. sec. cor., a quartz stone 13 X 4 in. with trench, as per instructions, from which	d 15
	a beech 20 in. dia. bears S. 44 E. 95 l. dist.	
	Planted NW. 6 honey locust seed.	
61.11	A dry ditch 10 l. wide.	
80.00	To corner of Tps. 25 and 26 N. Rs. 2 and 3. W.	level
	set stone, a granite 18 X 6 in., raised	level
	stone mound with trench, as per instructions, and	
	Planted NW. 4 chestnuts. NE. 6 beechnuts. SW. a W. oak acorn. SE. 4 do.	
	January 29th, 1851.	

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EXAMPLE

OF THE

FIELD NOTES

OF THE

SUBDIVISIONAL OR SECTIONAL LINES

AND

MEANDERS.

Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.		Feet.
	SUBDIVISIONS. Commenced February 1, 1851.	
[22]North.	Between secs. 35 and 36—	
9.19	A beech 30 in. dia	d 10
29.97	A beech 30 in. dia	d 5
40.00	Set qr. sec. post, from which	d 5
	a beech 15 in. dia. bears S. 48 E. 12 l. dist.	
	a do 8 do do N. 23 W. 45 do.	
51.90	A beech 18 in dia	d 5
76.73	A sugar 30 in. dia	d 8
80.00	Set a post cor. of secs. 25, 26, 35, 36, from which	d 2
	a beech 24 in. dia. bears N. 62 W. 17 l. dist.	
	a poplar 36 do do S. 66 E. 34 do.	
	a do 20 do do S. 70 W. 50 do.	
	a beech 28 do do N. 60 E. 45 do.	
	Land level, second rate; timber, beech, poplar, sugar, and und'gr. spice, &c.	
[23] East.	On random between secs. 25 and 36—	
9.00	A brook 30 l. wide, course N	d 10
15.00	To foot of hill	a 10
40.00	Set temporary qr. sec. post	a 60
55.00	To opposite foot of hill	d 40
72.00	A brook 15 l. wide, course N	d 20
80.00	Intersect E. boundary at post	a 10
	Land level, second rate; timber, beech, oak, ash, &c., und'gr. spice, &c.	

19. Corner in river.

20. Trees in true line.

21. Stone mound at T'p corner.

22. True line.

23. Random.

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.		Feet.
[22] West.	On true line west, between secs. 25 and 36—	
40.00	Set qr. sec. post, at average dist. from which	
	a hickory 14 in. dia. bears N. 60 E. 27 l. dist.	
	a beech 15 do do S. 74 W. 9 do.	
80.00	To sec. cor.	
[22] North.	Between secs. 25 and 26—	
7.00	A poplar 40 in. dia	d 5
17.25	A brook 30 l. wide, course W	d 10
18.05	A walnut 30 in. dia	d 2
23.44	A brook 25 l. wide, course NE	d 5
40.00	Set qr. sec. post, from which	a 10
	a beech 10 in. dia. bears S. 72 W. 9 l. dist.	
	a B. oak 36 do do N. 42 E. 18 do.	
60.15	A beech 30 in. dia	a 5
80.00	Set post cor. of secs. 23, 24, 25, 26,	
	from which	a 10
	a sugar 12 in. dia. bears S. 42 E. 14 l. dist.	
	a do 12 do do N. 14 W. 31 do.	
	a W. oak 14 do do N. 50 E. 40 do.	
	a do 13 do do S. 38 W. 32 do.	
	Land level, second rate; timber, beech, walnut, ash, sugar, &c.; und'gr. spice, &c.	
[24] East.	On random between secs. 24 and 25—	
8.90	A stream 30 l. wide, course NW	d 10
12.00	To foot of hill	a 10
40.00	Set temp. qr. sec. post	a 50
48.00	To opposite foot of hill	d 50
60.50	A stream 30 l. wide, course NW	d 10
73.00	To foot of hill	a 10
80.12	Intersect E. boundary at post	a 50
	Land rolling, good second rate; timber, walnut, beech, elm, &c.; und'gr. spice, &c.	
[22] West.	On true line between secs. 24 and 25—	
40.06	Set qr. sec. post, at aver. dist. from which	
	a beech 18 in. dia. bears N. 74 W. 25 l. dist.	
	a do 16 do do S. 73 E. 22 do.	
80.12	To sec. cor.	
[25] North.	Between secs. 23, 24—	
6.70	A W. oak 20 in. dia	d 10
9.65	A stream 40 l. wide, course NW	d 5

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.		Feet.
13.15	A brook 25 l. wide, course NE	level
16.00	A brook 25 l. wide, course NW	level
35.00	To south boundary of Henry Thompson's claim,	
	S. 76 E. 2 c. 20 l. to southeast corner of	
	claim as pointed out	a 15
40.00	Set qr. sec. post in H. Thompson's claim,	
	from which	d 10
	a cottonwood 18 in. dia. bears S. 7 W. 7 l. dist.	
	a W. walnut 24 do do S. 22 E. 4 do.	
40.35	A stream 125 links wide, course NW	level
54.08	To road from Astoria to Williamsburg	a 30
58.00	Enter wet prairie	d 15
68.00	Leave do and enter timber land	level
72.12	A W. oak 30 in. dia	a 10
80.00	Set post cor. of secs. 13, 14, 23, and 24, from which	a 2
	an elm 8 in. dia. bears S. 67 W. 16 lks dist.	
	a W. waln't 24 do do N. 59 E. 27 do.	
	a W. oak 16 do do N. 42 E. 15 do.	
	a B. oak 14 do do S. 38 E. 17 do.	
	First half mile hilly second rate land; second half mile first rate; timber, walnut, buckeye, oak; and undergrowth, spice, &c.	
East	On random between sections 13 and 24—	
14.00	To east boundary of H. Thompson's claim as	
	pointed out, course NE	a 15
40.00	Set temporary quarter section post	a 10
80.00	Intersect east boundary 16 links S. of post	a 20
	Land first rate; timber, walnut, sugar, elm, buckeye, oak, &c.; undergrowth, spice, &c.	
West	On true line between sections 13 and 24—	
40.00	Set qr. sec. post at an average distance,	
	from which	
	a sugar 30 in. dia. bears N. 80 W. 22 l. dist.	
	a W. oak 16 do do S. 53 E. do.	
80.00	To sec. corner.	
North	Between sections 13 and 14—	
6.17	A W. oak 30 in dia	a 10
22.15	A beech 30 do	a 10
40.00	Set quarter section post, from which	a 20
	a beech 24 in. dia. bears N. 66 W. 6 links dist.	
	a do 20 do do S. 45 E. 40 do.	

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.		Feet.
42.25	To northern boundary line of H. Thompson's	
	claim, course NW	a 5
52.25	A beech 24 in. dia	a 5
62.61	A B. oak 30 do	a 5
80.00	Set post cor. of secs. 1, 2, 11, and 12,	
	from which	a 20
	a sugar 30 in dia. bears S. 32 W. 25 lks. dist.	
	a B. oak 36 do do N. 53 E. 10 do.	
	a W. oak 20 do do S. 24 E. 20 do.	
	a B. oak 21 do do N. 20 W. 35 do.	
	Land level, second rate; timber, beech, oak, ash; and undergrowth, spice, &c.	
East	On random between sections 12 and 13—	
40.00	Set temporary quarter section post	a 50
80.10	Intersect east boundary 13 links north of post	a 50
	Land level, second rate; timber, beech, black oak, and undergrowth, spice, &c.	
West	On true line between sections 12 and 13—	
40.05	Set quarter section post at average dist.,	
	from which	
	an elm 24 in. dia. bears N. 51 E. 50 lks. dist.	
	a beech 18 do do S. 51 W. 29 do.	
80.10	To sec. corner.	
North	Between sections 11 and 12—	
10.81	An elm 15 in. dia	a 10
40.00	Set quarter section post, from which	a 5
	a beech 30 in. dia. bears N. 33 W. 9 lks. dist.	
	a do 20 do do S. 64 W. 20 do.	
52.25	A beech 24 do	level
62.61	A B. oak 30 do	d 10

22. **True line.**

24. Random line.

25. Claim noted.

80.00	Set post corner of secs. 1, 2, 11, and 12, from which	d 10
	a sugar 30 in. dia. bears S. 32 W. 25 lks. dist.	
	a poplar 36 do do N. 43 E. 25 do.	
	a do 32 do do N. 41 E. 30 do.	
	a sugar 21 do do S. 35 E. 40 do.	
	Land level, good second rate; timber, sugar, poplar, walnut; and undergrowth, spice, &c.	
East.	On random between secs. 1 and 12—	
30.00	To second bluff of hill	a 50
40.00	Set temp. qr. sec. post	a 20

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.		Feet.
73.00	To steep bluff	a 50
80.25	Intersect E. boundary 13 l. N. of post	a100
	Level, 2d rate land; timber, beech, oak, sugar, &c.; open woods.	
West.	On true line between secs. 1 and 12—	
40.12½	Set qr. sec. post, at aver. dist. from which	
	a sugar 24 in. dia. bears S. 56 W. 25 l. dist.	
	a do 20 do do N. 20 E. 32 do	
80.25	To sec. cor.	
[26]North.	On random between secs. 1 and 2—	
6.82	A sugar 27 in. dia	a 10
40.00	Set temp. qr. sec. post	level
44.96	A beech 28 in. dia	d 10
62.94	A sugar 36 do	d 5
80.11	Intersect N. boundary 30 l. E. of true corner	d 10
	Land level; timber, walnut, sugar, beech, and open wood.	
[27]South.	48° E. on the true line between secs. 1 and 2—	
40.11	Set qr. sec. cor., from which	
	a sugar 14 in. dia. bears S. 49 E. 32 l. dist.	
	a W. oak 20 do do N. 31 W. 65 do	
80.11	To sec. corner.	
	February 3d, 1851.	
North.	Between secs. 34 and 35—	
6.56	A hickory 36 in. dia	d 10
23.00	To foot of hill	d 30
34.58	A walnut 38 in. dia	d 5
40.00	Set qr. sec. post, from which	d 5
	a beech 16 in. dia. bears S. 18 E. 13 l. dist.	
	a do 10 do do N. 69 W. 40 do.	
50.00	A maple 24 in. dia	d 10
75.86	An ash 24 do	d 10
80.00	Set post sec. cor. of secs. 26, 27, 34, & 35, from which	d 5
	a beech 14 in. dia. bears S. 67 E. 12 l. dist.	
	an ash 36 do do N. 52 W. 19 do.	
	an do 30 do do N. 40 E. 24 do.	
	a beech 16 do do S. 69 W. 41 do.	
	Land level; timber, beech, oak; undgr. spice, &c.	

26. Random for course line.

27. Course line.

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.		Feet.
East.	On random between 26 and 35—	
40.00	Set temp. qr. sec. post	d 10
80.00	Intersect N. and S. line 20 l. N. of true corner	d 10
	Land level; brushy timber, beech, elm, &c.; und'gr. spice, &c.	
West.	On the true line between 26 and 35—	
40.00	Set qr. sec. post at aver. dist., from which	
	a beech 14 in. dia. bears N. 56 E. 12 l. dist.	
	a do 12 do do S. 32 W. 32 do.	
80.00	To sec. cor.	
North.	Between secs. 26 and 27—	
8.47	An elm 20 in. dia	a 5
29.18	A lynn 34 do	a 5
40.00	Set qr. sec. post, from which	level
	a sugar 14 in. dia. bears S. 13 W. 31 l. dist.	
	a beech 12 do do N. 54 E. 27 do.	
46.37	A poplar 40 do	d 5
60.48	A B. oak 36 do	d 5
80.00	Set post cor. of secs. 22, 23, 26, adn 27, from which	d 10
	an ironwood 8 in. dia. bears S. 32 E. 24 l. dist.	
	a walnut 30 do do N. 36 W. 14 do.	
	a do 24 do do S. 24 W. 16 do.	
	a W. oak 31 do do N. 50 E. 13 do.	
	First half mile 2d rate, 2d half mile 1st rate land; timber, walnut, poplar, beech, &c., spices, &c.	
East.	On random between secs. 23 and 26—	
40.00	Set temp. qr. sec. post	a 10
48.00	A spring branch 8 l. wide, course NW	d 10
80.00	Intersect N. and S. line at post	a 10
	Land good, 2d rate; timber, poplar, beech, &c.; ugr. spice, &c.	
[28] West.	On the true line between secs. 23 and 26—	
40.00	Set qr. sec. post at aver. dist. from which	
	a beech 16 in. dia. bears N. 72 W. 18 l. dist.	
	a do 10 do do S. 72 W. 16 do.	
South.	To N. margin of lake where set post, from which	a 5
24.00	a beech 14 in. dia. bears N. 45 E. 10 l. dist.	
	a do 9 do do N. 15 W. 14 do.	

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.		Feet.
	Thence meander lakes as follows:	

S. 53° E.	17.75	
S. 3½ E.	13.00	
S. 29½ W.	8.00	
S. 65 W.	12.00	
N. 63½ W.	10.00	
N. 12 W.	21.00	Thence to ½ mile post on line between secs. 26 and 27 east 28 chains.
N. 50 E.	16.83	To place of beginning.

West.	
80.00	To sec. cor.

28. Small lakes insec.

[29]North.	Between secs. 22 and 23—
8.00	A stream 150 l. wide, course SW ..... d 5
24.18	A do 150 do do NE ..... level
40.00	Set qr. sec. post, from which level
	a B. oak 20 in. dia. bears S. 9 W. 45 l. dist.
	a do 20 do do N. 34 E. 48 do
41.66	Same stream 150 l. wide, course SW ..... level
47.00	Enter wet prairie ..... level
56.00	To S. boundary of Henry Thompson's claim as pointed out, course N. 76 W. 2 c. to SW. corner of claim ..... level
64.00	To west boundary of H. Thompson's claim ..... level
65.00	Leave wet prairie ..... level
68.00	To road from Astoria to Williamsburg ..... a 15
69.92	A W. oak 18 in. dia ..... a 2
80.00	Set post cor. of secs. 14, 15, 22, and 23, from which a 10
	a sugar 24 in. dia. bears S. 52 E. 23 l. dist.
	an elm 24 do do N. 34 W. 45 do.
	Do 16 do do N. 27 E. 50 do.
	a sugar 18 do do S. 60 W. 42 do.
	First ½ mile broken, 2d ½ mile 2d rate land; timber, W. oak, sugar, beech, &c.; ugr. spices.
East.	On random between secs. 14 and 23—
4.00	To W. boundary of H. Thompson's claim as pointed out ..... a 5
40.00	Set temp. qr. sec. post ..... level
80.15	Intersect N. and S. line at post ..... a 10
	Land level, good, second rate; timber, sugar, oak, beech, &c.; ugr. spice, &c.

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.	Feet.
West.	On the true line between secs. 14 ank 23—
40.07½	Set qr. sec. post at aver. dist. in Thompson's claim, from which
	a sugar 30 in. dia. bears N. 39 E. 31 l. dist.
	a mulberry do do S. 26 W. 4 do.
80.15	To sec. cor.
North	Between sections 14 and 15—
14.14	A sugar 14 in. dia ..... a 5
34.13	A cotton wood 22 do ..... a 5
40.00	Set qr. sec. post, from which a 10
	a sugar 20 in. dia. bears S. 43 E. 74 lks. dist.
	a beech 24 do do N 45 W. 37 do.
47.20	A walnut 27 do do ..... a 5
61.84	A do 36 do do ..... a 5
77.72	A stream 25 lks. wide, course SW ..... d 10
80.00	Set post cor. of secs. 10, 11, 14, and 15, from which a 5
	a hickory 15 in. dia. bears S. 12 E. 36 lks. dist.
	a B. oak 30 do do N. 17 W. 32 do.
	a do 28 do do N. 16 E. 40 do.
	a W. oak 14 do do S. 15 W. 38 do.
	Land level, second rate; timber, beech, oak, walnut, &c.; undergrowth, spice, &c.
East	On random between sections 11 and 14—
2.62	A stream 25 links wide, course N ..... d 5
7.03	Same 25 do do SW ..... level
8.05	Same 25 do do SW ..... level
13.00	Same 25 do do NE ..... level
40.00	Set temporary quarter section post ..... a 20
80.15	Intersect N. and S. line 20 links N. of post ..... a 50
	Land brushy; timber, beech, oak, &c.

29. Connexion with claim.

West.	On the true line between sections 11 and 14—
40.07½	Set qr. sec. post at average dist., from which
	a sugar 16 in. dia. bears N. 66 E. 35 links dist.
	a do 14 do do S. 44 W. 13 do.
80.15	To sec. corner.
North	Between sections 10 and 11—
5.29	A W. oak 24 in. dia ..... a 2
39.16	A do 36 do ..... a 8

[Ed. Note: Pages 66 through 81 of the sample field notes are deleted here in the interest of space. The deleted pages are in the same vein and style as those given.]

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.	Feet.
East.	On the true line between secs. 7 and 18—
35.67	Set qr. sec. post, from which
	a R. oak 30 in. dia. bears S. 6 E. 22 l. dist.
	a do 30 do do N. 26 E. 52 do.
75.67	To sec. cor.
North.	Between secs. 7 and 8—
10.00	A stream 10 l. wide, course SE ..... level
11.39	A R. oak 24 in. dia ..... level
16.00	A stream 40 l. wide, course SE ..... level
35.17	A B. oak 15 in. dia ..... level
40.00	Set qr. sec. post, from which level
	a W. oak 4 in. dia. bears S. 35 W. 17 l. dist.
	a do 7 do do N. 59 E. 4 do.
67.83	A hickory 10 do ..... level
80.00	Set post cor. of secs. 5, 6, 7, and 8, from which level
	a W. oak 40 in. dia. bears S. 75 E. 22 l. dist.
	A R. oak 24 do do S. 80 W. 39 do.
	a do 21 do do N. 20 E. 40 do.
	a W. oak 25 do do N. 16 W. 43 do.
	Land and timber as before noted.
East.	On random between secs. 5 and 8—
10.57	To a point near right bank of Chickeeles river, 2 l S. of meander sec. cor ..... d 5
	Completed meander corner of secs. 5 and 8, from whence
	a R. oak 32 in. dia. bears N. 58 E. 5 l. dist.
	a hickory 12 do do S. 42 W. 5 do.
	Land broken, 1st rate; timber, as before noted.
West.	On the true line between secs. 5 and 8—
10.57	To sec. cor.
West.	On random between secs. 6 and 7—
20.19	A hickory 10 in. dia ..... a 10
25.10	A stream 35 l. wide, course SE ..... d 5
40.00	Set temp. qr. sec. post ..... a 10
56.00	A stream 15 l. wide, course SE ..... d 5
61.00	A W. oak 40 in. dia ..... a 10
75.00	Intersect W. boundary 21 l. N. of corner ..... a 5
	Land hilly, 2d rate; timber, oak, sugar, hickory; und'gr. sassafras and hickory.

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Township 25 N., Range 2 W., Willamette Mer.

Ch. lks.	Feet.
East.	On the true line between secs. 6 and 7—

35.00	Set qr. sec. post, from whence a W. oak 40 in. dia. bears S. 4 W. 41 l. dist. a cherry 15 do do N. 4 W. 49 do.
5.00	To sec. cor.
North.	On random between secs. 5 and 6—
28.75	A sugar 18 in. dia ..... level
40.00	Set temp. qr. sec. post ..... a 5
53.75	A sugar 30 in. dia ..... a 5
66.25	A do 18 do ..... a 3
80.06	Intersect N. boundary 24 l. E. of corner ..... a 5
	Land level and 1st rate; timber, sugar, and ash; ugr. hazel and walnut.
South	47'E. on true line between secs. 18 and 19—
40.06	Set qr. sec. post, from which a hickory 20 in. dia. bears S. 2 E. 63 l. dist. an elm 16 do do N. 18 E. 53 do.
53.75	A sugar 30 in. dia.
66.25	A do 18 do.
80.06	To sec. cor. February 13.

MEANDERS OF CHICKEELES RIVER.

Beginning at a post in western boundary, thence right bank up stream.

Courses.	Dist. Ch. lks.	REMARKS.
N. 34 E.	19.29	In sec. 19.
N. 40 E.	14.79	
N. 58 E.	3.48	To post in line between secs. 18 and 19.
N. 58 E.	9.72	In sec. 18.
N. 63 E.	17.00	
N. 70 E.	30.34	To post in line between secs. 17 and 18.

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Township 25 N., Range 2 W., Willamette Mer.

Courses.	Dist. Ch. lks.	REMARKS.
N. 72 E.	10.24	In sec. 17.
N. 45 E.	6.82	
N. 16 E.	12.17	To lower line of town of Williamsburg.
North.	7.29	
N. 2 W.	11.92	
N. 8 W.	11.92	
N. 10 W.	7.36	To post in line between secs. 8 and 17.
N. 18 W.	4.06	In sec. 8.
N. 30 W.	3.00	
N. 19 W.	5.00	
N. 9 W.	11.25	At 2.15 c. a stream 40 l. wide.
N. 2 W.	10.06	
N. 7 W.	10.00	
N. 15 W.	4.42	
North.	13.55	
N. 8 E.	5.50	
N. 18 E.	8.50	
N. 10 E.	5.45	To post in line between secs. 5 and 8.
N. 17 E.	5.50	In sec. 5.
N. 26 E.	5.13	
N. 23 E.	12.06	
N. 30 E.	9.16	
N. 40 E.	3.20	
N. 44 E.	2.50	
N. 40 E.	6.74	
N. 45 E.	9.05	
N. 38 E.	8.79	
N. 49 E.	15.14	
N. 37 E.	5.00	Intersect the lower cor. of John Burton's claim.
N. 55 E.	5.00	
N. 62 E.	7.30	
N. 72 E.	11.00	To post in line between secs. 4 and 5.
N. 45 E.	5.00	In sec. 4 to post in N. boundary of tp.

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Township 25 N., Range 2 W., Willamette Mer.

Courses.	Dist. Ch. lks.	REMARKS.
		Commenced again right bank in sec. 31 and thence up stream.
N. 7 E.	6.85	
N. 32 E.	10.90	
N. 68 E.	12.50	
N. 50 E.	9.00	
N. 20 E.	6.10	
East.	10.90	
N. 45 W.	13.80	
N. 55 W.	11.80	
N. 31 W.	12.50	Post in W. boundary of tp. February 15th, 1851.

GENERAL DESCRIPTION.

The quality of the land in this township is considerably above the common average. There is a very fair proportion of rich bottom land, chiefly situated on both sides of the river Chickeeles, which is navigable through this township for steamboats of light draft; and although a few small patches of swamp and wet prairie occur, the uplands, especially as we approach the eastern and southern boundaries of the township, where the surface becomes more undulating, are well calculated for the sereal grains, and afford many beautiful and apparently healthy locations for first rate farms. The timber, chiefly oak, beech and sugar, is very equally distributed through the township, and we met several very fair specimens of good building stone exposed at two or three points on the river banks, indicating a sufficient abundance thereof in the township to supply the wants of the settlers and for the construction of roads. The town of Williamsburg, on the right bank, was founded about five years ago. It now contains some thirty houses, several of which are of stone, has a good landing in front, with a ferry, and

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Township 25 N., Range 2 W., Willamette Mer.

bears all the marks of enterprise, and of an industrious, temperate, thriving community. The township is intersected

from east to west with a road leading from Williamsburg to Astoria, thus affording, together with the river, a good outlet to market.

LIST OF NAMES.

A list of the names of the individuals employed to assist in running, measuring, or marking the lines and corners described in the foregoing field notes of township No. 25 north, of the base line of range No. 2 west, of the Willamette meridian, showing the respective capacities in which they acted.

PETER LONG, *Chainman.*
JOHN SHORT, *Chainman.*
GEORGE SHARP, *Axeman.*
ADAM DULL, *Axeman.*
HENRY FLAGG, *Compassman.*

We hereby certify that we assisted Robert Acres, deputy surveyor, in surveying the exterior boundaries and subdividing township number twenty-five north, of the base line of range number two west, of the Willamette meridian, and that said township has been in all respects, to the best of our knowledge and belief, well and faithfully surveyed, and the boundary monuments planted according to the instructions furnished by the surveyor general.

PETER LONG, *Chainman.*
JOHN SHORT, *Chainman.*
GEORGE SHARP, *Axeman.*
ADAM DULL, *Axeman.*
HENRY FLAGG, *Compassman.*

Subscribed and sworn to by the above named persons, before me, a justice of the peace for the county of Willamette, at Oregon city, O. T., this 24th day of February, 1851.

HENRY DOOLITTLE,
Justice of the Peace.

I, Robert Acres, deputy surveyor, do solemnly swear, that in pursuance of a contract No. 1, with John B. Preston, surveyor of the public lands of the United States in the Territory of Oregon, bearing date the second day of January, A.D. 1851, and in strict conformity to the laws of the United States and the instructions furnished by the said surveyor general, I have faithfully surveyed the exterior boundaries, subdivisions, and meanders of township number twenty-five north, of the base line of range number two

west, of the Willamette meridian, in the Territory aforesaid, and do further solemnly swear that the foregoing are the true and original Field Notes of such survey.

ROBERT ACRES,
Deputy Surveyor.

Subscribed by said Robert Acres, deputy surveyor, and sworn to before me, a justice of the peace for Willamette county, O. T., at the city of Oregon, this 24th day of February, 1851.

HENRY DOOLITTLE,
Justice of the Peace.

To the copies of the Field Notes transmitted to the seat of Government, the surveyor general will append to each township the following certificate:

I certify that the foregoing transcript of Field Notes of the survey of township number twenty-five north, of the base line of range number two west, of the Willamette meridian, in the territory of Oregon, has been compared with the original on file in this office.

JOHN B. PRESTON, *Sur. Gen.*

SURVEYOR GENERAL'S OFFICE,
Oregon City, March 4th, 1851.

N. B. The abbreviations for chains and links should invariably have been chs. and lks. The marginal columns should have been extended on several of the foregoing pages where they have been omitted. Time did not admit of the correction.

(This copy of the 1855 manual is taken from an original volume now in the possession of the National Archives.)

INSTRUCTIONS TO THE SURVEYORS GENERAL OF PUBLIC LANDS OF THE UNITED STATES, FOR THOSE SURVEYING DISTRICTS ESTABLISHED IN AND SINCE THE YEAR 1850; CONTAINING, ALSO, A MANUAL OF INSTRUCTIONS TO REGULATE THE FIELD OPERATIONS OF DEPUTY SURVEYORS, ILLUSTRATED BY DIAGRAMS.

PRESCRIBED, ACCORDING TO LAW, BY THE PRINCIPAL CLERK OF SURVEYS, PURSUANT TO ORDER OF THE COMMISSIONER OF THE GENERAL LAND OFFICE.

WASHINGTON:
A. O. P. NICHOLSON, PUBLIC PRINTER.
1855.

TO THE SURVEYORS GENERAL

OF

PUBLIC LANDS OF THE UNITED STATES

FOR THE SURVEYING DISTRICTS ESTABLISHED IN AND SINCE THE YEAR 1850.

By the direction of the COMMISSIONER OF THE GENERAL LAND OFFICE, the accompanying instructions are prescribed for your official government, including a MANUAL OF INSTRUCTIONS to regulate the field operations of your deputy surveyors. The latter is a revision of the Manual of Surveying Instructions prepared for OREGON in 1851, (the edition of which is now exhausted,) and presents, in some respects, more copious illustrations, both in the specimen field notes and in the diagrams, than could be furnished amidst the pressure of the exigency under which the former had to be prepared. It will be observed that, in the former edition, the township and section lines south of the base are made to start therefrom, and close on the first standard parallel south; whereas, under the present instructions, such lines are made to start from the first standard parallel south, and to close to the north on the base: and thus there will be closing corners and starting corners, both on the base and standard lines. Such modification is introduced for the sake of entire uniformity of method in new fields of survey, and will not, of course, affect any past operations under the original instructions.

The starting corners on the base line and on the standards will, of course, be common to two townships or to two sections lying on and north of such lines; and the closing corners on such lines, from the south, should be carefully connected with the former by measurements to be noted in the field book.

Where STONE can be had to perpetuate corner boundaries, such, for obvious reasons, should always be preferred for that purpose, and the dimensions of the stone, as herein prescribed, (on page 9,) are to be regarded as the minimum size; but in localities where it is found practicable to obtain a stone of *increased dimensions*, it is always desirable to do so, particularly for TOWNSHIP CORNERS, and especially for those on base, meridian, and standard lines; and to such purport the deputy surveyor is to be specially instructed.

Prior to entering upon duty, the deputy surveyor is to make himself thoroughly acquainted with the official requirements in regard to field operations in all the details herein set forth, and to be apprized of the weighty moral and legal responsibilities under which he will act.

Unfaithfulness in the execution of the public surveys will be detected by special examinations of the work to be made for that purpose, and, when detected, will immediately subject the delinquent deputy and his bondsmen to be sued by the district attorney of the United States, at the instance of the proper surveyor general—the institution of which suit will act at once as a lien upon any property owned by him or them at that time; and such delinquency, moreover, is an offence punishable by the statute, with all the pains and penalties of perjury, (see act of 1846, quoted on pages 19 and 20 hereof,) and will of necessity debar the offending deputy from future employment in like capacity. Hence, in the execution of contracts for surveying public lands, there is every incentive to fidelity that can address itself either to the moral sense, or to motives of private interest.

By order to the Commissioner:

JOHN M. MOORE,
Principal Clerk of Surveys.

GENERAL LAND OFFICE,
February 22, 1855

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SYSTEM

OF

RECTANGULAR SURVEYING.

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1. The public lands of the United States are ordinarily surveyed into rectangular tracts, bounded by lines conforming to the cardinal points.

2. The public lands are laid off, in the first place, into bodies of land of six miles square, called *Townships*, containing as near as may be 23,040 acres. The townships are subdivided into thirty-six tracts called *Sections*, of a mile square, each containing as near as may be, 640 acres. Any number of series of contiguous townships, situate north or south of each other, constitute a *Range*.

The law requires that the lines of the public surveys shall be governed by the true meridian, and that the townships shall be *six miles square*,—two things involving in connexion a mathematical impossibility—for, strictly to conform to the meridian, necessarily throws the township out of square, by reason of the convergency of meridians, and hence, by adhering to the true meridian, results the necessity of departing from the strict requirements of law, as respects the precise area of townships and the subdivisional parts thereof, the township assuming something of a trapezoidal form, which inequality developes itself more and more as such the higher the latitude of the surveys. It is doubtless in view of these circumstances that the law provides (see sec. 2 of the act of May 18, 1796) that the sections of a mile square shall contain the quantity of 640 acres, *as nearly as may be;* and, moreover, provides (see sec. 3 of the act of 10th May, 1800) in the following words: "And in all cases where the exterior lines of the townships, thus to be subdivided into sections or half sections, shall exceed, or shall not extend six miles, the excess or deficiencey shall be specially noted, and added to or deducted from the western or northern ranges of sections or half sections in such township, according as the error may be in running the lines from east to west, or from south to north; the sections and half sections bounded on the northern and western lines of such townships shall be sold as containing only the quantity expressed in the returns and plats, respectively, and all others as containing the complete legal quantity."

[2]

The accompanying diagram, marked A, will serve to illustrate the method of running out the exterior lines of townships, as well on the *north* as on the *south* side of the base line; and the order and mode of subdividing townships will be found illustrated in the accompanying specimen field notes, conforming with the township diagram B. The method here presented is designed to insure as full a compliance with all the requirements, meaning, and intent of the surveying laws as, it is believed, is practicable.

The section lines are surveyed from *south* to north on true meridians, and from *east* to west, in order to throw the ex-

cesses or deficiencies in measurements on the north and west sides of the township, as required by law.

3. The townships are to bear numbers in respect to the base line either north or south of it; and the tiers of townships, called "Ranges," will bear numbers in respect to the meridian line according to their relative position to it, either on the east or west.

4. The thirty-six sections into which a township is subdivided are numbered, commencing with number *one* at the *northeast* angle of the township, and proceeding west to number six, and thence proceeding east to number twelve, and so on, alternately, until the number thirty-six in the southeast angle.

5. STANDARD PARALLELS (usually called correction lines) are established at stated intervals to provide for or counteract the error that otherwise would result from the convergency of meridians, and also to arrest error arising from inaccuracies in measurements on meridian lines, which, however, must ever be studiously avoided. On the *north* of the paincipal base line it is proposed to have these standards run at distances of every *four* townships, or twenty-four miles, and on the *south* of the principal base, at distances of every *five* townships, or thirty miles.

OF MEASUREMENTS, CHAINING, AND MARKING.

1. Where uniformity in the variation of the needle is not found, the public surveys must be made with an instrument operating independently of the magnetic needle. Burt's *improved solar compass*, or other istrument of equal utility, must be used of necessity in such cases; and it is deemed best that such instrument should be used under all circumstances. Where the needle can be relied on, however, the ordinary compass may be used in subdividing and meandering.

2. The township lines, and the subdivision lines, will usually be measured by a two-pole chain of thirty-three feet in length, consisting of fifty links, and each link being seven inches and ninety-two hundredths of an inch long. On uniform and level ground, however, the four-pole chain may be used. Your measurements will, however, always be represented according to the four-pole chain of one hundred links. The deputy surveyor must also have with him a measure of the standard chain, wherewith to compare and adjust the chain in use, from day to day, with punctuality and carefulness; and must return such standard chain to the Surveyor General's office for examination when his work is completed.

OF TALLY PINS.

3. You will use eleven tally pins made of steel, not exceeding fourteen inches in length, weighty enough towards the point to make them drop perpendicularly, and having a ring at the top, in which is to be fixed a piece of red cloth, or something else of conspicuous color, to make them readily seen when stuck in the ground.

PROCESS OF CHAINING.

4. In measuring lines with a two-pole chain, every *five* chains are called "a *tally*," because at that distance the last of the ten tally pins with which the forward chainman set out will have been stuck. He then cries "tally;" which cry is repeated by the other chainman, and each registers the distance by slipping a thimble, button, or ring of leather, or something of the kind, on a belt worn for that purpose, or by some other convenient method. The hind chainman then comes up, and having counted in the presence of his fellow the tally pins which he has taken up, so that both may be assured that none of the pins have been lost, he then takes the forward end of the chain, and proceeds to set the pins. Thus the chainmen alternately chain places, each setting the pins that he has taken up, so that one is forward in all the odd, and the other in all the even tallies. Such procedure, it is believed, tends to insure accuracy in measurement, facilitates the recollection of the distances to objects on the line, and renders a mis-tally almost impossible.

LEVELLING THE CHAIN AND PLUMBING THE PINS.

5. The length of every line you run is to be ascertained by precise horizontal measurement, as nearly approximating to an air line as is pos-

sible in practice on the earth's surface. This all important object can only be attained by a rigid adherence to the three following observances:

1. Ever keeping the chain *stretched* to its utmost degree of tension on even ground.
2. On uneven ground, keeping the chain not only stretched as aforesaid, but horizontally *levelled*. And when ascending and descending steep ground, hills, or mountains, the chain will have to be *shortened* to one-half its length, (and sometimes more,) in order accurately to obtain the true horizontal measure.
3. The careful plumbing of the tally pins, so as to attain precisely *the spot* where they should be stuck. The more uneven the surface, the greater the caution needed to set the pins.

MARKING LINES.

6. All lines on which are to be established the legal corner boundaries are to be marked after this method, viz: Those trees which may intercept your line must have two chops or notches cut on each side of them without any other marks whatever. These are called *"sight trees," "line trees,"* or *"station trees."*

A sufficient number of other trees standing nearest to your line, on either side of it, are to be *blazed* on two sides diagonally, or quartering towards the line, in order to render the line conspicuous, and readily to be traced, the blazes to be opposite each other, coinciding in direction with the line where the trees stand very near it, and to approach nearer each other the further the line passes from the blazed trees. Due

care must ever be taken to have the lines so well marked as to be readily followed.

ON TRIAL, OR RANDOM LINES,

the trees are not to be blazed, unless occasionally from indispensable necessity, and then it must be done so guardedly as to prevent the possibility of confounding the marks of the trial line with the *true*. But bushes and limbs of trees may be lopped, and *stakes set* on the trial, or random line, at every ten chains, to enable the surveyor on his return to follow and correct the trial line, and establish therefrom the *true line*. To prevent confusion, the temporary stakes set on the trial, or random lines, must be *pulled up* when the surveyor returns to establish the true line.

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INSUPERABLE OBJECTS ON LINE— WITNESS POINTS.

7. Under circumstances where your course is obstructed by impassable obstacles, such as ponds, swamps, marshes, lakes, rivers, creeks, &c., you will prolong the line across such obstacles by taking the necessary right angle offsets; or, if such be inconvenient, by a traverse or trigonometrical operation, until you regain the line on the opposite side. And in case a north and south, or a true east and west, line is regained in advance of any such obstacle, you will prolong and mark the line back to the obstacle so passed, and state all the particulars in relation thereto in your field book. And at the intersection of lines with both margins of impassable obstacles, you will establish a *Witness Point*, (for the purpose of perpetuating the intersections therewith,) by setting a post, and giving in your field book the course and distance therefrom to two trees on opposite sides of the line, each of which trees you will mark with a blaze and notch facing the post; but on the margins of navigable water courses, or navigable lakes, you will mark the trees with the proper number of the fractional section, township, and range.

The best marking tools adapted to the purpose must be provided for marking neatly and *distinctly* all the letters and figures required to be made at corners; and the deputy is to have always at hand the necessary implements for keeping his marking irons in order; for which purpose a rat-tail file and a small whetstone will be found indispensable.

ESTABLISHING CORNER BOUNDARIES.

To procure the faithful execution of this portion of a surveyor's duty is a matter of the utmost importance. After a true coursing, and most exact measurements, the corner boundary is the consummation of the work, for which all the previous pains and expenditures have been incurred. If, therefore, the corner boundary be not perpetuated in a permanent and workmanlike manner, the *great aim* of the surveying service will not have been attained. A boundary corner, in a timbered country, is to be a *tree*, if one be found at the precise spot; and if not, *a post* is to be planted thereat; and the position of the corner post is to be indicated by trees adjacent, the angular bearings and distances of which from the corner are facts to be ascertained and registered in your field book. (See article, "Bearing trees.")

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In a region where stone abounds the corner boundary will be a small *monument of stones* along side of a single marked stone for a township corner, and a single stone for all other corners.

In a region where timber is not near, and stone not found, the corner will be a *mound* of earth, of prescribed size, varying to suit the case.

The following are the different points for perpetuating corners, viz:

1. For township boundaries, at intervals of every six miles.
2. For section boundaries, at intervals of every mile, or 80 chains.
3. For quarter section boundaries, at intervals of every half mile, or 40 chains. Exceptions, however, occur on east and west lines, as explained hereafter.

[The half quarter section boundary is not marked in the field, but is regarded by the law as a point intermediate between the half mile or quarter section corners. See act of 24th April, 1820, entitled "An act making further provision for the sale of the public lands," which act refers to the act of Congress passed on the 11th of February, 1805, entitled "An act concerning the mode of surveying the public lands of the United States," for the manner of ascertaining the corners and contents of half quarter sections.][1]

4. MEANDER CORNER POSTS are planted at all those points where the township or section lines intersect the banks of such rivers, bayous, lakes, or islands, as are by law directed to be meandered.

The courses and distances on meandered navigable streams govern the calculations wherefrom are ascertained the true areas of the tracts of land (sections, quarter sections, &c.) known to the law as *fractional*, and binding on such streams.

MANNER OF ESTABLISHING CORNERS BY MEANS OF POSTS.

Township, sectional, or mile corners, and quarter sectional or half mile corners, will be perpetuated by planting a post at the place of the corner, to be formed of the most durable wood of the forest at hand.

The posts must be set in the earth by digging a hole to admit them *two feet* deep, and must be very securely rammed in with earth, and also with stone, if any be found at hand. The portion of the post which protrudes above the earth must be *squared* off sufficiently smooth to admit of receiving the marks thereon, to be made with appropriate marking irons, indicating what it stands for. Thus the sides of *township*

1. The subdivision of the half-quarter section into quarter-quarter sections is authorized by "An act supplementary to the several laws for the sale of the public lands," approved April 5, 1832.

[7]

corner posts should square at least *four* inches, (the post itself being *five* inches in diameter,) and must protrude *two feet* at least above the ground; the sides of *section corner posts* must square at least *three inches*, (the post itself being four inches in diameter,) and protrude *two feet* from the ground; and the *quarter section corner posts* and *meander corner posts* must be *three* inches *wide,* presenting *flattened* surfaces, and protruding *two* feet from the ground.

Where a township post is a corner common to four townships, it is to be set in the earth *diagonally*, thus:

N
W ◇ E
S

On each surface of the post is to be marked the number of the particular township, and its range, which it *faces*. Thus, if the post be a common boundary to four townships—say *one* and *two*, south of the base line, of range *one*, west of the meridian; also to townships *one* and *two*, south of the base line, of range *two*, west of the meridian, it is to be marked thus:

From N. to E. { R. 1 W. / T. 1 S. / S. 31 } from E. to S. { 1 W. / 2 S. / 6 }

From N. to W. { 2 W. / 1 S. / 36 } from W. to S. { 2 W. / 2 S. / 1 }

These marks are not only to be distinctly but *neatly* cut into the wood, at least the eighth of an inch deep; and to make them yet more *conspicuous* to the eye of the anxious explorer, the deputy must apply to all of them a *streak of red chalk.*

Section or mile posts, being corners of sections, and where such are common to *four* sections, are to be set *diagonally* in the earth, (in the manner provided for township corner posts;) and on each side of the squared surfaces (made smooth, as aforesaid, to receive the marks) is to be marked the appropriate *number* of the particular one of the *four sections,* respectively, which such side *faces*; also on one side thereof are to be *marked* the numbers of its *township* and *range*; and to make such marks yet more *conspicuous*, in manner aforesaid, a streak of *red chalk* is to be applied.

In every township, subdivided into thirty-six sections, there are twenty-five interior section corners, each of which will be *common* to *four sections.*

A quarter section, or half mile post, is to have no other mark on it than ¼ S., to indicate what it stands for.

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NOTCHING CORNER POSTS.

Township corner posts, common to four townships, are to be notched with *six* notches on each of the four angles of the squared part set to the cardinal points.

All mile posts *on township lines* must have as many notches on them, on two opposite *angles* thereof, as they are miles distant from the township corners, respectively. Each of the posts at the corners of sections in the *interior* of a township must indicate, by a number of notches on each of its four corners directed to the cardinal points, the corresponding number of miles that it stands from the *outlines* of the township. The four sides of the post will indicate the number of the section they respectively *face*. Should a tree be found at the place of any corner, it will be marked and notched as aforesaid, and answer for the corner in lieu of a post, the kind of tree and its diameter being given in the field notes.

BEARING TREES.

The position of all corner posts, or corner trees, of whatever description, that may be established, is to be evidenced in the following manner, viz: From such post or tree the courses must be taken and the distances measured to two or more adjacent trees in opposite directions, as nearly as may be, and these are called "bearing trees." Such are to be distinguished by a large *smooth blaze*, with a *notch* at its lower end, facing the corner, and in the blaze is to be marked the number of the *range, township,* and *section*; but at quarter section corners nothing but ¼ S. need be marked. The letters B. T. (bearing tree) are also to be marked upon a smaller blaze directly under the large one, and as near the ground as practicable.

At all township corners, and at all section corners, on range or township lines, *four* bearing trees are to be marked in this manner, one in each of the adjoining sections.

At interior section corners *four* trees, one to stand within each of the four sections to which such corner is common, are to be marked in manner aforesaid, if such be found.

A tree supplying the place of a corner post is to be marked in the manner directed for posts; but if such tree should be a beech, or other *smooth bark* tree, the marks may be made on the *bark,* and the tree notched.

From quarter section and meander corners two bearing trees are to be marked, one within each of the adjoining sections.

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Where the requisite number of "bearing trees" is not to be found at convenient and suitable distances, such as are found are to be marked as herein directed; but in all cases of deficiency in the number of bearing tree, (unless, indeed, the boundary itself be a tree,) a *quadrangular trench*, with sides of *five* feet, and with the angles to the cardinal points, must be spaded up outside the corner, as a centre, and the earth carefully thrown on the inside, so as to form a range of earth, which will become covered with grass, and present a small square elevation, which in aftertime will serve to mark, unmistakably, the spot of the corner.

CORNER STONES.

Where it is deemed best to use STONES for boundaries, in lieu of posts, you may, at *any* corner, insert endwise into the ground, to the depth of 7 or 8 inches, a stone, the number of cubic inches in which shall not be less than the number contained in a stone 14 inches long, 12 inches wide, and 3 inches thick—equal to 504 cubic inches—the edges of which must be set north and south, on north and south lines, and east and west, on east and west lines; the dimensions of each stone to be given in the field notes at the time of establishing the corner. The kind of stone should also be stated.

MARKING CORNER STONES.

Stones at township corners, common to four townships, must have *six* notches, cut with a pick or chisel on each edge or side towards the cardinal points; and where used as section corners on the range and township lines, or as section corners in the interior of a township, they will also be notched, to correspond with the directions given for notching posts similarly situated.

Posts or stones at township corners on the base and standard lines, and which are common to two townships on the north side thereof, will have *six* notches on each of the *west, north,* and *east* sides or edges; and where such stones or posts are set for corners to two townships *south* of the base or standard, *six* notches will be cut on each of the west, *south,* and east sides or edges.

Stones, when used for quarter section corners, will have ¼ cut on them—on the west side on north and south lines, and on the north side on east and west lines.

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MOUNDS.

Whenever bearing trees are not found, mounds of earth, or stone, are to be raised *around posts* on which the corners are to be marked in the manner aforesaid. Wherever a mound of earth is adopted, the same will present a conical shape; but at its base, on the earth's surface, a *quadrangular trench* will be dug; by the "trench" (here meant) is to be understood a *spade deep* of earth thrown up from the four sides of the line, *outside* the trench, so as to form a *continuous elevation along its outer edge*. In mounds of earth, common to *four* townships or to *four* sections, they will present the *angles* of the quadrangular trench *(diagonally)* towards the cardinal points. In mounds, common only to *two* townships or *two* sections, the *sides* of the quadrangular trench will *face* the cardinal points. The sides of the quadrangular trench at the base of a township mound are to be *six* feet, the height of mound *three* feet.

At section, quarter section, and meander corners, the sides of the quadrangular trench at base of mounds are to be *five* feet, and the conical height *two and a half feet.*

Prior to piling up the earth to construct a mound, there is to be dug a spadefull or two of earth from the corner boundary point, and in the cavity so formed is to be deposited a *marked stone*, or a portion of *charcoal*, (the quantity whereof is to be noted in the field book;) or in lieu of charcoal or marked stone, *a charred stake* is to be driven twelve inches down into such centre point: either of those will be a *witness* for the future, and whichever is adopted, the fact is to be noted in the field book.

When mounds are formed of *earth*, the spot from which the earth is taken is called the *"pit,"* the centre of which ought to be, wherever practicable, at a uniform distance and in a uniform direction from the centre of the mound. There is to be a "pit" on *each* side of every mound, distant eighteen inches outside of the trench. The trench may be expected hereafter to be covered by tufts of grass, and thus to indicate the place of the mound, when the mound itself may have become obliterated by time or accident.

At meander corners the "pit" is to be directly on the line, *eight links* further from the water than the mound. Wherever necessity is found for deviating from these rules in respect to the "pits," the course and distance to each is to be stated in the field books

Perpetuity in the mound is a great desideratum. In forming it with light alluvial soil the surveyor may find it necessary to make due allowance for the future settling of the earth, and thus making the mound

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more elevated than would be necessary in a more compact and tenacious soil, and increasing the base of it. In so doing, the relative proportions between the township mound and other mounds is to be preserved as nearly as may be.

The earth is to be pressed down with the shovel during the process of piling it up. Mounds are to be *covered* with sod, grass side up, where sod is to be had: but, in forming a mound, *sod* is NEVER to be *wrought up* with the earth, because sod decays, and in the process of decomposing it will cause the mound to become porous, and therefore liable to premature destruction.

POSTS IN MOUNDS

must show above the top of the mound ten or twelve inches, and be notched and marked precisely as they would be for the same corner without the mound.

MOUND MEMORIALS.

Besides the *charcoal,* marked *stone* or *charred stake*, one or the other of which must be lodged in the earth at the point of the corner, the deputy surveyor is recommended to plant *midway* between each pit and the trench, seeds of some tree, (those of fruit trees adapted to the climate being always to be preferred,) so that, in course of time, should such take root, a small clump of trees may possibly hereafter note the place of the corner. The facts of planting such seed, and the kind thereof, are matters to be truthfully noted in the field book.

WITNESS MOUNDS TO TOWNSHIP OR SECTION CORNERS.

If a township or section corner, in a situation here bearing or witness trees are not found within a reasonable distance therefrom, shall fall within a ravine, or in any other situation where the nature of the ground, or the circumstances of its locality, shall be such as may prevent, or prove unfavorable to, the erection of a mound, you will perpetuate such corner by selecting in the immediate vicinity thereof a suitable plot of ground as a site for a bearing or *witness mound*, and erect thereon a mound of earth in the same manner and conditioned in every respect, with *charcoal, stone,* or *charred stake* deposited beneath, as before directed; and measure and state in your field book the distance and course from the position of the true corner of the bearing or witness mound so placed and erected.

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DOUBLE CORNERS.

Such corners are to be nowhere except on the base and standard lines, whereon are to appear both the corners which mark the intersections of the lines which close thereon, and those from which the surveys start on the north. On these lines, and at the time of running the same, the township, section, and quarter section corners are to be planted, and each of these is a corner commmon to *two*, (whether township or section corners,) on the north side of the line, and must be so marked.

The corners which are established on the standard parallel, at the time of running it, are to be known as *"standard corners,"* and, in addition to all the *ordinary* marks, (as herein prescribed,) they will be marked with the letters S. C. Closing corners will be marked with the letters C. C. in addition to other marks.

The standard parallels are designed to be run in *advance* of the contiguous surveys on the south of them, but circumstances may exist which will *impede* or temporarily delay the *due* extension of the standard; and when, from uncontrollable causes, the *contiguous townships* must be surveyed in advance of the time of extending the standard, in any such event it will become the duty of the deputy who shall afterwards survey any such standard to plant thereon the *double set* of corners, to wit, the standard corners, to be marked S. C., and the closing ones which are to be marked C. C.; and to make such measurements as may be necessary to connect the closing corners and complete the unfinished meridianal lines of such contiguous and prior surveys, on the principles herein set forth, under the different heads of "exterior or township lines," and of "diagram B."

You will recollect that the corners, (whether township or section corners,) which are *common to two*, (two townships or two sections,) are not to be planted *diagonally* like those which are common to *four*, but with the flat sides facing the cardinal points, and on which the marks and notches are made as usual. This, it will be perceived, will serve yet more fully to distinguish the standard parallels from all other lines.

THE MEANDERING OF NAVIGABLE STREAMS.

1. Standing with the face looking *down* stream, the bank on the *left* hand is termed the "left bank," and that on the *right* hand the "right bank." These terms are to be universally used to distinguish the two banks of a river or stream.

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2. Both banks of *navigable* rivers are to be meandered by taking the courses and distances of their sinuosities, and the same are to be entered in the field book.

At those points where either the township or section lines intersect the banks of a navigable stream, POSTS, or, where necessary, MOUNDS of *earth* or *stone*, are to be established at the time of running these lines. These are called "meander corners;" and in meandering you are to commence at one of those corners on the township line, coursing the banks, and measuring the distance of each course from your commencing corner to the next "meander corner," upon the same or another boundary of the same township, carefully noting your intersection with all intermediate meander corners. By the same method you are to meander the opposite bank of the same river.

The crossing distance *between* the MEANDER CORNERS on same line is to be ascertained by triangulation, in order that the river may be protracted with entire accuracy. The particulars to be given in the field notes.

3. You are also to meander, in manner aforesaid, all *lakes* and deep ponds of the area of twenty-five acres and upwards; also navigable bayous; *shallow* ponds, readily to be drained, or likely to dry up, are not to be meandered.

You will notice all streams of water falling into the river, lake, or bayou you are surveying, stating the width of the same at their mouth; also all springs, noting the size thereof and depth, and whether the water be pure or mineral; also the head and mouth of all bayous; and all islands, rapids, and bars are to be noticed, with intersections to their upper and lower points to establish their exact situation. You will also note the elevation of the banks of rivers and streams, the heights of falls and cascades, and the length of rapids.

4. The precise relative position of islands, in a township made fractional by the river in which the same are situated, is to be determined trigonometrically—sighting to a flag or other fixed object on the island, from a special and carefully measured base line, connected with the surveyed lines, on or near the river bank, you are to form connexion between the meander corners on the river to points corresponding thereto, in direct line, on the bank of the island, and there establish the proper meander corners, and calculate the distance across.

5. In meandering lakes, ponds, or bayous, you are to commence at a meander corner upon the township line, and proceed as above directed for the banks of a navigable stream. But where a lake, pond, or bayou

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lies entirely within the township boundaries, you will commence at a meander corner established in subdividing, and from thence take the courses and distances of the entire margin of the same, noting the intersection with all the meander corners previously established thereon.

6. To meander a pond lying entirely within the boundaries of a section, you will run and measure *two* lines thereunto from the nearest section or quarter section corner on *opposite* sides of such pond, giving the courses of such lines. At *each* of the points where such lines shall intersect the margin of such pond, you will establish a *witness* point, by fixing a post in the ground, and taking bearings to any adjacent trees, or, if necessary, raising a mound.

The relative position of these points being thus definitely fixed in the section, the meandering will commence at one of them, and be continued to the other, noting the intersection, and thence to the beginning. The proceedings are to be fully entered in the field book.

7. In taking the connexion of an island with the main land,

when there is no meander corner in line, opposite thereto, to sight from, you will measure a special base from the meander corner nearest to such island, and from such base you will triangulate to some fixed point on the shore of the island, ascertain the distance across, and there establish a *special* meander corner, wherefrom you will commence to meander the island.

The field notes of meanders will be set forth in the body of the field book according to the dates when the work is performed, as illustrated in the specimen notes annexed. They are to state and describe particularly the meander corner from which they commenced, each one with which they close, and are to exhibit the meanders of each fractional section separately; following, and composing a part of such notes, will be given a description of the land, timber, depth of inundation to which the bottom is subject, and the banks, current, and bottom of the stream or body of water you are meandering.

9. No blazes or marks of any description are to be made on the lines meandered between the established corners, but the utmost care must be taken to pass no object of topography, or *change* therein, without giving a particular description thereof in its proper place in your meander notes.

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OF FIELD BOOKS.

The FIELD NOTES afford the elements from which the plats and calculations in relation to the public surveys are made. They are the source wherefrom the description and evidence of locations and boundaries are officially delineated and set forth. They therefore must be a faithful, distinct and minute record of every thing officially done and observed by the surveyor and his assistants, pursuant to instructions, in relation to running, measuring, and marking lines, establishing boundary corners, &c.; and present, as far as possible, a full and complete *topographical description* of the country surveyed, as to every matter of useful information, or likely to gratify public curiosity.

There will be sundry separate and distinct field books of surveys, as follows:

Field notes of the MERIDIAN and BASE lines, showing the establishment of the *township, section* or mile, and *quarter section* or half mile, boundary corners thereon; with the crossings of streams, ravines, hills, and mountains; character of soil, timber, minerals, &c.

Field notes of the "STANDARD PARALLELS, or correction lines," will show the establishment of the township, section, and quarter section corners, besides exhibiting the topography of the country on line, as required on the base and meridian lines.

Field notes of the EXTERIOR lines of TOWNSHIPS, showing the establishment of corners on lines, and the topography, as aforesaid.

Field notes of the SUBDIVISIONS OF TOWNSHIPS, into sections and quarter sections.

The field notes must in all cases be taken precisely in the order in which the work is done on the ground, and the date of each day's work must follow immediately after the notes thereof. The *variation of the needle* must always occupy a *separate line* preceding the notes of measurements on line.

The exhibition of every mile of surveying, whether on township or subdivisional lines, must be *complete in itself*, and be separated by a black line drawn across the paper.

The description of the surface, soil, minerals, timber, undergrowth, &c., on *each mile* of line is to follow the notes of survey of such line, and not be mixed up with them.

No abbreviations of words are allowable, except of such words as are *constantly* occurring, such as *"sec."* for *"section;"* *"in. diam,"* for

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"inches diameter;" *"chs."* for *"chains;"* *"lks."* for *"links;"* *"dist."* for *"distant,"* &c. Proper names must never be abbreviated, however often their recurrence.

The nature of the subject-matter of the field book is to form its title page, showing the State or Territory where such survey lies, by whom surveyed, and the dates of commencement and completion of the work. The second page is to contain the names and duties of assistants. Whenever a new assistant is employed, or the duties of any one of them are changed, such facts, with the reasons therefor, are to be stated in an appropriate entry immediately preceding the notes taken under such changed arrangements. With the notes of the *exterior* lines of townships, the deputy is to submit a plat of the lines run, on a scale of two inches to the mile, on which are to be noted all the objects of topography on line necessary to illustrate the notes, viz: the distances on line at the crossings of streams, so far as such can be noted on the paper, and the direction of each by an arrow-head pointing down stream; also the intersection of line by prairies, marshes, swamps, ravines, ponds, lakes, hills, mountains, and all other matters indicated by the notes, to the fullest extent practicable.

With the instructions for making subdivisional surveys of townships into sections, the deputy will be furnished by the Surveyor General with a diagram of the *exterior* lines of the townships to be subdivided, (on the above named scale,) upon which are carefully to be laid down the measurements of each of the section lines on such boundaries whereon he is to close, the magnetic variation of each mile, and the particular description of each corner. P. in M. signifies post in mound. And on such diagram the deputy who subdivides will make appropriate sketches of the various objects of topography as they occur on his lines, so as to exhibit not only the points on line at which the same occur, but also the direction and position of each between the lines, or within each section, so that every object of topography may be properly completed or connected in the showing.

These notes must be distinctly written out, in language precise and clear, and their figures, letters, words, and meaning are always to be unmistakable. No leaf is to be cut or mutilated, and none to be taken out, whereby suspicion might be created that the missing leaf contained matter which the deputy believed it to be his interest to conceal.

SUMMARY OF OBJECTS AND DATA REQUIRED TO BE NOTED.

1. The precise length of every line run, noting all necessary offsets therefrom, with the reason and mode thereof.

2. The kind and diameter of all *"bearing trees,"* with the course and distance of the same from their respective corners; and the precise relative position of WITNESS CORNERS to the *true corners.*

3. The kind of materials (earth or stone) of which MOUNDS are constructed—the fact of their being conditioned according to instructions—with the course and distance of the *"pits,"* from the centre of the mound, where necessity exists for deviating from the *general* rule.

4. *Trees on line.* The name, diameter, and distance on line to all trees which it intersects.

5. Intersections by line of *land objects.* The distance at which the line first intersects and then leaves every *settler's claim and improvement*; prairie; river, creek, or other "bottom;" or swamp, marsh, grove, and wind fall, with the course of the same at both points of intersection; also the distances at which you begin to ascend, arrive at the top, begin to descend, and reach the foot of all remarkable hills and ridges, with their courses, and *estimated* height, in feet, above the level land of the surrounding country, or above the bottom lands, ravines, or waters near which they are situated.

6. Intersections by line of *water objects.* All rivers, creeks, and smaller streams of water which the line crosses; the distance on line at the points of intersection, and their *widths on line.* In cases of *navigable* streams, their width will be ascertained between the *meander corners,* as set forth under the proper head.

7. The land's *surface*—whether level, rolling, broken, or hilly.

8. The *soil*—whether first, second, or third rate.

9. *Timber*—the several kinds of timber and undergrowth, in the order in which they predominate.

10. *Bottom lands*—to be described as wet or dry, and if subject to inundation, state to what depth.

11. *Springs of water*—whether fresh, saline, or mineral, with the course of the stream flowing from them.

12. *Lakes and ponds*—describing their banks and giving their height, and also the depth of water, and whether it be pure or stagnant.

13. *Improvements.* Towns and villages; Indian towns and wigwams; houses or cabins; fields, or other improvements; sugar tree groves, sugar camps, mill seats, forges, and factories.

14. *Coal* banks or beds; *peat* or turf grounds; *minerals* and ores; with particular description of the same as to quality and extent, and all *diggings* therefor; also *salt* springs and licks. All reliable information you can obtain respecting these objects, whether they be on your immediate line or not, is to appear in the general description to be given at the end of the notes.

15. *Roads and trails,* with their directions, whence and whither.

16. Rapids, cataracts, cascades, or falls of water, with the height of their fall in feet.

17. Precipices, caves, sink-holes, ravines, stone quarries, ledges of rocks, with the kind of stone they afford.

18. *Natural curiosities,* interesting fossils, petrifactions, organic remains, &c.; also all ancient works of art, such as mounds, fortifications, embankments, ditches, or objects of like nature.

19. The *variation* of the needle must be noted at all points or places on the lines where there is found any material *change* of variation, and the position of such points must be perfectly identified in the notes.

20. Besides the ordinary notes taken on line, (and which must always be written down on the spot, leaving nothing to be supplied by memory,) the deputy will subjoin, at the conclusion of his book, such further description or information touching any matter or thing connected with the township (or other survey) which he may be able to afford, and may deem useful or necessary to be known—with a *general description* of the township in the *aggregate,* as respects the face of the country, its soil and geological features, timber, minerals, waters, &c.

SWAMP LANDS.

By the act of Congress approved September 28, 1850, swamp and overflowed lands "unfit for cultivation" are granted to the State in which they are situated. In order clearly to define the quantity and locality of such lands, the field notes of surveys, in addition to the other objects of topography required to be noted, are to indicate the points at which you enter all lands which are evidently subject to such grant, and to show the distinctive character of the land so noted; whether it is a swamp or marsh, or otherwise subject to inundation to an extent that, without artificial means, would render it "unfit for cultivation." The depth of inundation is to be stated, as determined from indications on the trees where timber exists; and its frequency is to be set forth as accurately as may be, either from your own knowledge of the general

character of the stream which overflows, or from reliable information to be obtained from others. The words "unfit for cultivation," are to be employed in addition to the usual phraseology in regard to entering or leaving such swamps, marshy, or overflowed lands. It may be that sometimes the margin of bottom, swamp, or marsh, in which such uncultivable land exists, is not identical with the margin of the body of land "unfit for cultivation;" and in such cases a separate entry must be made for each opposite the marginal distance at which they respectively occur.

But in cases where lands are overflowed by *artificial* means, (say by dams for milling, logging, or for other purposes,) you are not officially to regard such overflow, but will continue your lines across the same without setting meander posts, stating particularly in the notes the depth of the water, and how the overflow was caused.

SPECIAL INSTRUCTION RESPECTING THE NOTING OF SETTLERS' CLAIMS IN OREGON, WASHINGTON, AND NEW MEXICO.

The law requires that such claims should be laid down temporarily on the township plats; in order to do which, it is indispensably necessary to obtain, to some extent, connexions of these claims with the lines of survey. Under the head of "intersection by line of land objects," the deputy is required to note the *points* in line *whereat* it may be intersected by such claims; but, in addition thereto, there must be obtained at least *one angle* of each claim, with its course and distance either from the point of intersection, or from an established corner boundary, so that its connexion with the regular survey will be legally determined. If the settler's *dwelling* or barn is visible from line, the bearings thereof should be carefully taken from *two* points noted on line, and set forth in the field notes.

AFFIDAVITS TO FIELD NOTES.

At the close of the notes and the *general description* is to follow an affidavit, a form for which is given; and to enable the deputy surveyor fully to understand and appreciate the responsibility under which he is acting, his attention is invited to the provisions of the second section of the act of Congress, approved August 8th, 1846, entitled "An act to equalize the compensation of the surveyors general of the public lands of the United States, and for other purposes," and which is as follows:

"Sec. 2. That the surveyors general of the public lands of the United

States, in addition to the oath now authorized by law to be administered to deputies on their appointment to office, shall require each of their deputies, on the return of his surveys, to take and subscribe an oath or affirmation that those surveys have been faithfully and correctly executed according to law and the instructions of the surveyor general; and on satisfactory evidence being presented to any court of competent jurisdiction, that such surveys, or any part thereof, had not been thus executed, the deputy making such false oath or affirmation shall be deemed guilty of perjury, and shall suffer all the pains and penalties attached to that offence; and the district attorney of the United States for the time being, in whose district any such false, erroneous, or fraudulent surveys shall have been executed, shall, upon the application of the proper surveyor general, immediately institute suit upon the bond of such deputy; and the institution of such suit shall act as a lien upon any property owned or held by such deputy, or his sureties, at the time such suit was instituted."

Following the "general description" of the township is to be "A list of the names of the individuals employed to assist in running, measuring and marking the lines and corners described in the foregoing field notes of township No. _____ of the BASE LINE of range No. _____ of the _____ MERIDIAN, showing the respective capacities in which they acted."

FORM OF OFFICIAL OATHS TO BE TAKEN PRIOR TO ENTERING UPON DUTY.

For a deputy surveyor.

I, A. B., having been appointed a deputy urveyor of the lands of the United States in _____, do solemnly swear (or affirm) that I will well and faithfully, and to the best of my skill and ability, execute the duties confided to me pursuant to a contract with C. D., surveyor general of public lands in _____, bearing date the _____ day of _____, 18 , according to the laws of the United States and the instructions received from the said surveyor general.

(To be sworn and subscribed before a justice of the peace, or other officer authorized to administer oaths.)

For chainman.

I, E. F., do solemnly swear (or affirm) that I will faithfully execute the duties of chain carrier; that I will leel the chain upon uneven ground, and plumb the tally pins, whether by sticking or dropping the

same; that I will report the true distance to all notable objects, and the true length of all lines that I assist in measuring, to the best of my skill and ability.

(To be sworn and subscribed as above.)

For flagman or axeman.

I, G. H., do solemnly swear (or affirm) that I will well and truly perform the duties of _____, according to instructions given me, and to the best of my skill and ability.

(To be sworn and subscribed as above.)

EXTERIORS OR TOWNSHIP LINES.

The principal meridian, the base line, and the standard parallels having been first run, measured, and marked, and the corner boundaries thereon established, according to instructions, the process of running, measuring, and marking the exterior lines of townships will be as follows:

Townships situated NORTH of the base line, and WEST of the principal meridian.

Commence at No. 1, (see figures on diagram A,) being the southwest corner of T. 1 N—.R. 1 W., as established on the base line; thence north, on a true meridian line, four hundred and eighty chains, establishing the section and quarter section corners thereon, as per instructions, to No. 2, whereat establish the corner of Tps. 1 and 2 N—.Rs. 1 and 2 W.; thence east, on a random or trial line, setting *temporary* section and quarter section stakes, to No. 3, where measure and note the distance at which the line intersects the eastern boundary, north or south of the *true* or established corner. Run and measure westward, on the true line, (taking care to note all the land and water crossings, &c., as per instructions,) to No.

4, which is identical with No. 2, establishing the section and quarter section PERMANENT CORNERS on said line. Should it happen, however, that such random line falls short, or overruns in length, or intersects the eastern boundary of the township at more than three chains and fifty links distance from the *true* corner thereon, as compared with the corresponding boundary on the south, (either of which would indicate an important error in the surveying,) the lines must be *retraced*, even if found necessary to remeasure the meridianal

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boundaries of the township, (especially the western boundary,) so as to discover and correct the error; in doing which, the *true corners* must be established and marked, and the *false ones* destroyed and obliterated, to prevent confusion in future; and *all the facts* must be distinctly set forth in the notes. Thence proceed in a similar manner from No. 4 to No. 5, No. 5 to No. 6, No. 6 to No. 7, and so on to No. 10, the southwest corner of T. 4 N—.R. 1 W. Thence north, still on a true meridian line, establishing the mile and half-mile corners, until reaching the STANDARD PARALLEL or correction line; throwing the *excess* over, or *deficiency* under, *four hundred and eighty chains,* on the *last* half-mile, according to law, and at the intersection establishing the "CLOSING CORNER," the distance of which *from* the standard corner must be measured and noted as required by the instructions. But should it ever so happen that some impassable barrier will have prevented or delayed the extension of the standard parallel along and above the field of present survey, then the deputy will plant, in place, the corner for the township, subject to correction thereafter, should such parallel be extended.

NORTH of the base line, and EAST of the principal meridian.

Commence at No. 1, being the *southeast* corner of T. 1 N—.R. 1 E., and proceed as with townships situated "north and west," except that the *random* or trial lines will be run and measured *west*, and the *true* lines east, throwing the excess over or deficiency under four hundred and eighty chains on the *west end* of the line, as required by law; wherefore the surveyor will commence his measurement with the length of the deficient or excessive half section boundary on the west of the township, and thus the remaining measurements will all be *even* miles and half-miles.

METHOD OF SUBDIVIDING.

1. The first mile, both of the south and east boundaries of each township you are required to subdivide, is to be carefully traced and measured before you enter upon the subdivision thereof. This will enable you to observe any change that may have taken place in the magnetic variation, as it existed at the time of running the township lines, and will also enable you to compare your chaining with that upon the township lines.

2. Any discrepancy, arising either from a change in the magnetic variation or a difference in measurement, is to be carefully noted in the field notes.

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3. After adjusting your compass to a variation which you have thus found will retrace the eastern boundary of the township, you will commence at the corner to sections 35 and 36, on the south boundary, and run a line due north, forty chains, to the quarter section corner which you are to establish between sections 35 and 36; continuing due north forth chains further, you will establish the corner to sections 25, 26, 35 and 36.

4. From the section corner last named, run a *random* line, without blazing, *due east,* for corner of sections 25 and 36, in east boundary, and at forty chains from the starting point set a post for *temporary* quarter section corner. If you intersect exactly at the corner, you will blaze your random line back, and establish it as the *true* line; but if your random line intersects the said east boundary, either north or south of said corner, you will measure the distance of such intersection, from whih you will calculate a course that will run a *true* line back to the corner from which your random started. You will establish the *permanent* quarter section corner at a point equidistant from the two terminations of the *true* line.

5. From the corner of sections 25, 26, 35, 36, run due north between sections 25 and 26, setting the quarter section post, as before, at forty chains, and at eighty chains establishing the corner of sections 23, 24, 25, 26. Then run a random *due east* for the corner of sections 24 and 25 in east boundary; setting temporary quarter section post at forty chains; correcting back, and establishing *permanent* quarter section corner at the equidistant point on the *true* line, in the manner directed on the line between sections 25 and 36.

6. In this manner you will proceed with the survey of each successive section in the first tier, until you arrive at the north boundary of the township, which you will reach in running up a random line between sections 1 and 2. If this random line should not intersect at the corner established for sections 1, 2, 35 and 36, upon the township line, you will note the distance that you fall east or west of the same, from which distance you will calculate a course that will run a true line south to the corner from which your random started. Where the closing corner is on the base or standard line, a deviation from the general rule is explained under the head of "Diagram B."

7. The first tier of sections being thus laid out and surveyed, you will return to the south boundary of the township, and from the corner of sections 34 and 35 commence and survey the second tier of sections in the same manner that you pursued in the survey of the first, closing at the section corners on the first tier.

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8. In like manner proceed with the survey of each successive tier of sections, until you arrive at the fifth tier; and from each section corner which you establish upon this tier, you are to run random lines to the corresponding corners established upon the range line forming the western boundary of

the township; setting, as you proceed, each *temporary* quarter section post at forty chains from the interior section corner, so as to throw the excess or deficiency of measurement on the extreme tier of quarter sections contiguous to the township boundary; and, on returning, establish the *true* line, and establish thereon the *permanent* quarter section corner.

QUARTER SECTION CORNERS, both upon north and south and upon east and west lines, are to be established at a point *equidistant* from the corresponding section corners, *except* upon the lines closing on the north and west boundaries of the township, and in those situations the quarter section corners will always be established at precisely *forty chains* to the north or west (as the case may be) of the respective section corners from which those lines respectively *start*, by which procedure the excess or deficiency in the measurements will be thrown, according to law, on the extreme tier of quarter sections.

Every north and south section line, except those terminating in the north boundary of the township, is to be eighty chains in length. The east and west section lines, except those terminating on the west boundary of the township, are to be within one hundred links of eighty chains in length; and the north and south boundaries of any one section, except in the extreme western tier, are to be within one hundred links of equal length. The meanders within each fractional section, or between any two meander posts, or of a pond or island in the interior of a section, must close within one chain and fifty links.

DIAGRAM A illustrates the mode of laying off township exteriors *north* of the BASE line and EAST and WEST of the principal MERIDIAN, whether between the base and first standard, or between any two standards; and the same general principles will equally apply to townships *south* of the base line and east and west of the meridian, and between any two standards *south*, where the distances between the base and first standard, and between the standards themselves, are five townships or thirty miles.

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DIAGRAM B indicates the mode of laying off a TOWNSHIP into sections and quarter sections, and the accompanying set of field notes (marked B) critically illustrate the mode and order of conducting the survery under every variety of circumstance shown by the topography on the diagram. In townships lying south of and *contiguous* to the base or to any standard parallel, the lines between the northern tier of sections will be run *north*, and be made to close as *true* lines; quarter section corners will be set at forty chains, and section corners established at the intersection of such section lines with the base or standard, (as the case may be,) and the distance is to be measured and entered in the field book to the nearest corner on such standard or base.

DIAGRAM C illustrates the mode of making mound, stake, or stone corner boundaries for townships, sections, and quarter sections.

The mode and order of surveying the *exterior* boundaries of a township are illustrated by the specimen field notes marked A; and the mode and order of *subdividing* a township into sections and quarter sections are illustrated by the specimen field notes marked B. The attention of the deputy is particularly directed to these specimens, as indicating not only the method in which his work is to be conducted, buy also the order, manner, language, &c., in which his field notes are required to be returned to the Surveyor General's office; and such specimens are to be deemed part of these instructions, and any *departure* from their details, without special authority, in cases where the circumstances are analogous in practice, *will be regarded as a violation of his contract and oath.*

The subdivisions of fractional sections into forty acre lots, (as near as may be,) are to be so laid down on the official township plat in *red* lines, as to admit of giving to each a specific designation, if possible, according to its relative position in the fractional section, as per examples afforded by diagram B, as well as by a number, in all cases where the lot cannot properly be designated as a quarter-quarter. Those fractional subdivision lots which are not susceptible of being described according to relative local position, are to be numbered in regular series; No. 1 being (wherever practicable, and as a general rule) either the northeastern or the most easterly fractional lot, and proceeding from east to west and from west to east, alternately, to the end of the series; but such general rule is departed from under circumstances given as examples in fractional sections 4, 7, 19 and 30, where No. 1 is the interior lot of the northern and western tiers of the quarter sections to which there is a corresponding No. 2 given to the exterior lot, and the series of num-

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bers is in continuation of the latter. The lots in the extreme northern and western tiers of quarter sections, containing either more or less than the regular quantity, are always to be numbered as per example. Interior lots in such extreme tiers are to be *twenty* chains wide, and the excess or deficiency of measurement is always to be thrown on the exterior lots; elsewhere, the assumed subdivisional corner will always be a point equidistant from the established corners.

The official township plat to be returned to the General Land Office is to show on its face, on the right hand margin, the meanders of navigable streams, islands, and lakes. Such details are wanted in the adjustment of the surveying accounts, but may be omitted in the copy of the township plat to be furnished to the district land office by the surveyor general. A suitable margin for *binding* is to be preserved on the left hand side of each plat. Each plat is to be certified, with table annexed, according to the forms subjoined to "diagram B," and is to show the areas of public land, of private surveys, and of water, with the aggregate area as shown on the diagram.

Each township plat is to be prepared in *triplicate*: one for the General Land Office, one for the district office, and the third to be retained as the record in the office of the Surveyor General.

The original field books, each bearing the *written approval* of the Surveyor General, are to be substantially bound into volumes of suitable size, and retained in the surveyor general's office, and certified *transcripts* of such field books (to be of

foolscap size) are to be prepared and forwarded, from time to time, to the General Land Office.

With the copy of each township plat furnished to a district land office, the surveyor general is required by law to furnish *descriptive notes* as to the character and quality of the soil and timber found on and in the vicinity of each surveyed line, and giving a description of each corner boundary.

Printed blank forms for such notes will be furnished by the General Land Office. The forms provide eighteen spaces for *meander corners*, which, in most cases, will be sufficient; but when the number shall exceed eighteen, the residue will have to be inserted on the face of the township plat, to be furnished to the register of the district land office. There is shown a series of meander corners on diagram B, viz: from No. 1 to No. 22, on the river and islands; 23 to 28 being on Island lake; 29 and 30 on Clear lake; and 31 and 32 on lake in section 26.

There is also a distinct series of numbers, 1 to 7, to designate corners D. Reed's private survey, and to fractional sections, made such thereby; and the same series is continued from 8 to 14 inclusive, to

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designate corners to S. William's private survey, and to fractional sections made such thereby. These are numberings on the plat merely for the purpose of ready reference to the descriptions of such corners to be furnished to the registers.

The *letters* on "diagram B," at the "corners" on the township boundaries, are referred to in the descriptive notes to be furnished to the district land office, but are not required to be inserted on the official plat to be returned to the General Land Office.

The following chapter, on the subject of the variation of the magnetic needle, is extracted from the revised edition of the work on surveying by CHARLES DAVIES, L. L. D., a graduate of the Military Academy at West Point. The work itself will be a valuable acquisition to the deputy surveyor; and his attention is particularly invited to the following chapter, which sets forth the modes by which the variation may be ascertained.

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VARIATION OF THE NEEDLE.

1. The angle which the magnetic meridian makes with the true meridian, at any place on the surface of the earth, is called the *variation of the needle* at that place, and is east or west, according as the north end of the needle lies on the east or west side of the true meridian.

2. The variation is different at different places, and even at the same place it does not remain constant for any length of time. The variation is ascertained by comparing the magnetic with the true meridian.

3. If we suppose a line to be traced through those points on the surface of the earth, where the needle points directly north, such a line is called the *line of no variation.* At all places lying on the east of this line, the variation of the needle is west; at all places lying on the west of it, the variation is east.

4. The public is much indebted to Professor Loomis for the valuable results of many observations and much scientific research on the dip ad variation of the needle, contained in the 39th and 42d volumes of Siliman's Journal.

The variation at each place was ascertained for the year 1840; and by a comparison of previous observations and the application of known formulas, the annual motion, or change in variation, at each place, was also ascertained, and both are contained in the tables which follow.

5. If the annual motion was correctly found, and continues uniform, the variation at any subsequent period can be ascertained by simply multiplying the annual motion by the number of years, and adding the product, in the algebraic sense, to the variation in 1840. It will be observed that all variations west are designated by the plus sign; and all variations east, by the minus sign. The annual motions being all west, have all the plus sign.

6. Our first object will be to mark the line, as it was in 1840, of *no variation.* For this purpose we shall make a table of places lying near this line.

PLACES NEAR THE LINE OF NO VARIATION.

Place.	Latitude.	Longitude.	Variation.	An. Motion.
A Point.....	40°53′	80°13′	0°00′	+4′.4
Cleveland, Ohio.....	41 31	81 45	−0 19	4 .4
Detroit, Mich	42 24	82 58	−1 56	4
Mackinaw	45 51	84 41	−2 08	3 .9
Marietta, Ohio.....	39 0	81 28	−1 24	4 .3
Charlottesville, Va ...	39 02	78 30	+0 19	3 .7
Charleston, S. C.....	32 42	80 04	−2 44	1 .3

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At the point whose latitude is 40° 53′, longitude 80° 13′, the variation of the needle was nothing in the year 1840, and the direction of the line of no variation, traced north, was N. 24° 35′ west. The line of no variation, prolonged, passed a little to the east at Cleveland, in Ohio—the variation there being 19 minutes east. Detroit lay still further to the west of this line, the variation there being 1° 56′ east; and Mackinaw still further to the west, as the variation at that place was 2° 08′ east.

The course of the line of no variation, prolonged southerly, was S. 24° 35′ E. Marietta, Ohio, was west of this line—the variation there being 1° 24′ east. Charlottesville, in Virginia, was a little to the east of it—the variation there being 19′ west; whilst Charleston, in South Carolina, was on the west—the variation there being 2° 44′ east.

From these results, it will be easy to see about where the line of no variation istraced in our own country.

7. We shall give two additional tables:

PLACES WHERE THE VARIATION WAS WEST.

Places.	Latitude.	Longitude.	Variation.	An. Motion.
Angle of Maine	48°00′	67°37′	+19°30′	+8°.8
Waterville, Me.	44 27	69 32	12 36	5 .7
Montreal	45 31	73 35	10 18	5 .7
Keesville, N. Y.	44 28	73 32	8 51	5 .3
Burlington, Vt.	44 27	73 10	9 27	5 .3
Hanover, N. H.	43 42	72 14	9 20	5 .2
Cambridge, Mass.	42 22	71 08	9 12	5
Hartford, Ct.	41 46	72 41	6 58	5
Newport, R. I.	41 28	71 21	7 45	5
Geneva, N. Y.	42 52	77 03	4 18	4 .1
West Point.	41 25	74 00	6 52	4
New York City	40 43	71 01	5 34	3 .6
Philadelphia	39 57	75 11	4 08	3 .2
Buffalo, N. Y.	42 52	79 06	1 37	4 .1

PLACES WHERE THE VARIATION WAS EAST.

Places.	Latitude.	Longitude.	Variation.	An. Motion.
Mouth of Columbia River ...	46°12′	123°30′	−21°40′	Unknown.
Jacksonville, Ill.	39 43	90 20	8 28	+2′ .5
St. Louis, Mo..	38 37	90 17	8 37	2 .3
Nashville, Tenn.	36 10	86 52	6 42	2
Louisiana, at.	29 40	94 00	8 41	1 .4
Mobile, Ala.	30 42	88 16	7 05	1 .4
Tuscaloosa, Ala.	33 12	87 43	7 26	1 .6
Columbus, Geo.	32 28	85 11	5 28	2
Milledgeville, Geo.	33 07	83 24	5 07	2 .4
Savannah, Geo.	32 05	81 12	4 13	2 .7
Tallahassee, Fla.	30 26	84 27	5 03	1 .8
Pensacola, Fla.	30 24	87 23	5 53	1 .4
Logansport, Ind.	40 45	86 22	5 24	2 .7
Cincinnati, Ohio	39 06	84 27	4 46	3 .1

METHODS OF ASCERTAINING THE VARIATION.

8. The best practical method of determining the true meridian of a place, is by observing the north star. If this star were precisely at the point in which the axis of the earth, prolonged, pierces the heavens, then, the intersection of the vertical plane passing through it and the place, with the surface of the earth, would be the true meridian. But the star being at a distance from the pole, equal to 1° 30′ nearly, it performs a revolution about the pole in a circle, the polar distance which is 1° 30′: the time of revolution is 23 h. and 56 min.

To the eye of an observer, this star is continually in motion, and is due north but twice in 23 h. 56 min; and is then said to be on the meridian. Now, when it departs from the meridian, it apparently moves east or west, for 5 h. and 59 m., and then returns to the meridian again. When at its greatest distance from the meridian, east or west, it is said to be at its greatest *eastern* or *western* elongation.

The following tables show the times of its greatest eastern and western elongations.

EASTERN ELONGATIONS.

Days.	April.	May.	June.	July.	August.	Sept.
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1	18 18	16 26	14 24	12 20	10 16	8 20
7	17 56	16 03	14 00	11 55	9 53	7 58
13	17 34	15 40	13 35	11 31	9 30	7 36
19	17 12	15 17	13 10	11 07	9 08	7 15
25	16 49	14 53	12 45	10 43	8 45	6 53

WESTERN ELONGATIONS.

Days.	Oct.	Nov.	Dec.	Jan.	Feb.	March.
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.
1	18 18	16 22	14 19	12 02	9 50	8 01
7	17 56	15 59	13 53	11 36	9 26	7 38
13	17 34	15 35	13 27	11 10	9 02	7 16
19	17 12	15 10	13 00	10 44	8 39	6 54
25	16 49	14 45	12 34	10 18	8 16	6 33

The eastern elongations are put down from the first of April to the first of October; and the western, from the first of October to the first of April; the time is computed from 12 at noon. The western elongations in the first case, and the eastern in the second, occurring in the daytime, cannot be used. Some of those put down are also invisible, occurring in the evening, before it is dark, or after daylight in the morning. In such case, if it be necessary to determine the meridian at that particular season of the year, let 5 h. and 59 m. be added to, or subtracted from, the time of greatest eastern or western elongation, and the observation be made at night, when the star is on the meridian.

9. The following table exhibits the angle which the meridian plane makes with the vertical plane passing through the pole-star, when at its greatest eastern or western elongation: such angle is called the *azimuth*. The mean angle only is put down, being calculated for the first of July of each year:

AZIMUTH TABLE.

Year.	Lat. 32° Azimuth.	Lat. 34° Azimuth.	Lat. 36° Azimuth.	Lat. 38° Azimuth.	Lat. 40° Azimuth.	Lat. 42° Azimuth.	Lat. 44° Azimuth.
1851	1° 45½′	1° 48′	1° 50½′	1° 53½′	1° 56¾′	2° 00¼′	2° 04¼′
1852	1° 45′	1° 47½′	1° 50′	1° 53′	1° 56¼′	1° 59¾′	2° 03¾′
1853	1° 44½′	1° 47′	1° 49¾′	1° 52½′	1° 55¾′	1° 59¼′	2° 03¾′
1854	1° 44¼′	1° 46½′	1° 49¼′	1° 52′	1° 55¼′	1° 59′	2° 02¾′
1855	1° 43¾′	1° 46¼′	1° 48¾′	1° 51¾′	1° 54¾′	1° 58½′	2° 02¼′
1856	1° 43¼′	1° 45¾′	1° 48¼′	1° 51¼′	1° 54½′	1° 58′	2° 01¾′
1857	1° 43′	1° 45¼′	1° 48′	1° 50¾′	1° 54′	1° 57½′	2° 01¼′
1858	1° 42½′	1° 44¾′	1° 47½′	1° 50¼′	1° 53½′	1° 57′	2° 00¾′
1859	1° 42′	1° 44½′	1° 47′	1° 49¾′	1° 53′	1° 56½′	2° 00¼′
1860	1° 41¾′	1° 44′	1° 46½′	1° 49½′	1° 52½′	1° 56′	2° 00′
1861	1° 41¼′	1° 43¾′	1° 46¼′	1° 49′	1° 52¼′	1° 55¾′	1° 59½′

The use of the above tables, in finding the true meridian, will soon appear.

TO FIND THE TRUE MERIDIAN WITH THE THEODOLITE.

10. Take a board, of about one foot square, paste white paper upon it, and perforate it through the centre: the diameter of the hole being somewhat larger than the diameter of the telescope of the theodolite. Let this board be so fixed to a vertical staff as to slide up and down freely; and let a small piece of board, about three inches square, be nailed to the lower edge of it, for the purpose of holding a candle.

About twenty-five minutes before the time of the greatest eastern or western elongation of the pole-star, as shown by the tables of elongations, let the theodolite be placed at a convenient point and levelled. Let the board be placed about one foot in front of the theodolite, a lamp or candle placed on the shelf at its lower edge; and let the board be slipped up or down, until the pole-star can be seen through the hole. The light reflected from the paper will show the cross hairs in the telescope of the theodolite.

Then, let the vertical spider's line be brought exactly upon the pole-star, and, if it is an eastern elongation that is to be observed, and the star has not yet reached the most easterly point, it will move from the line towards the east, and the reverse when the elongation is west.

At the time the star attains its greatest elongation, it will appear to coincide with the vertical spider's line for some time, and then leave it, in the direction contrary to its former motion.

As the star moves towards the point of greatest elongation, the telescope must be continually directed to it, by means of the tangent-screw of the vernier plate; and when the star has attained its greatest elongation, great care should be taken that the instrument be not afterwards moved.

Now, if it be not convenient to leave the instrument in its place until daylight, let a staff, with a candle or small lamp upon its upper extremity, be arranged at thirty or forty yards from the theodolite, and in the same vertical plane with the axis of the telescope. This is easily effected, by revolving the vertical limb about its horizontal axis without moving the vernier plate, and aligning the staff to coincide with the vertical hair. Then mark the point directly under the theodolite; the line passing through this point and the staff, makes an angle with the true meridian equal to the azimuth of the pole-star.

From the table of azimuths, take the azimuth corresponding to the year and nearest latitude. If the observed elongation was east, the true meridian lies on the west of the line which has been found, and makes

with it an angle equal to the azimuth. If the elongation was west, the true meridian lies on the east of the line; and, in either case, laying off the azimuth angle with the theodolite, gives the true meridian.

TO FIND THE TRUE MERIDIAN WITH THE COMPASS.

11. 1. Drive two posts firmly into the ground, in a line nearly east and west; the uppermost ends, after the posts are driven, being about three feet above the surface, and the posts about four feet apart: then lay a plank, or piece of timber three or four inches in width, and smooth on the upper side, upon the posts, and let it be pinned or nailed, to hold it firmly.

2. Prepare a piece of board four or five inches square, and smooth on the under side. Let one of the compass-sights be placed at right angles to the upper surface of the board, and let a nail be driven through the board, so that it can be tacked to the timber resting on the posts.

3. At above twelve feet from the stakes, and in the direction of the pole-star, let a plumb be suspended from the top of an inclined stake or pole. The top of the pole should be of such a height that the pole star will appear about six inches below it; and the plumb should be swung in a vessel of water to prevent it from vibrating.

This being done, about twenty minutes before the time of elongation, place the board, to which the compass sight is fastened, on the horizontal plank, and slide it east or west, until the aperture of the compass-sight, the plumb-line, and the star, are brought into the same range. Then if the star depart from the plumb-line, move the compass-sight east or west along the timber, as the case may be, until the star shall attain its greatest elongation, when it will continue behind the plumb-line for several minutes, and will then recede from it in the direction contrary to its motion before it became stationary. Let the compass-sight be now fastened to the horizontal plank. During this observation it will be necessary to have the plumb-line lighted: this may be done by an assistant holding a candle near it.

Let now a staff, with a candle or lamp upon it, be placed at a distance of thirty or forty yards from the plumb-line, and in the same direction with it and the compass-sight. The line so determined makes, with the true meridian, an angle equal to the azimuth of the pole-star; and from this line the variation of the needle is readily determined, even without tracing the true meridian on the ground.

Place the compass upon this line, turn the sights in the direction of it, and note the angle shown by the needle. Now, if the elongation, at

the time of observation, was west, and the north end of the needle is on the west side of the line, the azimuth, plus the angle shown by the needle, is the true variation. But should the north end of the needle be found on the east side of the line, the elongation being west, the difference between the azimuth and the angle would show the variation, and the reverse when the elongation is east.

1. Elongation west, azimuth ---------- 2° 04′
North end of the needle on the west,
angle ---------- 4° 06′

Variation ---------- 6° 10′ west.

2. Elongation west, azimuth ---------- 1° 59′
North end of the needle on the east,
angle ---------- 4° 50′

Variation ..... 2° 51′ east.

3. Elongation east, azimuth ---------- 2° 05′
North end of the needle on the west,
angle ---------- 8° 30′

Variation ---------- 6° 25′ west.

4. Elongation east, azimuth ---------- 1° 57′
North end of the needle on the east,
angle ---------- 8° 40′

Variation ---------- 10° 37′ east.

REMARK I. The variation at West Point, in September, 1835, was 6° 32′ west.

REMARK II. The variation of the needle should always be noted on every survey made with the compass, and then if the land be surveyed at a future time, the old lines can always be re-run.

12. It has been found by observation, that heat and cold sensibly affect the magnetic needle, and that the same needle will, at the same place, indicate different lines at different hours of the day.

If the magnetic meridian be observed early in the morning, and again at different hours of the day, it will be found that the needle will continue to recede from the meridian as the day advances, until about the time of the highest temperature, when it will begin to return, and at evening will make the same line as in the morning. This change is called the *diurnal variation*, and varies, during the summer season, from one-fourth to one-fifth of a degree.

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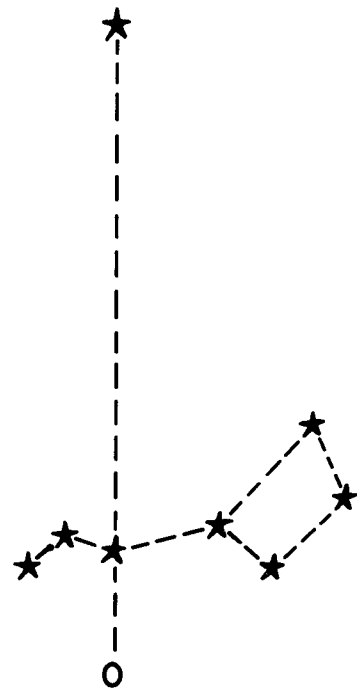
13. A very near approximation to a true meridian, and consequently to the variation, may be had, by remembering that the pole-star very nearly reaches the true meridian, when it is in the same vertical plane with the star Alioth in the tail of the Great Bear, which lies nearest the four stars forming the quadrilateral.

The vertical position can be ascertained by means of a plumb-line. To see the spider's lines in the field of the telescope at the same time with the star, a faint light should be placed near the object-glass. When the plumb-line, the star Alioth, and the north star, fall on the vertical spider's line, the horizontal limb is firmly clamped, and the telescope brought down to the horizon; a light, seen through a small aperture in a board, and held at some distance by an assistant, is then moved according to signals, until it is covered by the intersection of the spider's lines. A picket driven into the ground, under the light, serves to mark the meridian line for reference by day, when the angle formed by it and the magnetic meridian may be measured.



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Referring the lines to the pages of the field-notes.

Town. 25 N. Range 2 W. Willamette Meridian.

A.

Field Notes of the survey of the exterior boundaries of Township 25 north of range 2 west of the Willamette meridian, in the Territory of Oregon, by Robert Acres, deputy surveyor, under his contract No. 1, bearing date the 2d day of January, 1854.

South Boundary, T. 25 N. R. 2 W. Willamette Meridian.

CHAINS.	
	Begin at the post, the established corner to Townships 24 and 25 North, in Ranges 2 and 3 West. The witness trees all standing, and agree with the description furnished me by the office, viz: A Black Oak, 20 in. dia. N. 37 E. 27 links, A Bur Oak, 24 in. dia. N. 43 W. 35 links, A Maple, 18 in. dia. S. 27 W. 39 links, A White Oak, 15 in. dia. S. 47 E. 41 links.
	East, on a random line on the South Boundaries of sections 31, 32, 33, 34, 35, and 36.
	Variation by Burt's improved solar compass, 18° 41′ E,
	I set temporary half mile and mile posts at every 40 and 80 chains, and at 5 miles, 74 chains, 53 links, to a point 2 chains and 20 links north of the corner to Townships 24 and 25 North, Ranges 1 and 2 W.
	(Therefore the correction will be 5 chains, 47 links West, and 37 links *South* per mile,)
	I find the corner post standing and the witness trees to agree with the description furnished me by the surveyor general's office, viz: A Bur Oak, 17 in. dia. bears N. 44 E. 31 links, A White Oak, 16 in. dia. N. 26 W. 21 links, A Lynn, 20 in. dia. S. 42 W. 15 links.

	A Black Oak, 24 in. dia. S. 27 E. 14 links.
	From the corner to Townships 24 and 25 N. Ranges 1 and 2 West, I run (at a variation of 18° 25′ East,)
	West, on a *true* line along the South Boundary of section 36,
40.00	Set a post for quarter section corner, from which
	A Beech, 24 in. dia. bears N. 11 E. 38 links dist
	A Beech, 9 in. dia. bears S. 9 E. 17 links dist.
62.50	A Brook, 6 links wide runs North,
80.00	Set a post for corner to sections 35 and 36, 1 and 2, from which
	A Beech, 9 in. dia. bears N. 22 E. 16 links dist.
	A Beech, 8 in. dia. bear N. 19 W. 14 links dist.
	A White Oak, 10 in. dia. bears S. 52 W. 7 links dist.
	A Black Oak, 14 in. dia. bears S. 46 E. 8 links dist.
	Land level, good soil, fit for cultivation,
	Timber, Beech; various kinds of Oak, Ash, and Hickory.

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South Boundary, T. 25 N. R. 2 W. Willamette Meridian.

CHAINS.	
	West, on a *true* line along the South Boundary of section 35, Variation 18° 25′ East,
40.00	Set a post for quarter section corner, from which
	A beech, 8 in. dia. bears N. 20 E. 8 links dist.
	No other tree convenient; made trench around post,
65.00	Begin to ascend a moderate hill; bears N. and S.
80.00	Set a post with trench, for corner of sections 34 and 35, 2 and 3, from which
	A Beech, 10 in. dia. bears N. 56 W. 9 links dist.
	A Beech, 10 in. dia. bears S. 51 E. 13 links dist.
	No other trees convenient to mark,
	Land level, or gently rolling, and good for farming,
	Timber, Beech, Oak, Ash, and Hickory; some Walnut and Poplar.
	West, on a *true* line along the South Boundary of section 34, Variation 18° 25′ East,
40.00	Set a quarter section post with trench, from which
	A Black Oak, 10 in. dia. bears N. 2 E. 635 links dist.
	No other tree convenient to mark,
80.00	To point for corner of sections 33, 34, 3 and 4,
	Drove charred stakes, raised mounds with trenches, as per instructions, from which
	A Bur Oak, 16 in. dia. bears N. 31 E. 344 links, and
	A Hickory, 12 in. dia. bears S. 43 W. 231 links,
	No other trees convenient to mark,
	Land level, rich and good for farming,
	Timber, some scattering Oak and Walnut.
	West, on a *true* line along the South Boundary of section 33, Variation 18° 25′ East,
37.51	A Black Oak, 24 in. dia.
40.00	Set a post for quarter section corner, from which
	A Black Oak, 18 in. dia. bears N. 25 E. 32 links dist.
	A White Oak, 15 in. dia. bears N. 43 W. 22 links dist.
62.00	To foot of steep hill, bears N. E. and S. W.
80.00	Set a post for corner to sections 32, 33, 4 and 5, from which
	A White Oak, 15 in. dia. bears N. 23 E. 27 links dist.
	A Black Oak, 20 in. dia. bears N. 82 W. 75 links dist.
	A Bur Oak, 20 in. dia. bears S. 37 W. 92 links dist.
	A White Oak, 24 in. dia. bears S. 26 E. 42 links dist.
	Land gently rolling; good rich land for farming,
	Timber, Black and White Oak, Hickory and Ash.
	West, on a *true* line along the South Boundary of section 32, Variation 18° 25′ East,
37.50	A creek 20 links wide, runs North,
40.00	Set a granite stone 14 in. long, 10 in. wide, and 4 in. thick, for quarter section corner from which

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South Boundary, T. 25 N. R. 2 W. Willamette Meridian.

CHAINS.	
	A Maple, 20 in. dia. bears N. 41 E. 25 links distant,
	A Birch, 24 in. dia. bears N. 35 W. 22 links distant,
76.00	To S. E. edge of swamp,
	As it is impossible to establish *permanently* the corner to sections 31, 32,5 and 6 in the swamp, I therefore at this point, 400 chains East of the true point for said section cor. raise a witness mound with trench, as per instructions, from which
	A Black Oak, 20 in. dia. bears N. 51 E. 115 links,
80.00	A point in deep swamp for corner to sections 31, 32, 5 and 6,
	Land, rich bottom; *west* of creek part wet; *east* of creek good for farming,
	Timber, good; Oak, Hickory, and Walnut.
	West, on a *true* line along the South Boundary of Section 31, Variation 18° 25′ East,
11.00	Leave swamp and rise bluff 30 feet high, bears N. and S.
40.00	Set post for quarter section corner, from which
	A Sugar Tree, 27 in. dia. bears S. 81 W. 42 links dist.
	A Beech, 24 in. dia. bears S. 71 E. 24,
54.00	Foot of rocky bluff 30 feet high, bears N. E. and S. W.
57.50	A spring branch comes out at the foot of the bluff 5 links wide; runs N. W. into swamp,
61.00	Enter swamp; bears N. and S.
70.00	Leave swamp; bears N. S. The swamp contains about 15 acres, the greater part in section 31,
74.73	The corner to Townships 24 and 25 N. ranges 2 and 3 W.
	Land, except the swamp, rolling, good, rich soil,
	Timber, Sugar Tree, Beech, and Maple.
	January 25th, 1854.
	Between ranges 1 and 2 West S. 25 N. Willamette Meridian,
	From the corner to Townships 24 and 25 N. ranges 1 and 2 W. I run North, along the East Boundary of section 36, Variation 17° 51′ E.
1.00	A brook 5 links wide, runs N. W.
18.00	To foot of hill, bearing N. W. and S. E.
20.00	To rocky bluff 50 feet high, bears N. W. and S. E.
40.00	Set a post for quarter section corner, from which
	A Beech, 13 in dia. bears N. 36 E. 22 links dist.
	A Poplar, 20 in. dia. bears S. 39 E. 42 links dist.
55.00	To top of rocky bluff 40 feet high, bears N. W. and S. E.
57.00	To foot of bluff; enter level, rich land,
72.50	A brook 10 links wide, runs N. W.
80.00	Set a post for corner to sections 25, 36, 30, and 31, from which

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Between Ranges 1 and 2 W. T. 25 N. Willamette Meridian.

CHAINS.	
	A Birch, 24 in. dia. bears N. 20 E. 49 links dist.
	A Sugar Tree, 12 in. dia. bears N. 81 W. 25 links dist.
	A White Oak, 9 in. dia. bears S. 40 W. 60 links dist.
	A Poplar, 15 in. dia. bears S. 38 E. 12 links dist.
	Land, North and South parts rich and good for farming; middle part broken, 3d rate; Timber, Beech, Sugar Tree, Poplar, and White Oak.
	North, on the East Boundary of section 25, Variation 18° East.
5.51	A Maple, 20 in. dia.
6.00	To foot of hill, rises moderately, bears E and N. W.
40.00	Set quarter section stone (a rose quartz) 15 inches long, 12 inches wide, and 3 inches thick, (on steep side hill, slopes West,) from which

	A Poplar, 40 in. dia. bears N. 40 W. 10 links dist.
	A Beech. 9 in. dia. bears S. 42 W. 11 links dist.
73.21	A White Oak, 20 in. dia.
80.00	Set a post for corner of sections 24, 25, 19 and 30, from which
	A Beech, 20 in. dia. bears N. 64 E. 41 links dist.
	A White Oak, 10 in. dia. bears N. 30 W. 13 links dist.
	A Beech, 12 in. dia. bears S. 32 W. 26 links dist.
	A White Oak, 11 in. dia. bears S. 34 E. 48 links dist.
	Land rolling; good soil; nearly 1st rate,
	Timber, Sugar Tree, Beech, Walnut, Elm, and White Oak.
	North, on the East Boundary of section 24,
	Variation 17° 55′ East,
21.17	A White Walnut, 20 in. dia.
40.00	Set a quarter section post, from which
	A Buckeye, 14 in. dia. bears N. 39 E. 27 links dist.
	A Buckeye, 10 in. dia. bears S. 48 W. 6 links dist.
44.00	The road (at the foot of the bluff) from Williamsburg to Astoria, bears East and West,
49.00	Elk creek, 150 links wide, gentle current, runs West,
57.10	A brook, 10 links wide, runs S. W.
59.67	A Black Oak, 24 in. dia.
65.50	Leave creek bottom and enter upland, bears E. and W.
80.00	Set a lime stone, 16 in. long, 14 wide, and 3 in. thick, for corner to sections 13, 24, 18 and 19, from which
	A Beech, 12 in. dia. bears N. 30 E. 50 links dist.
	A Walnut, 9 in. dia. bears N. 18 W. 29 links dist.
	A Walnut, 8 in. dia. bears S. 8 W. 51 links dist.
	A Beech, 6 in. dia. bears S. 20 E. 40 links dist.
	Land, except creek bottom, rolling; good, rich soil. The bottom, dry and rich—not subject to inundation,
	Timber, good; Walnut, Beech, Maple, Ash and Hickory.

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Between Ranges 1 and 2 W. T. 25 N. Willamette Meridian.

CHAINS.	
	North, on the East Boundary of section 13,
	Variation 17° 55′ East,
14.00	A White Oak, 24 in. dia.
21.00	Enter high broken ridges, bearing East and N. W.
40.00	Set a post for quarter section corner, from which
	A Cherry, 10 in. dia. bears N. 35 W. 2 links dist.
	A Cherry, 10 in. dia. bears S. 52 E. 21 links dist.
43.71	A Bur Oak, 30 in. dia.
80.00	Set a post for corner to sections 12, 13, 7 and 18, from which
	A Hickory, 15 in. dia. bears N. 40 E. 14 links dist.
	A Hickory, 20 in. dia. bears N. 39 W. 38 links dist.
	A Beech, 12 in. dia. bears S. 36 W. 16 links dist.
	A Sugar Tree, 10 in. dia. bears S. 42 E. 23 links dist.
	Land (except 21.00 chains, South part) high, broken, and mountainous,
	Timber, Beech, Hickory, Sugar Tree, and Blackjack.
	North, on the East Boundary of section 12,
	Variation 17° 55′ East,
7.26	A Black Oak, 24 in. dia.
40.00	Set a post for quarter section corner, from which
	A White Ash, 10 in. dia. bears N. 35 W. 15 links dist.
	An Elm, 10 in. dia. bears S. 83 E. 2 links dist.
68.00	The foot of the mountain bears East and N. W.
80.00	Set a post on the top of eastern extremity of mountain, 300 feet high, for corner to sections 1, 12, 6 and 7, from which
	An Elm, 12 in. dia. bears N. 46 E. 30 links dist.
	A Beech, 10 in. dia. bears N. 40 W. 28 links dist.
	A Hickory, 10 in. dia. bears S. 55 W. 40 links dist.
	A Beech, 10 in. dia. bears S. 40 E. 6 links dist.
	Land mountainous and broken,
	Timber, Hickory, White Oak, Black Oak, Beech, and Ash.
	North, on the East Boundary of section 1,
	Variation 17° 55′ East,
9.00	The foot of mountain bears East and West,
25.37	A White Oak, 16 in. dia.
40.00	Set a post in deep ravine bearing S. W. for quarter section corner, from which
	A Poplar, 9 in. dia. bears N. 76 E 7 links dist.
	A Sugar Tree , 9 in. dia. bears S. 22 E. 15 links dist.
44.00	Leave timber and enter prairie, bears E. and N. W.
80.00	To a point for corner to Townships 25 and 26 N. Ranges 1 and 2 W.
	Drove charred stake, and raised a mound with trench, as per instructions, and planted N. W. 4 Chesnuts, S. W. 2 Hickory Nuts, N. E. 4 Cherry Stones, and S. E. 4 White Oak Acorns.

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Between Ranges 2 and 3 W. T. 25 N. Willamette Meridian.

CHAINS.	
	Land, South of prairie, mountainous and broken; prairie good for farming,
	Timber, Sugar Tree, Cedar, and Pine.
	January 26th, 1854.
	From the corner to Townships 24 and 25 N. Ranges 2 and 3 West, I run
	North, on the Range line between sections 31 and 36,
	Variation 18° 56′ East,
8.56	Set a post on the left bank of Chickeeles river, for corner to fractional sections 31 and 36, from which
	A Hackberry, 11 in. dia. bears N. 50 E. 11 links dist.
	A Sycamore, 60 in. dia. bears S. 15 W. 24 links dist.
	I now cause a flag to be set on the *right* bank of the river, and in the line between sections 31 and 36. I now cross the river, and from a point on the right bank thereof, *West* of the corner just established on the left bank, I run *North,* on an offset line, 25 chains and 94 links, to a point 8 chains and 56 links *West* of the flag. I now set a post in the place of the flag, for corner to fractional sections 31 and 36, from which
	A Beech, 10 in. dia. bears N. 2 E. 12 links dist.
	A Black Oak, 12 in. dia. bears N. 80 W. 16 links dist.
34.50	The corner above described,
40.00	Set a post for quarter section corner, from which
	A Bur Oak, 20 N. bears N. 37 E. 26 links dist.
	A Black Oak, 24 in. dia. bears S. 75 W. 21 links dist.
43.41	A Black Walnut, 30 in. dia.
80.00	Set a post for corner to sections 30, 31, 25 and 36, from which
	A Beech, 14 in dia. bears N. 20 E. 14 links dist.
	A Hickory, 9 in. dia. bears N. 25 W. 12 links dist.
	A Beech, 16 in. dia. bears S. 40 W. 16 links dist.
	A White Oak, 10 in. dia. bears S. 44 E. 20 links dist.
	Land level; rich bottom; not subject to inundation,
	Timber, White and Black Oak, Beech, Hickory, and Ash.
	North, between sections 25 and 30,
	Variation 18° 50′ East,
27.73	Set a post for corner to fractional sections 25 and 30 on the right bank of Chickeeles river, a navigable stream, which here runs S. E. from which
	A Willow, 6 in. dia. bears S. 37 W. 55 links dist.
	A Maple, 20 in. dia. bears S. 30 E. 11 links dist.
	I now cause a flag to be set on the left bank of the river, and in the line between sections 25 and 30. From the above corner I run West 333 chains to a point from which the flag bears N. 16° 30′ E. which gives for the distance across

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Between Ranges 2 and 3 W. T. 25 N. Willamette Meridian.

CHAINS.	
	the river on the line 11.27 chains, to which add 27.73, makes,
39.00	To the flag on the bank, I here set a post for corner to fractional sections 25 and 30, from which A Hickory, 8 in. dia. bears N. 44 E. 17 links dist. A White Oak, 8 in. dia. bears N. 15 W. 8 links dist.
40.00	Set a post for quarter section corner, from which A Hickory, 9 in. dia. bears N. 16 E. 16 links dist. A Buckeye, 10 in. dia. bears S. 16 E. 18 links dist.
43.71	A Hickory, 24 in. dia.
80.00	Set a post for corner to sections 19, 30, 24, 25, from which An Elm, 6 in. dia. bears N. 82 E. 25 links dist. A Sugar Tree, 14 in. dia. bears N. 49 W. 4 links dist. An Elm, 9 in. dia. bears S. 42 W. 30 links dist. A Sugar Tree, 10 in dia. bears S. 55 E. 45 links dist. Land good; rich bottom, 1st rate, Timber, Hickory, Elm, Buckeye, Sugar Tree, and Ash;
	North, between sections 19 and 24, Variation 18° 50′ East,
32.50	A Hickory, 20 in. dia. on the left bank of Chickeeles river mark it for corner to fractional sections 19 and 24, from which A Hackberry, 20 in. dia. bears S. 13 W. 27 links dist. A Black Oak, 24 in. dia. bears S. 27 E. 31 links dist. I now cause a flag to be set on the right bank of the river, and in the line between sections 19 and 24, and from the corner run a *base* East 5.90 chains to a point from which the flag bears N. 17 W. continue the base East to a point 9.00 chains *East* of the corner on the river bank, from which the flag bears N. 25° 15′ W. which gives by calculation as the mean result of the two observations for the distance across the the river on the line between sections 19 and 24, 19.30 chains, to which add 32.50 chains, the distance to the river, makes
51.80	To the flag on the right bank of the river; I here set a post for corner to fractional sections 19 and 24, from which A Beech, 12 in. dia. bears N. 24 E. 39 links dist. A Beech, 14 in. dia. bears S. 55 W. 120 links dist. NOTE.—The point for quarter section corner falling in the river, it cannot therefore be established,
55.74	A Black Oak, 30 inches diameter,
80.00	Set a post for corner to sections 18, 19, 13, and 24, from which A White Oak, 18 in. dia. bears N. 55 E. 24 links dist. A White Oak, 17 in. dia. bears N. 64 W. 18 links dist. A Red Oak, 27 in. dia. bears S. 26 W. 20 links dist. A Red Oak, 15 in. dia. bears S. 29 E. 40 links dist.

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Between Ranges 2 and 3 W. T. 25 N. Willamette Meridian.

CHAINS.	
	Land good; rich bottom; not subject to inundation, Timber, various kinds of Oak, Beech, Hickory, and Ash; undergrowth same, and vines.
	North, between sections 13 and 18, Variation 18° 53′ East,
5.00	Leave bottom and enter upland; bears N. E. and S. W.
21.88	A Red Oak, 20 in. dia.
38.60	A White Oak, 24 in. dia.
40.00	Set a post for quarter section corner, from which A White Oak, 22 in. dia. bears N. 27 W. 27 links dist. A White Oak, 23 in. dia. bears S. 28 E. 92 links dist.
46.50	A road from Williamsburg bears East and West,
68.37	A Black Walnut, 21 in. dia.
80.00	Set a post for corner to sections 7, 18, 12, and 13, from which A White Oak, 12 in. dia. bears N. 55 E. 68 links dist. A Black Oak, 8 in. dia. bears N. 53 W. 40 links dist. A Black Oak, 16 in. dia. bears S. 40 W. 55 links dist. A Red Oak, 10 in. dia. bears S. 44 E. 50 links dist. Land rolling, and next the bottom broken; soil 2d rate, Timber good; various kinds of Oak and Hickory.
	North, between sections 7 and 12, Variation 18° 53′ East,
15.18	A White Oak, 15 in. dia.
30.26	A White Oak, 21 in dia.
40.00	Set a post for quarter section corner, from which A White Oak, 12 in. dia. bears S. 13 W. 60 links dist. A White Oak, 15 in. dia. bears S. 35 E. 55 links dist.
68.37	A Black Walnut, 21 in. dia.
80.00	Set a post for corner to sections 6, 7, 1, and 12, from which A White Oak, 17 in. dia. bears N. 58 E. 60 links dist. A White Oak, 18 in. dia. bears N. 54 W. 51 links dist. A White Oak, 18 in. dia. bears S. 51 W. 20 links dist. A Hickory, 14 in. dia. bears S. 64 E. 42 links dist. Land gently rolling, 2d rate. Timber, Oak and Hickory; undergrowth, Oak and Hazel.
	North, between sections 1 and 6, Variation 18° 53′ East,
3.00	Enter *stony* barrens; timber scattering; bears East and West,
25.31	A Blackjack, 12 in. dia.
40.00	Set a quartz stone, 13 in. long, 12 in. wide, and 4 in. thick, for quarter section corner, with trench, as per instructions, from which A Blackjack, 20 in. dia. bears S. 44 E. 95 links dist. No other tree convenient to mark,
45.00	Leave *stony* barrens, bears East and West,

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Between Townships 25 and 26 N. R. 2 W. Willamette Meridian.

CHAINS.	
61.11	A Hickory, 10 in. dia. Here leave timber and enter prairie, bearing West and N. E.
80.00	Set a granite stone, 18 in. long, 12 in. wide, and 6 inches thick, for corner to Townships 25 and 26 North, Ranges 2 and 3 West; raise a stone mound, with trench, as per instructions, Land broken and stony; too poor for cultivation, Timber, scattering and poor; Blackjack and Hickory. January 27th, 1851.
	From the corner to Townships 25 and 26 N. Ranges 2 and 3 West, I run East, on a *random* line between said Townships, the variation of my compass being 18° 41′ E. I set temporary half-mile and mile posts at 40.00 and 80,00 chains, At 160.09 intersected the right bank of Chickeeles river, a navigable stream, where set a temporary post; obtain the distance across the river on the line by causing my flag to be set on the left bank of the river, in said line, From the temporary post on the right bank, I run North 7 chains 63 links to a point; thence East, on an offset line, and at 30.00 chains a point North of the flag standing on the left bank of the river, set a temporary post in the place of the flag, I find the Township line to be 5 miles, 76 chains 53 links, and the falling to be 25 links North of the township corner, The correction for the true line will therefore be 3 chains 47 links West and 4.2 links South per mile.
	From the corner to Townships 25 and 26 N. Ranges 1 and 2 West, I run West, on a *true* line between sections 1 and 36, Variation 18° 39′ East,
20.00	Leave prairie and enter scattering timber; bears N. and S.

40.00	Set a post for quarter section corner, from which A Beech, 24 in. dia. bears N. 11 E. 38 links dist. A Beech, 9 in. dia. bears S. 9 W. 19 links dist.
43.71	A Black Walnut, 30 in. dia.
80.00	Set a sandstone, 16 in. long, 12 in. wide, and 3 in. thick, for corner to sections 1, 2, 35 and 36, from which A Buckeye, 9 in. dia. bears N. 66 E. 15 links dist. An Elm, 20 in dia. bears N. 4 W. 10 links dist. An Elm, 36 in dia. bears S. 65 W. 8 links dist. A Buckeye, 10 in. dia. bears S. 40 E. 20 links dist.
	Land level, or gently rolling, and 1st rate,
	Timber, scattering next the prairies; Elm, Buckeye, Beech, Walnut, and Oak.

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Between Townships 25 and 26 N. Range 2 W. Willamette Meridian.

CHAINS.	
	West, on a *true* line between sections 2 and 35, Variation 18° 39′ East,
27.13	A White Oak, 24 in. dia.
40.00	Set a post for quarter section corner, from which A White Oak, 9 in. dia. bears N. 24 E. 28 links dist. A Buckeye, 12 in. dia. bears S. 48 W. 9 links dist.
75.59	A Black Oak, 24 in. dia.
80.00	Set a post for corner to sections 2, 3, 34 and 35, from which A Sugar Tree, 15 in. dia. bears N. 46 E. 15 links dist.
	No tree convenient in section 34, A Beech, 16 in. dia. bears S. 35 W. 16 links dist. A Sugar Tree, 14 in dia. bears S. 30 E. 14 links dist.
	Land gently rolling, and 1st rate,
	Timber, good; Elm, Buckeye, Beech, Walnut, and Oak,
	West, on a *true* line between sections 3 and 34, Variation 18° 39′ East.
9.00	Enter wet prairie; bears N. and S.
16.00	A beautiful spring branch, 5 links wide, runs S. W.
22.00	Leave prairie; bears N. E. and S. W.
31.27	A Black Oak, 20 in. dia.
40.00	Set a post for quarter section corner, from which A White Walnut, 16 in. dia. bears N. 64 E. 7 links dist. A White Walnut, 12 in. dia. bears S. 73 W. 31 links dist.
41.33	A White Oak, 30 in. dia.
74.52	A point 4 links South of a Black Oak, 24 in. dia; mark it by cutting 2 notches South side,
75.00	Leave timber and enter a narrow strip of prairie; bears N. W. and S. E.
80.00	A point for corner to sections 3, 4, 33 and 34, drove a charred stake, and raised a mound, with trench, as per instructions, from which A White Oak, 20 in. dia. bears N. 73 E. 540 links dist. A Black Oak, 30 in. dia. bears S. 76 E. 613 links dist.
	Land gently rolling; 1st rate.
	Timber, White and Black Oak, Walnut and Sugar Tree.
	West, on a *true* line between sections 4 and 33, Variation 18° 39′ East,
7.50	Leave prairie; bears N. W. and S. E.
21.50	A spring branch, 15 links wide, runs N. W.
40.00	A Black Walnut, 30 in. dia.; mark it for quarter section corner, from which A Buckeye, 9 in. dia. bears S. 45 E. 11 links dist. A Black Walnut, 20 in. dia. bears N. 29 W. 25 links dist.
41.40	Leave upland and enter river bottom; bears N. E. and S. W.
46.44	Set a post on the left bank of Chickeeles river, for corner to fractional sections 4 and 33, from which

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Between Townships 25 and 26 N. R. 2 W. Willamette Meridian.

CHAINS.	
	An Elm, 8 in. dia. bears N. 71 E. 5 links dist. An Elm, 10 in. dia. bears S. 19 W. 6 links dist.
	The line running in the river, the distance on the random line was obtained on an offset by running *North* from the temporary post on the right bank 7 chains 63 links to a point thence *East* 30.00 chains, and coming back to *true* line on the left bank of the river,
76.44	Set a post on the right bank of the river for corner to fractional sections 4 and 33,from which A Cherry, 6 in. dia. bears N. 61 E. 17 links dist. A Sugar Tree, 20 in. dia. bears S. 75 W. 20 links dist.
76.64	A Sugar Tree, 23 in. dia.
80.00	Set a post for corner to sections 4, 5, 32 and 33, from which A Hackberry, 7 in. dia. bears N. 67 E. 17 links dist. A Sugar Tree, 20 in. dia. bears N. 71 W. 43 links dist. A Locust, 14 in. dia. bears S. 30 W. 16 links dist. A Beech, 20 in. dia. bears S. 20 E. 50 links dist.
	Land, East of bottom, rolling; good soil; the bottom subject to inundation 4 feet,
	Timber, on upland, Oak; in bottom, Sugar, Cherry, and Hackberry.
	West, on a *true* line between sections 5 and 32, Variation 18° 39′ East,
24.40	A White Oak, 16 in. dia. Here leave bottom and enter hills; bears N. E. and S. W.
40.00	Set a post for quarter section corner, from which A Hickory, 18 in. dia. bears N. 88 E. 40 links dist. A Mulberry, 14 in. dia. bears S. 69 W. 103 links dist.
42.73	A Black Ash, 15 in. dia.
80.00	Set a post for corner to sections 5, 6, 31 and 32, from which A Sugar Tree, 20 in. dia. bears N. 89 E. 60 links dist. An Elm, 14 in. dia. bears N. 12 W. 24 links dist. An Elm, 15 in. dia. bears S. 14 W. 23 links dist. A Sugar Tree, 16 in. dia. bears S. 15 E. 26 links dist.
	Land gently rolling, and 1st rate; the bottom level,
	Timber, Sugar Tree, Walnut, and Oak; undergrowth, same and Spice.
	West, on a *true* line between sections 6 and 31, Variation 18° 39′ East,
8.00	To swamp of about 15 acres; bears N. E. and S. W.
18.00	Leave swamp; bears N. E. and S. W.; the line passes through the middle of the swamp,
18.26	A Red Oak, 30 in. dia. on N. W. bank of swamp,
34.30	A Hickory, 18 in. dia.
40.00	Set a post for quarter section corner, from which A Bur Oak, 27 in. dia. bears N. 49 E. 46 links dist.

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Between Townships 25 and 26 N. R. 2 W. Willamette Meridian.

CHAINS.	
	A Sugar Tree, 20 in. dia. bears N. 56 W. 60 links dist.
	No tree convenient *South* of the line,
48.65	A stream 14 links wide runs South,
57.40	A White Oak, 28 in. dia.
61.00	Enter prairie; bears N. E. and S. W.
76.53	To the established corner to Townships 25 and 26 N. Ranges 2 and 3 West.

	Land level; 1st rate for farming,
	Timber, good; various kinds of Oak, Hickory, and Sugar Tree; undergrowth, Hazel, Hickory, and Vines.

GENERAL DESCRIPTION.

This Township contains a large amount of first rate land for farming. It is well timbered with the various kinds of Oak, Hickory, Sugar Tree, Walnut, Beech and Ash.

Chickeeles river is navigable for small boats in low-water, and does not often overflow its banks, which are from ten to fifteen feet high.

The Township will admit of a large settlement, and should therefore be subdivided.

B.

Field Notes of the subdivision lines and meanders of Chickeeles river in Township 25 N. R. 2 W. Willamette Meridian.

CHAINS.	
	To determine the proper adjustment of my compass for subdividing this Township, I commence at the corner to Townships 24 and 25 N. R. 1 and 2 W., and run
	North, on a blank line along the East Boundary of section 36, Variation 17° 51′ East,
40.05	To a point 5 links West of the quarter section corner,
80.09	To a point 12 links West of the corner to sections 25 and 36,
	To retrace this line or run parallel thereto, my compass must be adjusted to a variation of 17° 46′ East.
	Subdivision commenced February 1, 1854
	From the corner to sections 1, 2, 35 and 36 on the South Boundary of the Township, I run
	North, between sections 35 and 36, Variation 17° 46′ East,
9.19	A Beech, 30 in. dia.
29.97	A Beech, 30 in. dia.
40.00	Set a post for quarter section corner, from which
	A Beech, 8 in. dia. bears N. 23 W. 45 links dist.
	A Beech, 15 in. dia. bears S. 48 E. 12 links dist.
51.00	A Beech, 18 in. dia.
76.00	A Sugar Tree, 30 in. dia.
80.00	Set a post for corner to sections 25, 26, 35 and 36, from which
	A Beech, 28 in. dia. bears N. 60 E. 45 links dist.
	A Beech, 24 in. dia. bears N. 62 W. 17 links dist.
	A Poplar, 20 in. dia. bears S. 70 W. 50 links dist.
	A Poplar, 36 in. dia. bears S. 66 E. 34 links dist.
	Land level; 2d rate,
	Timber, Poplar, Beech, Sugar Tree, and some Oak; undergrowth, same and hazel.
	East, on a *random* line between sections 25 and 36, Variation 17° 46′ East,
9.00	A brook, 20 links wide, runs north,
15.00	To foot of hills bears N. and S.
40.00	Set a post for temporary quarter section corner
55.00	To opposite foot of hill, bears N. and S.
72.00	A brook, 15 links wide runs North,
80.00	Intersected East Boundary at post corner to sections 25 and 36, from which corner I run
	West, on a *true* line between sections 25 and 36, Variation 17° 46′ East,
40.00	Set a post on top of hill bears N. and S. from which
	A Hickory, 14 in. dia. bears N. 60 E. 27 links dist.

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	A Beech, 15 in dia. bears S. 74 W. 9 links dist.
80.00	The corner to sections 25, 26, 35 and 36,
	Land, east and west parts level, 1st rate; middle part broken, 3d rate,
	Timber, Beech, Oak, Ash, &c.; undergrowth, same and Spice in the branch bottoms.
	North, between sections 25 and 26, Variation 17° 46′ East,
7.00	A Poplar, 40 in. dia.
17.20	A brook, 25 links wide, runs N. W.
18.05	A Walnut, 30 in. dia.
23.44	A brook, 25 links wide, runs N. E.
40.00	Set a post for quarter section corner, from which
	A Bur Oak, 36 in. dia. bears N. 42 E. 18 links dist.
	A Beech, 30 in. dia. bears S. 72 W. 9 links dist.
60.15	A Beech, 30 in. dia.
80.00	Set a post for corner to sections 23, 24, 25 and 26, from which
	A White Oak, 14 in. dia. bears N. 50 E. 40 links,
	A Sugar Tree, 12 in. dia. bears N. 14 W. 31 links dist
	A White Oak, 13 in dia. bears S. 38 W. 32 links dist.
	A Sugar Tree, 12 in. dia. bears S. 42 E. 14 links dist.
	Land level on the line, high ridge of hills through the middle of section 25 running N. and S.
	Timber, Beech, Walnut, Ash, Sugar Tree, &c.
	East, on a *random* line between sections 24 and 25, Variation 17° 46′ East,
8.90	A stream, 30 links wide, rapid current, runs N.W.
12.00	To foot of hill, bears south and N. E.
40.00	Set a post for temporary quarter section corner,
48.00	To opposite foot of hill, bears South and N. W.
60.50	A stream, 30 links wide, runs N. soon turns N. W.
73.00	To foot of hill, rises moderately, bears S. and N. W.
80.12	Intersected East Boundary of the Township at the post corner to sections 24 and 25, from which corner I run
	West, on a *true* line beeween sections 24 and 25, Variation 17° 46′ East,
40.06	Set a post for quarter section corner, from which
	A Beech, 18 in. dia. bears N. 74 W. 26 links dist.
	A Beech, 16 in. dia. bears S. 73 E. 22 links dist.
80.12	The corner to sections 23, 24, 25, 26,
	Land rolling between the branches; good, 2d rate; branch bottoms level, 1st rate,
	Timber, Walnut, Beech, Elm, and Oak; undergrowth, same and Spice.
	North, between sections 23 and 24, Variation 17° 46′ East,
6.70	A White Oak, 20 in. dia.

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
9.65	A stream, 25 links wide, runs N. W.
13.50	Same stream, 25 links wide, runs N. E.
16.00	Same stream, 25 links wide, runs N. W.
40.00	Set a post near the South bank of a stream for quarter section corner, from which
	A Cottonwood, 18 in. dia. bears S. 7 W. 7 links dist.
	A White Walnut, 24 in. dia. bears S. 22 E. 4 links dist.
40.35	Elk Creek, 125 links wide, runs N. W. general course West.
	John Jones has a field on the North side of the creek and West of the line; his house is 2 chains South of the road and 2 chains East of the line,

54.00	To the road from Astoria to Williamsburg, bears E. and W.
58.00	Enter wet prairie, bears East and West,
68.00	Leave prairie and enter timber, bearing East and West,
	This prairie extends *East* into section 24 and 30 chains,
72.12	A White Oak, 30 in. dia.
75.00	Leave creek bottom and enter hills bearing East and West,
80.00	Set a post for corner to sections 13, 14, 23, 24,
	from which
	A White Walnut, 16 in. dia. bears N. 42 E. 15 links dist.
	A White Walnut, 24 in. dia. bears N. 59 W. 27 links dist.
	An Elm, 8 in. dia. bears S. 67 W. 16 links dist.
	A Black Oak, 14 in. dia. bears S. 38 E. 17 links dist.
	Land mostly level; 1st rate soil,
	Timber, Walnut, various kinds of Oak, Buckeye, and Hickory; undergrowth, same and Spice,
	February 1st, 1854.
	East, on a *random* line between sections 13 and 24,
	Variation 17° 46′ East,
40.00	Set a post for temporary quarter section corner,
80.10	Intersected the East Boundary of Township 16 links South of post corner to sections 13 and 24, from which corner I run
	West, on a *true* line between sections 13 and 24,
	Variation 17° 53′ East,
40.05	Set a post for quarter section corner, from which
	A Sugar Tree, 30 in. dia. bears N. 80 W. 22 links dist.
	A White Oak, 16 in. dia. bears S. 53 E. 20 links dist.
80.10	The corner to sections 13, 14, 23, 24,
	Land mostly rolling; good rich soil; 1st rate,
	Timber, Walnut, Sugar Tree, Oak, Elm, and Buckeye; undergrowth, same and Spice.
	North, between sections 13 and 14,
	Variation 17° 46′ East,
6.17	A White Oak, 30 in. dia.

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
22.15	A Beech, 30 in. dia.
40.00	Set a post for quarter section corner, from which
	A Beech, 24 in. dia. bears N. 66 W. 6 links dist.
	A Beech, 20 in. dia. bears S. 45 E. 40 links dist.
52.25	A Beech, 24 in. dia.
62.61	A Bur Oak, 30 in. dia.
80.00	Set a post for corner to sections 11, 12, 13, 14, from which
	A Black Oak, 26 in. dia. bears N. 53 E. 10 links dist.
	A Black Oak, 21 in. dia. bears N. 20 W. 35 links dist.
	A Sugar Tree, 30 in. dia. bears S. 32 W. 25 links dist.
	A White Oak, 20 in. dia. bears S. 24 E. 20 links dist.
	Land gently rolling; good, 2d rate.
	Timber, Beech, Oak, and Ash; undergrowth, same and Hazel.
	East, on a *random* line between sections 12 and 13,
	Variation 17° 46′ East,
20.50	Foot of hills, and enter broken ridges bearing North and South,
40.00	Set a post for temporary quarter section corner,
80.10	Intersected East Boundary 13 links North of post corner to sections 12 and 13, from which corner I run
	West, on a *true* line between sections 12 and 13,
	Variation 17° 40′ East,
40.05	Set a post for quarter section corner, from which
	An Elm, 24 in. dia. bears N. 51 E. 50 links dist.
	A Beech, 18 in. dia. bears S. 51 W. 29 links dist.
80.10	The corner to sections 11, 12, 13, 14,
	Land West 20 chains; gently rolling; good, 2d rate; the balance high, broken ridges,
	Timber, Beech, Black Oak, and White Oak; undergrowth, same and Hazel.
	North, between sections 11 and 12,
	Variation 17° 46′ East,
10.81	An Elm, 15 in dia.
40.00	Set a post for quarter section corner, from which
	A Beech, 30 in. dia. bears N. 33 W. 9 links dist.
	A Beech, 20 in. dia. bears S. 64 W. 20 links dist.
52.25	A Beech, 24 in. dia.
62.61	A Black Oak, 30 in. dia.
75.40	A spring branch, 10 links wide, runs West,
80.00	Set a post for corner to sections 1, 2, 11 and 12, from which
	A Poplar, 32 in. dia. bears N. 41 E. 30 links dist.
	A Poplar, 36 in. dia. bears N. 43 W. 25 links dist.
	A Sugar Tree, 30 in. dia. bears S. 32 W. 25 links dist.
	A Sugar Tree, 21 in. dia. bears S 35 E. 40 links dist.
	Land level; good, 2d rate,
	Timber, Sugar Tree, Poplar, Walnut, and Oak; undergrowth, same and Hazel.

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	East, on a *random* line between sections 1 and 12,
	Variation 17° 46′ East,
23.00	Enter high, broken ridges, bearing N. E. and South,
40.00	Set a post for temporary quarter section corner,
42.50	A spring branch, 10 links wide, runs S. W.
63.00	To foot of high mountain; bears North and South,
80.24	Intersected the East Boundary of the Township 13 links North of post corner to sections 1 and 12, from which corner I run
	West, on a *true* line between sections 1 and 12,
	Variation 17° 40′ East,
40.12	Set a post on top of narrow ridge, bearing North and South, for quarter section corner, from which
	A Sugar Tree, 20 in. dia. bears N. 20 E. 32 links dist.
	A Sugar Tree, 24 in. dia. bears S. 56 W. 25 links dist.
80.24	The corner to sections 1, 2, 11, 12,
	Land very broken and mountainous,
	Timber, Sugar Tree, Beech; various kinds of Oak and Hickory.
	On this line, and towards the foot of the mountain, we discovered gold dust; and throughout the line we observed many specimens of what appeared to be rich auriferous quartz.
	North, on a *random* line between sections 1 and 2,
	Variation 17° 46′ East,
40.00	Set a post for temporary quarter section corner,
80.11	Intersected the North Boundary 32 links East of corner to sections 1 and 2, from which corner I run
	South, on a *true* line between sections 1 and 2,
	Variation 18° 00′ East,
40.11	Set a post for quarter section corner, from which
	A White Oak, 20 in. dia. bears N. 31 W. 65 links dist.
	A Sugar Tree, 14 in. dia. bears S. 49 E. 32 links dist
80.11	The corner to sections 1, 2, 11, 12,
	Land level; good, rich soil,
	Timber, Walnut, Sugar Tree, Beech, and various kinds of Oak; open woods.
	February 2d, 1854.
	North, between sections 34 and 35,
	Variation 17° 46′ East,
6.56	A Hickory, 36 in. dia.
23.00	To foot of hill; bears East and West,
34.58	A Walnut, 38 in. dia.
40.00	Set a post for quarter section corner, from which
	A Beech, 16 in. dia. bears S. 18 E. 13 links dist.
	A Beech, 10 in. dia. bears N. 69 W. 40 links dist.
50.00	A Maple, 24 in. dia.
75.86	An Ash, 24 in. dia.
80.00	Set a post for corner to sections 26, 27, 34 and 35, from which

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	An Ash, 30 in. dia. bears N. 30 E. 24 links dist. An Ash, 36 in. dia. bears N. 52 W. 19 links dist. A Beech, 16 in. dia. bears S. 69 W. 41 links dist. A Beech, 14 in. dia. bears S. 67 E. 12 links dist. Land, South 23 chains, broken; the balance level, rich soil, Timber, Ash, Beech, Oak, and Hickory; undergrowth, same and Spice.
	East, on a *random* line between sections 26 and 35, Variation 17° 46′ East,
40.00	Set a post for temporary quarter section corner,
80.08	Intersected N. and S. line 20 links North of the corner to sections 25, 26, 35 and 36, from which corner I run West, on a *true* line between sections 26 and 35, Variation 17° 37′ East,
40.04	Set a post for quarter section corner, from which A Beech, 14 in. dia. bears N. 56 E. 12 links dist. A Beech, 12 in. dia. bears S. 32 W. 32 links dist.
80.08	The corner to sections 26, 27, 34 and 35, Land level; good, rich soil, Timber, Beech, Elm, Ash, and Walnut.
	North, between sections 26 and 27, Variation 17° 46′ East,
8.47	An Elm, 20 in. dia.
29.18	A Lynn, 34 in. dia.
40.00	Set a post for quarter section corner, from which A Sugar Tree, 14 in. dia. bears N. 54 E. 27 links dist. A Beech, 12 in. dia. bears S. 13 W 31 links dist.
46.37	A Poplar, 40 in. dia.
60.48	A Black Oak, 36 in. dia.
80.00	Set a post for corner to sections 22, 23, 26, 27, from which A White Oak, 30 in. dia. bears N. 50 E. 13 links dist. A Walnut, 30 in. dia. bears N. 36 W. 14 links dist. A Walnut, 24 in. dia. bears S. 24 W. 16 links dist. An Ironwood, 8 in. dia. bears S. 32 E. 24 links dist. Land, south half, 2d rate; north half, 1st rate, Timber, Walnut, Poplar, White Oak, Beech and Hickory. About 10 chains from this corner on the S. W. and on the left bank of Elk creek we discovered evidences of extensive ancient works, supposed to be fortifications, with many ancient mounds in the vicinity.
	East, on a *random* line between sections 23 and 26, Variation 17° 46′ East,
40.00	Set a post for temporary quarter section corner,
48.00	A stream, 12 links wide, outlet to a lake in the middle of section 26, runs N. W.
80.00	Intersected North and South line 15 links North of post corner

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	to sections 23, 24, 25, 26, from which corner I run West, on a *true* line between sections 23 and 26, Variation 17° 40′ East,
40.00	Set a post for quarter section corner, from which A Beech, 16 in. dia. bears N. 72 W. 18 links dist. A Beech, 10 in. dia. bears S. 72 W. 16 links dist.
80.00	The corner to sections 22, 23, 26, 27, Land level, good; 2d rate soil, Timber, Beech, Sugar Tree, Elm and Hickory.
	Notes of the meanders of a small lake in section 26. Begin at the quarter section corner on the line between sections 23 and 26, and run thence South
24.00	To the North margin of the lake, where set a post for meander corner, from which A Beech, 14 in. dia. bears N. 45 E. 10 links dist. A Beech, 9 in. dia. bears N. 15 W. 14 links dist. Thence meander around the lake as follows: S. 53° E. 17.75 { At 75 links cross outlet to lake 10 links wide runs N. E. S. 3° E. 13.00 S. 30′ W. 8.00 S. 65° W. 12.00 to a point previously determined 20.30 chains *North* of the quarter section corner on the line between sections 26 and 35, Set post meander corner, Maple, 16 in. dia. bears S. 15 W. 20 links dist. Ash, 12 in. dia. bears S. 21 E. 15 links dist. N. 63° W. 10.00 / N. 13° W. 21.00 { In this vicinity we discovered remarkable fossil remains of animals well worthy the attention of naturalists. N. 52 E. 17.30 to the place of beginning. This is a beautiful lake, with well-defined banks from 6 to 10 feet high. Land, 1st rate.
	North, between sections 22 and 23, Variation 17° 46′ East,
8.00	Elk creek, 150 links wide, runs S. W.
24.20	Same creek, rapid current, rocky bed and banks, 150 links wide, runs S. E.
40.00	Set a post for quarter section corner, from which A Black Oak, 20 in. dia. bears N. 34 E. 48 links, A Black Oak, 20 in. dia. bears S. 9 W. 45 links,
41.60	Same creek, 150 links wide, rocky bed and banks, runs West. About 500 chains below the crossing of the line a stream 20 links wide comes in from the North, Two chains below the mouth of this stream the creek turns South

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	Here is a very fine mill seat, the fall in the river being about 6 feet in the distance of three chains. Both banks of the creek about 10 feet high, composed principally of limestone of excellent quality,
47.00	Enter wet prairie near the West end, bearing N. W. and East,
65.00	Leave wet prairie, bearing East and West,
68.00	The road from Astoria to Williamsburg, bearing S. 80 E. and N. 60 W.
69.92	A White Oak, 18 in. dia.
70.50	Enter high, rolling land, bearing East and West,
80.00	Set a post for corner to sections 14, 15, 22 and 23, from which An Elm, 16 in. dia. bears N. 27 E. 50 links dist. An Elm, 24 in, dia. bears N. 34 W. 45 links dist. A Sugar Tree, 18 in. dia. bears S. 60 W. 42 links dist. A Sugar Tree, 24 in. dia. bears S. 52 E. 23 links dist. Land, south of wet prairie at 47 chains, broken, 3d rate; the balance part wet, 2d rate, Timber, Elm, Sugar Tree, Oak, and Hickory, February 3d, 1854.
	East, on a *random* line between sections 14 and 23, Variation 17° 46′ East,
40.00	Set a post for temporary quarter section corner,
80.14	Intersected North and South line 14 links North of the corner to sections 13, 14, 23, and 24, from which corner I run West, on a *true* line between sections 14 and 23, Variation 17° 40′ East,
40.07	Set a post for quarter section corner, from which, A Sugar Tree, 30 in. dia. bears N. 39 E. 31 links dist. A Mulberry, 12 in. dia. bears S. 26 W. 4 links dist.

80.14	To corner to sections 14, 15, 22, 23, Land gently rolling; good soil, Timber, Elm, Sugar Tree, Oak, and Mulberry.
	North, between sections 14 and 15, Variation 17° 46′ East,
14.14	A Sugar Tree, 14 in. dia.
34.13	A White Oak, 22 in. dia.
40.00	Set a post for quarter section corner, from which A Beech, 24 in. dia. bears N. 45 W. 37 links dist. A Sugar Tree, 20 in. dia. bears S. 43 E. 74 links dist.
47.20	A Walnut, 27 in. dia.
61.84	A White Oak, 36 in. dia.
77.72	A stream, 25 links wide, rapid current, runs S. W.
80.00	Set a post for corner to sections 10, 11, 14, 15, from which A Burr Oak, 28 in. dia. bears N. 16 E. 40 links dist. A Black Oak, 30 in. dia. bears N. 17 W. 32 links dist.

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	A White Oak, 14 in. dia. bears S. 15 W. 38 links dist. A Hickory, 15 in. dia. bears S. 12 E. 36, Land gently rolling; 2d rate. Timber, various kinds of Oak, Beech and Walnut; open woods.
	East, on a *random* line between sections 11 and 14, Variation 17° 46′ East,
8.25	A stream, 25 links wide, runs S. W.
13.00	A stream, 10 links wide, runs N. W.
40.00	Set a post for temporary quarter section corner,
80.16	Intersected N. and S. line 20 links North of post corner to sections 11, 12, 13, 14, from which corner I run West, on a *true* line between sections 11 and 14, Variation 17° 37′ East,
40.08	Set a post for quarter section corner, from which A Sugar Tree, 16 in. dia. bears N. 66 E. 35 links dist. A Sugar Tree, 14 in. dia. bears S. 44 W. 13 links dist.
80.16	To corner to sections 10, 11, 14, 15, Land rolling, but not broken; good soil. Timber good; various kinds of Oak, Beech, Sugar Tree, Elm and Ash.
	North, between sections 10 and 11, Variation 17° 40′ East,
5.29	A White Oak, 24 in. dia.
39.16	A White Oak, 36 in. dia.
40.00	Set a post for quarter section corner, from which A Beech, 15 in. dia. bears N. 18 W. 42 links dist. A Beech, 18 in. dia. bears S. 62 E. 12 links dist.
45.17	A Sugar Tree, 27 in. dia.
63.79	A Sugar Tree, 30 in. dia.
71.12	A brook, 20 links wide, rapid current, gravelly bottom, runs West; soon turns South,
80.00	Set a post for corner to sections 2, 3, 10, 11, from which A Sugar Tree, 18 in. dia. bears N. 13 E. 61 links dist. A Beech, 24 in. dia. bears N. 48 W. 26 links dist. A White Oak, 13 in. dia. bears S. 39 W. 40 links dist. No tree in section 11 convenient to mark, Land gently rolling, good; 2d rate, Timber, various kinds of Oak, Beech, Walnut; open woods.
	East, on a *random* line between sections 2 and 11, Variation 17° 40′ East,
18.36	A brook, 20 links wide, runs S. W.
40.00	Set a post for temporary quarter section corner,
80.10	Intersected N. and S. line 12 links North of the corner to sections 1, 2, 11, 12, from which corner I run West, on a *true* line between sections 2 and 11, Variation 17° 35′ East,
40.05	Set a post for quarter section corner, from which

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	A Beech, 18 in. dia. bears N. 35 W. 5 links dist. A Beech, 14 in. dia. bears S. 47 E. 49 links dist.
80.10	The corner to sections 2, 3, 10, 11, Land gently rolling; soil good, Timber, Beech, Sugar Tree, Elm and Oak; West part brushy; East part open woods.
	North, on a *random* line between sections 2 and 3, Variation 17° 40′ East,
40.00	Set a post for temporary quarter section corner,
80.00	Intersected the North Boundary of the Township 25 links East of the corner to sections 2 and 3, from which corner I run South, on a *true* line between sections 2 and 3, Variation 17° 51′ East,
40.00	Set a post for quarter section corner, from which An Elm, 8 in. dia. bears N. 35 W. 5 links dist. A Hickory, 10 in. dia. bears S. 75 E. 18 links dist.
80.00	The corner to sections 2, 3, 10, 11, Land gently rolling; good, 2d rate, Timber, various kinds of Oak, Beech, Elm and Hickory; open woods. February 4, 1854.
	North, between sections 33 and 34, Variation 17° 46′ East,
5.61	An Ash, 22 in. dia.
13.20	An Elm, 15 in. dia.
40.00	Set a sand stone, 15 in. long, 12 in. wide, and 4 in. thick, for quarter section corner, from which A Beech, 15 in. dia. bears N. 22 E. 22 links dist. A Beech, 24 in. dia. bears S. 78 W. 15 links dist.
49.10	A Black Oak, 36 in. dia.
71.04	An Elm, 30 in. dia.
80.00	Set a post on high ridge bearing N. S. for corner to sections 27, 28, 33, 34, from which A White Oak, 14 in. dia. bears N. 22 E. 18 links dist. A Beech, 8 in. dia. bears N. 48 W. 14 links dist. An Elm, 12 in. dia. bears S. 16 W. 42 links dist. A Beech, 10 in. dia. bears S. 74 E. 14 links dist. Land broken; poor soil; not fit for cultivation, Timber, Beech, Oak, Sugar Tree and Elm.
	East, on a *random* line between sections 27 and 34, Variation 17° 46′ East,
18.00	To foot of hill bearing North and S. E.
40.00	Set a post for temporary quarter section corneh,
48.20	A brook, 20 links wide, runs North,
50.20	A brook, 15 links wide, runs N. W.
79.90	Intersected N. and S. line 14 links North of the corner to sec-

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	tions 26, 27, 34, and 35, from which corner I run West, on a *true* line between sections 27 and 34, Variation 17° 40′ East,
39.95	Set a post for quarter section corner, from which A Sugar Tree, 15 in. dia. bears N. 32 W. 32 links dist. A Sugar Tree, 15 in. dia. bears S. 52 E. 26 links dist.
79.90	The corner to sections 27, 28, 33, and 34, Land, east of hill; gently rolling; good soil, Timber, Sugar Tree, Elm, Oak, and Ash,
	North, between sections 27 and 28, Variation 17° 46′ East,

2.11	A Black Oak, 30 in. dia.
20.42	An Elm, 36 in. dia.
34.00	To foot of hill bearing S. W. and S. E.
40.00	Set a post for quarter section corner, from which A Buckeye, 10 in. dia. bears N. 30 W. 6 links dist. A Poplar, 36 in. dia. bears S. 15 E. 38 links dist.
62.16	A Sugar Tree, 24 in. dia.
64.20	Elk creek, 200 links wide, rapid current; bluff bank 20 feet high; South side runs west; enter bottom after crossing creek,
80.00	Set a sandstone 16 in. long, 12 in. wide, and 6 in. thick, for corner to sections 21, 22, 27, 28, from which An Elm, 15 in. dia. bears N. 31 E. 14 links dist. A Beech, 14 in. dia. bears N. 43 W. 37 links dist. An Elm, 20 in. dia. bears S. 24 W. 24 links dist. A Beech, 24 in. dia. bears S. 20 E. 52 links dist. Land, South of creek, broken and rolling, 3d rate; North of creek rich bottom, Timber, Beech, Elm, various kinds of Oak and Hickory.
	East, on a *random* line between sections 22 and 27, Variation 17° 46′ East,
40.00	Set a post for temporary quarter section corner,
75.70	Elk creek, 200 links wide, gentle current, gravelly bottom, runs S. W.
80.06	Intersected North and South line 15 links North of the corner to sections 22, 23, 26, and 27, from which corner I run West, on a *true* line between sections 22 and 27, Variation 17° 40′ East,
40.03	Set a post for quarter section corner, from which An Elm, 14 in. dia. bears N. 50 E. 16 links dist. A Mulberry, 10 in. dia. bears S. 87 W. 43 links dist.
80.06	The corner to sections 21, 22, 27, 28, Land level; rich bottom, 1st rate, Timber, Elm, Beech, Oak, and Hickory,
	North, Between sections 21 and 22, Variation 17° 46′ East,

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
3.15	A Walnut, 18 in. dia.
32.32	An Ash, 24 in. dia.
33.50	Set a post on the South bank of a lake of deep, clear water, for corner to fractional sections 21 and 22, from which A Maple, 16 in. dia. bears S. 33 W. 21 links dist. An Ash, 12 in. dia. bears S. 21 E. 34 links dist. To obtain the distance across the lake, I send my flagman around the west end thereof, who sets the flag on its North bank, and in the line between sections 21 and 22, I now run a base *West* (from the corner on South bank) 5.60 chains, to a point from which the flag bears N. 16° 15′ E. and continue said base line West, and at 9 chains and 6 links, a point from which said flag bears N. 25° 15′ E. and taking the mean between the results so ascertained, find for the distance across the lake, on the line between sections 21 and 22, 19 chains and 20 links, to which add 33.50 chains, makes
52.70	To the flag on the North bank of the lake, Here set a post for corner to fractional sections 21 and 22, from which An Ash, 16 in. dia. bears N. 21 E. 15 links dist. An Elm, 14 in. dia. bears N. 71 W. 23 links dist. The point for quarter section corner being in the lake, cannot be established,
56.11	An Elm, 36 in. dia.
80.00	Set a post for corner to sections 15, 16, 21, 22, from which A Black Oak, 12 in. dia. bears N. 83 E. 23 links dist. A Buckeye, 10 in. dia. bears N. 82 W. 17 links dist. A White Oak, 14 in. dia. bears S. 1 W. 14 links dist. A Black Oak, 15 in. dia. bears S. 28 E. 24 links dist. Land level; rich bottom; not subject to inundation, Timber, Elm, Oak, Hickory, and Ash.
	Field notes of the meanders of Clear Lake. Begin at the corner to fractional sections 21 and 22, on the North bank, and run thence, in section 22, as follows: East, 10.00 chains, thence N. 80 E. 12.00 " " S. 75 E. 5.00 " " S. 60 E. 5.00 " " S. 30 E. 5.00 " " S. 10 W. 6.00 " " S. 36 W. 8.00 " " S. 82 W. 10.00 " " West, 10.00 " " N. 89 W. 8.55 " to the corner to fractional sections 21 and 22, on the South bank of the lake. Thence in section 21

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	N. 75 W. 9.00 chains, thence N. 87 W. 10.50 " " N. 62 W. 8.00 " " N. 43 W. 5.50 " " N. 34 W. 4.20 " " North, 5.00 " " N. 35 E. 7.00 " " N. 55 E. 8.00 " " East, 5.00 " " S. 75 E. 3.00 " " S. 35 E. 6.50 " " S. 67½ E. 11.10 " to the corner to fractional sections 21 and 22, on the North bank of the lake, and place of beginning, Land, around this lake, good, rich soil; banks from 8 to 10 feet high, except at the Western part, as far *South* as the outlet, where the land is level and wet, Timber, good Black Oak, Hickory, and Ash. Monday, February 6th, 1854. If the Deputy should find it more convenient to meander the lake before continuing the line North of it, he will do so.
	At 1.50 chains outlet to lake 20 links wide runs South West.
	East, on a *random* line between sections 15 and 22, Variation 17° 46′ East,
40.00	Set a post for temporary quarter section corner,
58.00	The road from Astoria to Williamsburg bearing N. W. and S. E.
65.50	A stream, 20 links wide, runs South,
79.94	Intersected North and South line 12 links North of the corner to sections 14, 15, 22, and 23, from which corner I run West, on a *true* line between sections 15 and 22, Variation 17° 41′ East,
39.97	Set a post for quarter section corner, from which A Sugar Tree, 20 in. dia. bears N. 35 W. 21 links dist. A Lynn, 18 in. dia. bears S. 28 E. 81 links dist
79.94	The corner to sections 15, 16, 21, 22, Land, gently rolling; good, rich soil, Timber, good; various kinds of Oak, Hickory, Ash, and Sugar Tree.
	North, between sections 15 and 16, Variation 17° 46′ East,

4.68	An Elm, 24 in. dia.
13.00	Leave timber and enter high rolling prairie, bearing East and West,
16.75	The road from Astoria to Williamsburg bears N. 80 W. and S. 80 E.

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
40.00	Set a hard flint stone, which cannot be marked, for quarter section corner; said stone is 16 inches long, 12 inches wide, and 8 inches thick, and from which a cone White Oak, 16 in. dia. bears N. 42 W. 351 links dist.
	No other tree convenient to mark.
50.00	Enter John Orr's field, bearing N. W. and S. E.
55.00	A point 3 chains West of Orr's house,
61.00	Leave field bearing N. W. and S. E. This field contains about 10 acres, the line passing through the middle,
80.00	Set a post in mound, with trench, as per instructions, for corner to sections 9, 10, 15, 16, from which corner a granite boulder, four feet in diameter at the surface of the ground, and three feet high, bears N. 72 E. 257 links distant. I cut a (X) cross near the top, facing the corner, the cross-marks being four inches long and one-fourth of an inch deep.
	Land high, rolling prairie; good soil; not stony, but occasional boulders appear above the natural surface.
	East, on a *random* line between sections 10 and 15, Variation 17° 46′ East,
40.00	Set a post for temporary quarter section corner,
46.50	Leave prairie and enter timber bearing North and S. 40 E.
61.40	A stream, 25 links wide, gentle current, muddy bottom, runs South,
79.86	Intersected N. and S. line at the post corner to sections 10, 11, 14, 15, from which corner I run
	West, on a *true* line between sections 10 and 15, Variation 17° 46′ East,
39.93	Set a sand stone, 20 inches long, 12 inches wide, and 4 inches thick for quarter section corner, raise a mound 2 feet high West side of stone.
	From the stone a Bur Oak, 16 in. dia. in the Eastern edge of the timber, bears N. 75 E. 674 links distant.
79.86	The corner to sections 9, 10, 15, 16.
	Land; the prairie rolling; good soil; timber land level; 1st rate.
	Timber, Oak, Hickory and Ash.
	North, between sections 9 and 10, Variation 17° 46′ East,
40.00	Set a post for quarter section corner, raise a mound with trench, as per instructions. A lone Bur Oak, 10 in. dia. bears S. 75 E. 530 links distant; no other tree near. This corner about 10 chains *West* of a grove of Oak and Hickory of about 15 acres.
	From this corner Jacob Fry's house in the North end of grove bears N. 45 E.
51.25	A point from which Fry's house bears East, a field of about 10 acres North of the house.

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
80.00	Deposited a quart of charcoal and set a post for corner to sections 3, 4, 9, 10, and raised a mound, as per instructions, and planted N. W. 4 White Oak acorns, S. W. Wild Cherry stones, N. E. Beech nuts, and S. E. a Butter nut.
	Land high, rolling prairie; good rich soil; fit for cultivation.
	East, on a *random* line between sections 3 and 10, Variation 17° 46′ East,
40.00	Set a post for temporary quarter section corner,
55.00	Leave prairie and enter timber, bearing N. and S.
79.90	Intersected N. and S. line 14 links South of the corner to sections 2, 3, 10, 11, from which corner I run
	West, on a *true* line between sections 3 and 10, Variation 17° 52′ East,
39.95	Set a sand stone, 16 inchs long, 12 inches wide, and 4 inches thick for quarter section corner, from which a granite boulder 4 feet long E. and W. by 3½ feet wide N. and S. and 2 feet high above ground, and marked ¼ with a pick, bears N. 31 E. 153 links distant; no other boulder in sight of this corner.
79.90	The corner to sections 3, 4, 9, 10,
	Land level; good rich soil,
	Timber, Elm, Beech, Maple, and Ash.
	North, on a *random* line between sections 3 and 4, Variation 17° 46′ East,
40.00	Set a post for temporary quarter section corner,
42.00	Leave prairie and enter timber, bearing S. E. and S. W.
55.15	A spring branch, 10 links wide, runs N. W.
66.50	Enter prairie, bearing N. W. and S. E.
79.95	Intersected the North Boundary of the Township 30 links East of the corner to sections 3 and 4, from which corner I run
	South, on a *true* line between sections 3 and 4, Variation 17° 59′ East,
39.95	Set a Mulberry post 6 inches diameter in the North point of prairie, from which A White Oak, 16 in. dia. bears N. 41 E. 195 links. A Black Oak, 20 in. dia. bears N. 37 W. 205 links
79.95	The corner to sections 3, 4, 9, 10,
	Land level; good rich soil; fit for cultivation,
	Timber, Oak, Hickory, and Elm.
	February 7th, 1854.
	All traces of the corner to sections 4, 5, 32 and 33 on the South Boundary of the Township having disappeared, I restore and re-established said corner in the following manner, viz:
	Begin at the quarter section corner the line between sections 4 and 33. One of the witness trees to this corner has fallen down, and the post is gone.

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	The Black Oak, 18 in. dia. bearing North 25 E. 32 links, standing and sound,
	I find also the Black Oak station tree, 24 in. dia. called for at 37.51 chains; and 2.49 chains West of the quarter section corner, set a *new* post at the point for quarter section corner, and mark for witness tree a White Oak, 20 in. dia. bears N. 34 W. 37 links dist.
	West, with the *old* marked line, Variation 18° 25′ East,
40.00	Set a post for temporary corner to sections 4, 5, 32 and 33,
80.06	To a point 7 links South of the quarter section corner on the line between sections 5 and 32. This corner agrees with its description, and from which I run
	East, on the *true* line between sections 5 and 32, Variatien 18° 22′ East,
40.03	Set a lime stone 18 inches long, 12 inches wide, and 3 inches thick, for *re-established* corner to sections 4, 5,

	32 and 33, from which
	A White Oak, 12 in. dia. bears N. 21E. 41 links dist.
	A White Oak, 16 in. dia. bears N. 41 W. 21 links dist.
	A Black Oak, 18 in. dia. bears S. 17 W. 32 links dist.
	A Bur Oak, 20 in. dia. bears S. 21 E. 37 links dist.
	Thence between sections 4 and 33,
80.06	The quarter section corner on said line,
	The difference in measurement, being very small, will be rejected.
	North, between sections 32 and 33, Variation 17° 40′ East,
19.85	A Beech, 25 in. dia.
32.37	An Elm, 30 in. dia.
40.00	Set a post for quarter section corner, from which
	A Beech, 24 in. dia. bears N. 11 E. 30 links dist.
	A Sugar Tree, 20 in. dia. bears S. 40 W. 9 links dist.
48.75	A stream, 20 links wide, rapid current, runs East; general course N. E.
58.20	A Sugar Tree, 30 in. dia.
75.96	A Sugar Tree, 25 in. dia
80.00	Set a post with trench for corner to sections 28, 29, 32 and 33, from which
	An Elm, 20 in. dia. bears N. 66 W. 29 links dist.
	A Beech, 10 in. dia. bears S. 16 E. 13 links dist.
	No other trees convenient to mark,
	Planted N. E. 4 Hickory nuts, and S. W. 4 Cherry stones,
	Land gently rolling; good rich soil,
	Timber, Oak, Elm, Beech, and Sugar Tree.

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	East, on a *random* line between sections 28 and 33, Variation 17° 40′ East,
19.50	A stream, 25 links wide, runs North; rapid current; the line crosses about two chains below the mouth of a beautiful spring branch 10 links wide; comes from the hills on the S. E.
40.00	Set a post for temporary quarter section corner,
60.00	To foot of hills bearing N. and S.
80.12	Intersected the N. and S. line 7 links North of the corner to 27, 28, 33 and 34, from which corner I run
	West, on a *true* line, between sections 28 and 33, Variation 17° 37′ East,
40.06	Set a post for quarter section corner, from which
	A Hickory, 10 in. dia. bears N. 25 W. 22 links dist.
	An Elm, 24 in. dia. bears S. 9 W. 14 links dist.
80.12	The corner to sections 28, 29; 32, 33,
	Land, 20 chains, East part very broken; the balance gently rolling; good rich soil,
	Timber, Oak, Elm, Ash, and Sugar Tree.
	North, between sections 28 and 29, Variation 17° 40′ East,
17.13	A Sugar Tree, 30 in. dia.
29.65	A Beech, 24 in. dia.
40.00	Set a post for quarter section corner, from which
	An Elm, 14 in. dia. bears N. 6 W. 200 links dist.
	A White Oak, 12 in. dia. bears S. 41 E. 122 links dist.
52.73	A Beech, 36 in. dia.
71.15	Top of limestone bluff, 20 feet high, on the South bank of Elk creek, 200 links wide, rapid current, gravelly bottom, runs West; soon turns S. W.
	Enter low wet bottom on the right bank of creek,
80.00	Set a post for corner to sections 20, 21, 28, 29, from which
	A Hickory, 13 in. dia bears N. 39 E. 16 links dist.
	A Hickory, 18 in. dia. bears N. 32 W. 22 links dist.
	A Walnut, 17 in. dia. bears S. 48 W. 40 links dist.
	A Walnut, 26 in. dia. bears S. 56 E. 34 links dist.
	Land, South of creek, rolling; good, rich soil,
	Timber, Oak, Elm, Beech, and Sugar Tree; open woods; no undergrowth.
	East, on a *random* line between sections 21 and 28, Variation 17° 40′ East,
23.00	A stream, 10 links wide, runs S. W.
40.00	Set a post for temporary quarter section corner,
43.20	A stream, 20 links wide, low, muddy banks and bottom, runs South,
80.18	Intersected North and South line 20 links North of the corner to sections 21, 22, 27, 28, from which corner I run

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Township 25 N. Range 2 W. Willamette Meridian.

	West, on a *true* line between sections 21 and 28, Variation 17° 31′ East,
40.09	Set a post about 200 links North of the right bank of the creek for quarter section corner, from which
	A Sugar Tree, 14 in. dia. bears N. 57 E. 45 links dist.
	A Buckeye, 15 in. dia. bears S. 61 W. 61 links dist.
80.18	The corner to sections 20, 21, 28, 29,
	Land level, wet bottom; subject to inundation from 4 to 6 feet deep,
	Timber, Oak, Hickory, and Ash; no undergrowth.
	North, between sections 20 and 21, Variation 17° 40′ East,
8.24	A Bur Oak, 24 in. dia.
28.94	An Ash, 15 in. dia. on the S. E. margin of a large lake, across which no sight can be had because of the water bushes around lake lying principally in section 20, with low, muddy banks; mark said tree for corner to fractional sections 20 and 21, from which
	A Red Oak, 15 in. dia. bears S. 35 W. 32 links dist.
	A Water Willow, 10 in. dia. bears S. 21 E. 12 links dist
	NOTE.—The point for quarter section corner being in the lake, it cannot be established,
	I now run as follows around the East end of the lake in sec. 21.
	N. 35 E. 8.00 chains, thence
	N. 10 E. 6.50 " "
	N. 15 W. 5.50 " "
	N. 40 W. 6.70 " to a point in the line between sections 20 and 21,
	The northing on the 4 courses of meanders is 23.39 chains, to which add 28.94 chains, makes
52.33	To the point in the line between sections 20 and 21 on the N. E. bank of the lake. Here set a post for corner to fractional sections 20 and 21, from which
	An Elm, 20 in. dia. bears N. 22 E. 24 links dist.
	A Red Oak, 24 in. dia. bears N. 17 W. 21 links dist.
54.20	A stream, 25 links wide, gentle current, running S. W. into lake,
57.31	A Red Oak, 16 in. dia.
72.50	Leave level, rich bottom and enter upland, bearing E. and W.
80.00	Set a post for corner to sections 16, 17, 20, 21, from which,
	A Black Oak, 10 in. dia. bears N. 53 E. 53 links dist.
	A Beech, 14 in. dia. bears N. 16 W. 14 links dist.
	A Bur Oak, 12 in. dia. bears S. 8 W. 20 links dist.
	A Beech, 16 in. dia. bears S. 19 E. 15 links dist.
	Land mostly low, level, rich bottom; subject to inundation from 4 to 6 feet deep,
	Timber, Oak, Beech, Maple, and Ash; open woods,
	February 8th, 1854.

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	East, on a *random* line between sections 16 and 21, Variation 17° 40′ East,
18,90	A Brook, 10 links wide, runs South,
19,50	Same brook runs North,
21,55	Same brook runs South,
40,00	Set a post for temporary quarter section corner
61,50	Enter a small bushy swamp,
70,00	Leave swamp, which contains about 15 acres, and lies mostly in section 21,
80.20	Intersected N. and S. line 16 links North of the corner to sections 15, 16, 21 and 22, from which corner I run
	West, on a *true* line between sections 16 and 21, Variation 17° 33′ East,
40.10	Set a post for quarter section corner, from which
	A Beech, 30 in. dia. bears N. 19 W. 31 links dist.
	A Buckeye, 24 in. dia. bears S. 11 E. 29 links dist.
80.20	The corner to sections 16, 17, 20, 21,
	Land rolling; 2d rate; wet around swamp,
	Timber, Oak, Beech, Buckeye, and Hickory; thick undergrowth of same and Hazel.
	North, between sections 16 and 17, Variation 17° 40′ East,
9.72	A Bur Oak, 30 in. dia.
26.84	A Bur Oak, 36 in. dia.
39.00	The road from Astoria to Williamsburg bearing N. 80 W. and S. 80 E.
40.00	Set a post for quarter section corner, from which
	A Lynn, 15 in. dia. bears N. 88 W. 17 links dist.
	A Black Oak, 18 in dia. bears S. 76 E. 21 links dist.
54.20	A White Oak, 28 in. dia.
80.00	Set a post for corner to sections 8, 9, 16, 17, from which
	An Elm, 10 in. dia. bears N. 28 E. 5 links dist.
	A Black Oak, 10 in. dia. bears N. 13 W. 48 links dist.
	An Elm, 12 in. dia. bears S. 41 W. 42 links dist.
	A Bur Oak, 6 in. dia. bears S. 17 E. 105 links dist.
	Land gently rolling; good; 2d rate,
	Timber, good quality and open woods, Oak, Elm, Ash, and Hickory.
	East, on a *random* line between sections 9 and 16, Variation 17° 40′ East,
40.00	Set a post for temporary quarter section corner,
45.00	Enter prairie, bearing N. and S.
81.20	Intersected the N. and S. line 22 links North of the corner to sections 9, 10, 15, 16; section 16 is therefore out of the proper limits, and I am of opinion that the error is in the

[Pages 32 and 33 missing.]

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	Land, upland broken, 3d rate; the bottom level and rich,
	Timber, Oak, Hickory, &c.; in the bottom, Elm and Ash; undergrowth, same, Pawpaw, Spice, and Vines.
	The line between sections 4 and 5 will strike Chickeeles river before reaching the *Township* line; I therefore run it
	North, on a *true* line between sections 4 and 5, Variation 17° 40′ East,
13.75	A Cherry, 20 in. dia.
33.51	A White Oak, 24 in. dia.
40.00	Set a post for quarter section corner, from which
	A White Oak, 12 in. dia. bears N. 24 E. 12 links dist.
	A Beech, 28 in. dia. bears S. 44 E. 21 links dist.
	No tree West of the line convenient to mark,
43.15	A White Oak, 30 in. dia.
45.50	Leave broken upland and enter Chickeeles river bottom, bearing N. E. and S. W.
56.58	A Hackberry, 24 in. dia.
66.50	An Elm, 12 in. dia. on the left bank of Chickeeles river, mark it for corner to fractional sections 4 and 5, from which
	A Black Oak, 14 in. dia. bears S. 10 W. 18 links dist.
	An Elm, 18 in. dia. bears S. 45 E. 35 links dist.
	The upland broken, 3d rate; the bottom level, 1st rate,
	Timber, on upland, Oak; in bottom, Elm, Oak, Ash, and Hickory; undergrowth, Pawpaw and Spice. February 10th, 1854.
	The point for corner to sections 5, 6, 31 and 32 being in a deep swamp, and not having been established, I begin at the witness corner on the S. E. edge of the swamp, 4.00 chains East of said point, and run thence East 250 links (with the line between sections 5 and 32) to a point; thence *North* 7.50 chains to a point; thence *West* 6.50 chains to a point on the North edge of the swamp and in the line between sections 31 and 32, and 7.50 chains *North* of the point for corner to sections 31 and 32, on the South Boundary of the Township. I here set a post for witness point, from which
	A Bur Oak, 16 in. dia. bears N. 31 E. 25 links dist.
	An Ash, 12 in. dia. bears N. 25 W. 17 links dist.
	From this witness point I run
	North, between sections 31 and 32, counting the distance from the point for corner to said sections in the swamp, Variation 17° 40′ East,
12.98	A Walnut, 22 in. dia.
38.19	An Ash, 35 in. dia.
40.00	Set a post for quarter section corner, from which
	A Beech, 20 in. dia. bears N. 12 W. 45 links dist.
	A Sugar Tree, 20 in. dia. bears S. 12 E. 13 links dist.

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS	
57.74	An Ash, 24 in. dia.
66.19	A White Oak, 36 in. dia.
80.00	Set a post with trench for corner to sections 29, 30, 31, 32, from which
	A Beech, 26 in. dia. bears N. 9 W. 12 links dist.
	A Sugar Tree, 24 in. dia. bears S. 13 E. 56 links dist.
	And planted N. E. a Butter nut, and S. W. 4 Cherry stones,
	Land, South half level, North half rolling; good soil,
	Timber, Oak, Beech, Sugar Tree, and Walnut; undergrowth, same and Hazel on North part.
	East, on a *random* line between sections 29 and 32, Variation 17° 40′ East,
40.00	Set a post for temporary quarter section corner,
80.16	Intersected the N. and S. line 10 links N. of post corner to sections 28, 29, 32 and 33, from which corner I run
	West, on a *true* line between sections 29 and 32, Variation 17° 36′ East,
40.08	Set a post for quarter section corner, from which
	A Black Oak, 18 in. dia. bears N. 36 E. 42 links dist.
	A Bur Oak, 20 in. dia. bears S. 43 W. 47 links dist.
80.16	The corner to sections 29, 30, 31, 32,
	Land gently rolling; good soil; fit for cultivation,
	Timber, Oak, Beech, Hickory, and Walnut; open woods.
	West, on a *true* line between sections 30 and 31, knowing

	that it will strike the Chickeeles river in less than 80.00 chains,
	Variation 17° 40′ East,
3.41	A White Oak, 15 in. dia.
5.00	Leave upland and enter creek bottom, bearing N. E. and S. W.
8.00	Elk creek, 200 links wide, gentle current, muddy bottom and banks, runs S. W.
	Ascertain the distance across the creek on the line as follows, viz:
	Cause the flag to be set on the right bank of the creek, and in the line between sections 30 and 31. From the station on the left bank of creek, at 8.00 chains, I run *South* 245 links to a point from which the flag on the right bank bears N. 45 W. which gives for the distance across the creek, on the line between sections 30 and 31, 2 chains 45 links.
25.17	A Bur Oak, 24 in. dia.
40.00	Set a post for quarter section corner, from which
	A Buckeye, 24 in. dia. bears N. 15 W. 8 links dist.
	A White Oak, 30 in. dia. bears S. 65 E. 12 links,
41.90	Set a post on the left bank of Chickeeles river, a navigable stream, for corner to fractional sections 30 and 31, from which

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	A Buckeye, 16 in. dia. bears N. 50 E. 16 links dist.
	A Hackberry, 15 in. dia. bears S. 79 E. 14 links dist.
	Land, low bottom; subject to in undation 3 or 4 feet deep,
	Timber, Buckeye, Hackberry, Oak, and Hickory.
	North, between sections 29 and 30,
	Variation 17° 40′ East,
6.50	Enter creek bottom, bearing N. E. and S. W.
13.00	Elk creek, 200 links wide, runs S. W.
15.00	Enter a small prairie, about 40 acres,
31.00	Leave prairie and enter timber, bearing E. and W.
40.00	Set a post for quarter section corner, from which
	A Hickory, 14 in dia. bears N. 78 E. 15 links dist.
	A Bur Oak, 26 in. dia. bears N. 63 W. 19 links dist.
49.71	A Black Oak, 30 in. dia.
68.19	A Walnut, 36 in. dia.
80.00	Set a post for corner to sections 19, 20, 29, 30, from which
	A Beech, 15 in. dia. bears N. 24 E. 18 links dist.
	A Blue Ash, 24 in. dia. bears N. 79 W. 10 links dist.
	A Bur Oak, 9 in. dia. bears S. 14 W. 10 links dist.
	A Black Oak, 8 in. dia. bears S. 11 E. 14 links dist.
	Land, first half-mile, level prairie, and brushy, Oak and Hazel; second half-mile, some good timber, Oak, &c.; thick undergrowth, same.
	East, on a *random* line between sections 20 and 29,
	Variation 70° 25′ East,
40.00	Set a post for temporary quarter section corner,
80.10	Intersected the N. and S. line 20 links North of the corner to sections 20, 21, 28, 29, from which corner I run
	West, on a *true* line between sections 20 and 29,
	Variation 17° 31′ East,
40.05	Set a post for quarter section corner, from which
	A Sugar Tree, 24 in. dia. bears N. 17 W. 20 links dist.
	A Walnut, 14 in. dia. bears S. 10 E. 36 links dist.
80.10	The corner to sections 19, 20, 29, 30,
	Land level, and rather wet,
	Timber, Oak, Sugar Tree, Beech, and Walnut; open woods.
	West, on a *random* line between sections 19 and 30,
	Variation 17° 40′ East,
40.00	Set a post for temporary quarter section corner,
75.53	Intersected the West boundary of the Township 20 links
	South of the corner to sections 19 and 30, from which corner I run
	East, on a *true* line between sections 1 9 and 30,
	Variation 17° 31′ East,
35.52	Set a post for quarter section corner, from which
	A Sugar Tree, 18 in. dia. bears N. 26 W. 23 links dist.
	An Ash, 10 in. dia. bears S. 86 E. 32 links dist.

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
75.52	The corner to sections 19, 20, 29, 30,
	Land level; rich soil; not subject to inundation,
	Timber, Sugar Tree, Beech, Walnut, and Ash; undergrowth, Spice, Prickly Ash, and vines.
	February 11th, 1854.
	North, between sections 19 and 20,
	Variation 17° 40′ East,
7.70	A Bur Oak, 20 in. dia.
27.16	A Locust, 18 in. dia.
34.00	A pond, 200 links wide, muddy bottom, and low banks; water not so deep as to prevent measuring across on the line with the chain. This pond extends about 15 chains East into section 20, and lies mostly in section 19, extending West,
40.00	Set a post for quarter section corner, from which
	A Beech, 9 in. dia. bears N. 56 E. 44 links dist.
	A Lynn, 12 in. dia. bears S. 36 W. 111 links dist.
49.00	The S. W. bank of a lake to be meandered,
	Set a post for corner to fractional sections 19 and 20, from which
	A Red Oak, 12 in. dia. bears S. 45 W. 21 links dist.
	A Lynn, 15 in. dia. bears S. 23 E. 24 links dist.
	From this corner offset West 7.50 chains to a point; thence *North* on an offset line 24.00 chains to a point; thence *East* 7.50 chains to a point in the line between sections 19 and 20—50 links in advance of lake; thence *South* to N. W. margin of lake, 50 links, where set a post for corner to fractional sections 19 and 20, from which
	A Red Oak, 20 in. dia. bears N. 27 E. 31 links dist.
	A Bur Oak, 15 in. dia. bears N. 36 W. 24 links dist.
	This corner is 72.50 chains *North* of the corner to sections 19, 20, 29, 30, and from which I continue the line between sections 19 and 20 *North,* counting the distance from the corner to sections 19, 20, 29, 30,
80.00	Set a post for corner to sections 17, 18, 19, 20, from which
	A Chesnut, 10 in. dia. bears N. 14 E. 14 links dist.
	A Buckeye, 12 in. dia. bears N. 86 W. 13 links dist.
	A Beech, 20 in. dia. bears S. 13 W. 16 links dist.
	A Buckeye, 20 in. dia. bears S. 27 E. 35 links dist.
	Land level; rich soil, but too wet for cultivation,
	Timber, Oak, Walnut, Buckeye, and Beech; undergrowth, Prickly Ash and vines.
	East, on a *random* line between sections 17 and 20,
	Variation 17° 40′ East,
40.00	Set a post for temporary quarter section corner,
79.90	Intersected N. and S. line 7 links North of post corner to sections 16, 17, 20, 21, from which corner I run

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	West, on a *true* line between sections 17 and 20,
	Variation 17° 37′ East,
39.95	Set a post near the North bank of the lake for quarter section corner, from which

A White Oak, 12 in. dia. bears N. 33 E. 19 links dist.
A White Oak, 15 in. dia. bears S. 16 W. 34 links dist.
From this corner I run South 150 links to a point on the North bank of the lake, where set a meander corner, from which
A Red Oak, 15 in. dia. hears N. 21 E. 15 links dist.
An Ash, 12 in. dia. bears N. 16 W. 12 links dist.
79.90 The corner to sections 17, 18, 19, 20,
Land level and wet; rich soil,
Timber, Oak, Ash, Elm, and Beech; undergrowth, same, briers and vines.

Meanders of Island Lake.

Begin at the corner to fractional sections 19 and 20, on the N. W. margin of the lake, and run thence along the N. W. margin thereof, in fractional section 20, as follows, viz:

N. 79 E.	20.00	chains,	thence
N. 84 E.	20.43	"	to the meander corner 150 links South of the quarter section corner on the line between sections 17 and 20, thence
S. 73 E.	16.00	chains,	thence
S. 61 E.	14.00	"	"
S. 40½ E.	19.22	"	to the corner to fractional sections 20 and 21, on the N.E. bank of lake, at 52.33 chains. At 18.00 chains on this line across the mouth of a branch, 30 links wide, coming from N.E.

Begin at the corner to fractional sections 20 and 21, on S. E. bank of lake, at 28.94 chains, and run thence along the Southern bank of said lake in fractional section 20, as follows:

S. 70 W.	20.00	chains,	thence	
S. 85 W.	23.00	"	"	*At 14.50 chains cross outlet to lake, 30 links wide, running W. about 5 chains into pond.
N. 70 W.	12.00	"	"	
N. 30 W.	18.00*	"	"	
N. 63 W.	20.24	"	to the corner to fractional sections 19 and 20, at 49.00 chains; thence in section 19 as follows, viz:	

N. 75 W.	5.00	chains,	thence
N. 60 W.	2.00	"	"
N. 10 W.	6.00	"	"
N. 10 E.	6.00	"	"
N. 25 E.	3.00	"	"
N. 38¼ E.	8.48	"	to the corner to fractional sections 19 and 20 on the bank of lake at 72.50 chains.

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS. This lake has low, wet, brushy banks, and has an island of timber in the middle, which ought to be meandered. Timber, around lake, Ash, Maple, and Red Oak. I cause a flag to be set on the North bank of the island *South* of the meander corner, which is 150 links *South* of the quarter section corner on the line between sections 17 and 20. From the meander corner run a base 7.50 *East* to a point, from which the flag bears S. 45 W. which gives for the distance across the water to the flag on the island 7.50 chains. Set a meander post in the place of the flag, from which a Red Oak, 15 in. dia. bears S. 21 W. 24 links, and an Ash, 10 in. dia. bears S. 25 E. 17 links dist. From the meander post I run around the island as follows:

S. 62 E.	7.50	chains,	thence
S. 55 E.	10.00	"	"
S. 20 E.	5.00	"	"
South	4.00	"	"
S. 25 W.	6.00	"	"
S. 62 W.	5.00	"	"
S. 80 W.	4.00	"	"
West	3.50	"	"
N. 70 W.	5.00	"	"
N. 62 W.	15.00	"	"
N. 45 W.	10.00	"	"
N. 35 W.	6.00	"	"
N. 40 E.	6.50	"	"
N. 82 E.	8.00	"	"
S. 88½ E.	14.20	"	to the meander corner and place of beginning. This island is well timbered, and is good, dry land,

Timber, Oak, Hickory, Beeh, and Ash; undergrowth, same and vines.

The line between sections 18 and 19 will strike the river before reaching the range line, I therefore run it
West, on a *true* line between sections 18 and 19,
Variation 17° 40′ East,
7.91 A Buckeye, 15 in. dia.
16.54 A Locust, 24 in. dia.
28.90 Set a post on the left bank of Chickeeles river for corner to fractional sections 18 and 19, from which
A Buckeye, 24 in. dia. bears N. 76 E. 22 links dist.
A Hackberry, 16 in. dia. bears S. 24 W. 15 links.
There is an island in the river opposite this corner. To ascertain the distance on the line between sections 18 and 19 to the island, I send my flagman across the slough, who sets the flag on the S. E. bank of the island, and in the line between sectiocns 18 and 19, from the corner to said sections on the left bank of the river. I run South 260 links to a point from

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS. which the flag on the island bears N. 45 W. which gives for the distance 3.79 chains, to which add 28.90 chains, makes
32.69 To the flag. Set a post in the place of the flag for corner to fractional sections 18 and 19, from which
A White Oak, 16 in. dia. bears N. 41 W. 37 links dist.
A Bur Oak, 14 in. dia. bears S. 81 W. 16 links dist.
36.52 A White Oak, 20 in. dia.
39.10 A Bur Oak, 16 in. dia.
40.00 Set a post for quarter section corner, from which
A White Oak, 15 in. dia. bears N. 15 W. 21 links dist.
A Walnut, 20 in. dia. bears S. 21 E. 17 links dist.
45.50 Set a post on the N. W. bank of the island for corner to fractional sections 18 and 19, from which
A Hackberry, 10 in. dia. bears N. 85 E. 15 links dist.
A Hickory, 15 in. dia. bears S. 51 E. 17 links dist.
From this corner I meander around the island as follows:
In section 19,

S. 60 W.	10.00	chains,	thence
S. 43 W.	8.00	"	"
South	2.00	"	"
East	2.00	"	"
N. 55 E.	4.00	"	"
N. 60 E.	10.00	"	"
N. 66½ E.	14.15	"	to the corner to fractional sections 18 and 19, on the S. E. bank of the island, thence in section 18,

N. 70 E.	10.00	chains,	thence
N. 75 E.	10.00	"	"
N. 25 E.	4.00	"	"
North	2.50	"	"
West	1.00	"	"
S. 66 W.	2.00	"	"
S. 75 W.	4.00	"	"
S. 80 W.	10.00	"	"
S. 63½ W.	21.10	"	to the corner to fractional

	sections 18 and 19, on the N. W. bank of island, and place of beginning.
	Land, on island and main shore, level and rich; not subject to inundation,
	Timber, Oak, Hickory, Ash, and Walnut; undergrowth, same and vines.
	North, between sections 17 and 18, Variation 17° 40′ East.
6.57	A Hickory, 20 in. dia.
10.80	Set a post on the left bank of Chickeeles river for corner to fractional sections 17 and 18, from which A Buckeye, 8 in. dia. bears S. 25 W. 15 links dist. A Hackberry, 10 in. dia. bears S. 61 E. 3 links dist. Monday, February 13th, 1854.

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Township 25 N. Range 2 W. Willamette Meridian.

Meanders of the left bank of Chickeeles river through the Township.

Begin at the corner to fractional sections 4 and 33, in the North Boundary of the Township and on the left and S. E. bank of the river, and run thence down stream with the meanders of the left bank of said river, in fractional section 4, as follows:

Causes.	Distances.	Remarks.
S. 76 W.	18.50 chs.	
S. 61 W.	10.00	
S. 59 W.	8.30	To the corner to fractional sections 4 and 5; thence in section 5—
S. 54 W.	10.70	
S. 40 W.	5.60	
S. 50 W.	8.50	
S. 37 W.	17.00	
S. 44 W.	22.00	
S. 38 W.	26.72	To the corner to fractional sections 5 and 8; thence in section 8—
S. 21 W.	16.00	
S. 10 W.	13.00	
South	8.50	To the head of rapids.
S. 9 E.	5.00	
S. 17 E.	20.00	
S. 10 E.	12.00	To foot of rapids.
S. 22¼ E.	8.46	To the corner to fractional sections 8 and 17.
		Land, along fractional section 8, high, rich bottom; not subject to inundation.
		The rapids are 37.00 chains long; rocky bottom; estimated fall 10 feet.
		Meanders in section 17.
S. 17 E.	15.00	At 5 chains discovered a vein of coal, which appears to be 5 feet thick, and may be readily worked.
S. 8 E.	12.00	
S. 4 W.	22.00	At 3.00 chains the ferry across the river to Williamsburg, on the opposite side of the river.
S. 25 W.	17.00	
S. 78 W.	12.00	
S. 71 W.	9.55	To the corner to fractional sections 17 and 18; thence in section 18—
S. 65 W.	15.00	
S. 73¾ W.	15.93	To the corner to fractional sections 18 and 19.
S. 65 W.	14.00	In section 19.
S. 60 W.	23.00	

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Township 25 N. Range 2 W. Willamette Meridian.

Causes.	Distances.	Remarks.
S. 42 W.	10.00 chs.	
S. 20 W.	10.00	
S.16½ W.	13.83	At 2 chains cross outlet to pond and lake, 50 links wide, to the corner to fractional sections 19 and 24, on the range line, 32.50 chains North of the corner to sections 19, 30, 24 and 25.
		Begin at the corner to fractional sections 25 and 30, on the range line 1 chain *South* of the quarter section corner on said line, and run thence down stream with the meanders of the left bank of Chickeeles river, in fractional section 30, as follows, viz:
S. 41 E.	20.00	At 10 chains discovered a fine mineral spring.
S. 49 E.	15.00	Here appear the remains of an Indian village.
S. 42 E.	12.00	
S. 12¾ E.	5.30	To the corner to fractional sections 30 and 31; thence in section 31—
S. 12 E.	10.00	
S. 12 W.	13.50	To mouth of Elk river, 200 links wide; comes from the East.
S. 41 W.	9.00	At 200 links across the creek.
S. 58 W.	11.00	
S. 35 W.	11.00	
S. 20 W.	20.00	At 15 chains mouth of stream, 25 links wide; comes from S. E.
S. 23¾ W.	8.80	To the corner to fractional sections 31 and 36, on the range line, and 8.56 chains North of the corner to sections 1, 6, 31 and 36, or S. W. corner to this Township.
		Land along the left bank of Chickeeles river is level rich soil, and only a small part subject to inundation.
		Timber, Oak, Hickory, Beech, and Elm; not much undergrowth. February 14th, 1854.

CHAINS.	From the corner to sections 30 and 31, on the West Boundary of the Township, I run
	East, on a *true* line between sections 30 and 31, Variation 18° East,
15.10	A White Oak, 16 in. dia.
23.50	Intersected the right bank of Chickeeles river, where set a post for corner to fractional sections 30 and 31, from which A Black Oak, 16 in. dia. bears N. 60 W. 25 links dist. A White Oak, 20 in. dia. bears S. 35 W. 32 links dist.

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	From this corner I run South 12 links to a point *West* of the corner to fractional sections 30 and 31, on the left bank of the river; thence continue South 314 links to a point from which the corner to fractional sections 30 and 31, on the left bank of the river, bears N. 72 East, which gives for the distance across the river 9.65 chains. The length of the line between sections 30 and 31 as follows, viz:
	Part East of river ----------41.90 chains.
	Part across river ----------9.65

Part West of river----------23.50

Total----------75.05

Commence the meanders of section 31 at the corner to fractional sections 31 and 36, on the right bank of Chickeeles river, and run thence up stream with the meanders of the right bank of said river, in fractional section 31, as follows:

N. 25 E. 7.00 chains, thence
N. 38 E. 11,00 " "
N. 50 E. 12.50 " "
N. 25 E. 10.00 " "
North 13.40 " to the corner to fractional sections 30 and 31; thence in section 30
N. 45 W. 14.00 chains, thence
N. 40 W. 12.00 " "
N. 34½ W. 10.50 " to the corner to fractional sections 25 and 30, on the right bank of Chickeeles river, 27.73 chains North of the corner to sections 25, 30, 31, 36.

Land level; rich bottom; not subject to inundation,
Timber, Oak, Hickory, and Ash; undergrowth, same, Spice and vines.

From the corner to sections 18, 19, 13 and 24, I run East, on a *true* line between sections 18 and 19,
Variation 18° 00′ East,

3.52 A Bur Oak, 20 in. dia
17.31 A White Oak, 15 in. dia.
21.00 Set a post on the right bank of Chickeeles river for corner to fractional sections 18 and 19, from which
A White Oak, 15 in. dia. bears N. 10 E. 31 links dist.
A Black Oak, 20 in. dia. bears S. 80 W. 15 links dist.

From this corner the corner to fractional sections 18 and 19, on the N. W. bank of the island, bears *East*.

To obtain the distance across the river between the two corners, I run (from the corner on right bank) *North* 375 links to a point from which the corner on the island bears S. 68 E. which gives for the distance 9.27 chains

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.

The length of the line between sections 18 and 19 is 75.77 chains, the several parts of which being as follows:

East of river and across the island, including 3.79 chains across the slough----------45.50 chains.
Across the river N. W. of island----------9.27
West of river----------21.00

Aggregate as above----------75.77

From the corner to fractional sections 19 and 24, on the right bank of Chickeeles river, I run up stream with the right bank of said river in fractional section 19, as follows, viz:

N. 30 E. 20.00 chains, thence
N. 45¼ E. 15.50 " to the corner to fractional sections 18 and 19; thence, in section 18,
N. 58 E. 10.00 chains, thence
N. 63 E. 17.00 " "
N. 75¾ E. 32.12 " to a point on the right bank of Chickeeles river *North* of the corner to fractional sections 17 and 18, on the left bank of the river; I here set a post for corner to fractional sections 17 and 18, on North side of river, from which
A Black Oak, 15 in. dia. bears N. 25 E. 21 links dist.
A Black Oak, 20 in. dia. bears N. 27 W. 17 links dist.

To obtain the distance across the river, on the line between sections 17 and 18, I run a base line *West* 430 links to a point from which the post corner to fractional sections 17 and 18, on the left and South bank of the river, bears S. 23 East, which gives for the distance 10.13 chains, to which add 10.80 chains, makes

20.93 To the corner to fractional sections 17 and 18, on the right and North bank of the river.

Survey of a claim of 640 *acres, confirmed by law to Samuel Williams.*

Begin at a Black Oak, 15 inches diameter, on the right bank of Chickeeles river, opposite the head of a small island in said river. Mark said tree with a blaze 15 inches long and 6 inches wide, a notch at the top and another at the bottom of the blaze, and on the face of the blaze, with a marking iron, the letters P. S. C. (Private Survey Claim.) From the corner tree
A Black Oak, 20 in. dia. bears N. 27 W. 55 links dist.
A Bur Oak, 16 in. dia. bears S. 50 W. 41 links dist.

Both trees marked with a blaze and notch at the lower end of the blaze, facing the corner tree, and on the blaze, with a marking iron, cut the letters W. P. S. (Witness Private Survey.) This is also the S. E. corner of the town of Wil-

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.

liamsburg, and from which I run up stream with the meanders of the right bank of Chickeeles river as follows: At an assumed
Variation 18° 00′ East,

North 17.00 chains; at 11.00 chains ferry landing.
N. 12 W. 16.00 chains,
N. 18 W. 20.00 chains; at 14 chains foot of rapids.
N. 12 W. 27.45 chains, to a point on the right bank of the river, where set a post for corner to this survey, from which
A Black Oak, 20 in. dia. bears N. 75 W. 33 links dist.
A white Oak, 20 in. dia. bears S. 43 W. 35 links dist.

NOTE.—At 3 chains on the last course of meanders cross the mouth of stream 40 links wide; comes from the N. W.

From this corner I run
S 78 W. with the Northern line of this survey,

15.17 A Black Oak, 20 in. dia.
20.00 A stream, 30 links wide, rapid current, runs S. E.
37.51 A Bur Oak, 20 in. dia.
52.34 A Hickory, 16 in. dia.
62.41 A White Oak, 20 in. dia.
79.42 Set a post for corner to this survey, from which
A Black Oak, 16 in. dia. bears N. 25 E. 16 links dist.
A White Oak, 20 in. dia. bears N. 10 W. 21 links dist.
A White Oak, 24 in. dia. bears S. 21 W. 16 links dist.
A Black Oak, 24 in. dia. bears S. 60 E. 17 links dist.
thence
S. 12 E. with the Western line of this survey,

10.25 A Black Oak, 16 in. dia.
17.51 A White Oak, 15 in. dia.
41.73 A Sugar Tree, 20 in. dia.
55.00 The road to Williamsburg, bearing E. and W.
61.53 An Elm, 14 in. dia.
80.00 Set a post for corner of this survey, from which
A white Oak, 16 in. dia. bears N. 73 E. 25 links dist.
A white Oak, 12 in. dia. bears N. 21 W. 17 links dist.
A white Oak, 20 in. dia. bears S. 61 W. 22 links dist.
A white Oak, 24 in. dia. bears S. 31 E. 23 links dist.
thence
N. 78 E. with the Southern line of this survey,

15.73 A Black Oak, 16 in. dia.
25.31 A Black Oak, 20 in. dia.
45.61 A White Oak, 12 in. dia.

67.20	A White Oak, 18 in. dia.
77.68	To the corner tree and place of beginning.
	The land of this claim rolling, good, 2d rate soil; somewhat broken along the rapids in the N. E. part; well timbered,

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	Black Oak, White Oak, Hickory, and Bur Oak; not much undergrowth; some Hazel, briers, and vines. The town of Williamsburg, situated on the S. E. part of the claim, is pleasantly located on the right bank of the river, some 8 or 10 feet above high water, and has at this time sixteen families residing in it. Some three or four tenements are now being constructed within the limits of the town. February 15th, 1851.
	From the corner to fractional sections 17 and 18, on the right and North bank of Chickeeles river, 20.93 chains North of the corner to sections 17, 18, 19, 20, I run
	North, between sections 17 and 18, counting the distance from the corner to sections 17, 18, 19, 20, Variation 18° East,
22.73	A Black Oak, 20 in. dia.
36.45	Intersected the Southern line of Samuel Williams's claim, where set a post for corner to fractional sections 17 and 18, from which
	A Black Oak, 16 in dia. bears S. 50 W. 22 links dist.
	A White Oak, 20 in. dia. bears S. 21 E. 31 links dist.
	From this corner I run N. 78 E. along the Southern line of the said claim 20.15 chains to the corner tree on the right bank of Chickeeles river and S. E. corner of said claim; thence down stream, on the right bank of said river, in fractional section 17, as follows:
	S. 16 W. 10.00 chains, thence
	S. 45 W. 10.00 " "
	S. 72 W. 10.30 " to the corner to fractional sections 17 and 18.
	Fields notes of the survey of a small island in Chickeeles river, lying wholly in section 17.
	Cause the flag to be set on the head of the island at a point bearing S. 45 E. from the Black Oak Tree, the S. E. corner to Samuel Williams's claim; from said corner tree run S. 45 W. 215 links to a point *West* of the flag on the head of the island, which gives for the distance from the corner tree to the flag 215 links. Set a meander post in the place of the flag, from which
	A Bur Oak, 16 in. dia. bears S. 10 W. 15 links dist.
	A White Oak, 12 in. dia. bears S. 15 E. 21 links dist.
	From the meander post I run around the island as follows:
	S. 16 W. 9.00 chains, thence
	S. 45 W. 10.00 " "
	S. 10 W. 2.00 " "
	South 1.50 " to the lower end of island, thence

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	East 1.50 chains, thence
	N. 75 E. 4.00 " "
	N. 50 E. 5.00 " "
	N. 30 E. 6.00 " "
	N. 10 E. 6.00 " "
	N. 10 W. 3.00 " "
	N. 73 W. 2.96 " to the meander post and place of beginning.
	This island is well timbered; White and Black Oak, and Hickory; not subject to inundation; undergrowth, same, Spice and vines.
	From the corner to sections 7, 18, 12 and 13, on the range line I run
	East, on a *true* line between sections 7 and 18, Variation 18° 00′ East,
7.93	Intersected the western line of Samuel Williams's survey of 640 acres, and at said intersection set a post for corner to fractional sections 7 and 18, from which
	A White Oak, 15 in. dia. bears N. 25 W. 15 links dist.
	A Black Oak, 20 in. dia. bears S. 34 W. 19 links dist.
	From this corner I run
	N. 12 W. with the Western line of said Williams's claim, 23.23 chains to the N. W. corner thereof.
	Land gently rolling.
	Timber, Oak and Hickory.
	From the corner to fractional sections 17 and 18, in the Southern line of Samuel Williams's survey, and 36.45 chains *North* of the corner to sections 17, 18, 19, 20, I run
	North, on a *blank* line passing through Samuel Williams' survey, counting the distance from the corner to said sections 17 18, 19, 20, Variation 18° 00′ East,
40.00	Point for quarter section corner in Samuel Williams's survey; corner not established,
52.50	The road leading into Williamsburg,
80.00	Set a temporary corner to sections 7, 8, 17, 18, in said Williams's claim,
	This line passes through the back part of the town of Williamsburg; but I make no connexion with the lines of said town.
	North, on a *blank* line between sections 7 and 8, Variation 18° 00′ East,
12.50	To creek, 30 links wide; runs east, comes from N. W.
38.10	Intersected the North Boundary of Samuel Williams's survey, where set a post for corner to fractional sections 7 and 8, fom which

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	A Black Oak, 10 in. dia. bears N. 10 E. 15 links dist.
	A Bur Oak, 15 in. dia. bears N. 16 W. 17 links dist.
	From this corner I run N. 78 E. on the North line of said claim, 440 links to the N. E. corner thereof, on the right bank of Chickeeles river,
	From the corner of fractional sections 7 and 8 in the North line of Samuel Williams's survey,
	North, on a *true* line between sections 7 and 8, counting the distance from the temporary corner to sections 7, 8, 17, 18, within said Williams's survey,
40.00	Set a post for quarter section corner, from which
	A Black Oak, 15 in. dia. bears N. 25 E. 16 links dist.
	A White Oak, 16 in. dia. bears N. 73 W. 12 links dist.
45.17	A White Oak, 18 in. dia.
63.71	A Bur Oak, 15 in. dia.
80.00	Set a post for corner to sections 5, 6, 7, 8, from which
	A Red Oak, 20 in. dia. bears N. 20 E. 40 links dist.
	A White Oak, 16 in. dia. bears N. 16 W. 43 links dist.
	A Red Oak, 24 in. dia. bears S. 80 W . 39 links dist.
	A White Oak, 40 in. dia. bears S. 75 E. 22 links dist.
	Land gently rolling; good rich soil,
	Timber, Oak, Hickory, and Ash. February 16th, 1854.
	East, on *true* line between sections 5 and 8, Variation 18° 00′ East,

5.16	A White Oak, 15 in. dia.
7.41	A Bur Oak, 12 in. dia.
10.50	Set a post on the right bank of Chickeeles river for corner to fractional sections 5 and 8 west of river, from which A Red Oak, 30 in. dia. bears N. 58 W. 5 links dist. A Hickory, 12 in. dia. bears S. 42 W. 5 links dist.
	From this corner the post corner to fractional sections 5 and 8, on the left bank of the river, bears S. 89 E.
	From a point 16 links *South* of this corner, and *West* of the corner to fractional sections 5 and 8, on the left and East bank of the river, I run North 454 links to a point from which the corner post on the left bank of the river bears S. 63 E. which gives for the distance across the river 8.91 chains. The length of the line between sections 5 and 8, including the distance across the river, is therefore 80.06 chains, viz:

East of river	60.65	chains.
Across river	8.91	
West of river	10.50	
Total	80.06	

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	West, on a *random* line between sections 6 and 7, Variation 18° 00′ East,
25.10	A stream, 25 links wide, gentle current, runs South,
40.00	Set a post for temporary quarter section corner,
56.00	A stream, 15 links wide, runs S. E.
76.26	Intersected the West Boundary 21 links North of the corner to sections 6 and 7, from which corner I run
	East, on a *true* line between sections 6 and 7, Variation 18° 09′ East,
36.26	Set a post for quarter section corner, from which A Black Oak, 16 in. dia. bears N. 15 W. 21 links dist. A White Oak, 40 in. dia. bears S. 21 W. 33 links dist.
76.26	The corner to sections 5, 6, 7, 8.
	Land hilly; 2d rate,
	Timber, Oak, Sugar Tree, and Hickory; undergrowth, same and Hazel.
	North, on a *random* line between sections 5 and 6, Variation 18° 00′ East,
20.00	Enter windfall, bearing N. 60 W. and S. 60 E.
35.00	Leave windfall, having same bearings,
40.00	Set a post for temporary quarter section corner,
80.06	Intersected the North Boundary of the Township 24 links East of the corner to sections 5 and 6, from which corner I run
	South, on a *true* line between said sections 5 and 6, Variation 18° 10′ East,
40.06	Set a post for quarter section corner, from which A Hickory, 20 in. dia. bears N. 18 E. 27 links dist. A White Oak, 24 in. dia. bears S. 31 W. 18 links dist.
80.06	The corner to sections 5, 6, 7, 8.
	Land rolling, and 2d rate,
	Timber, Oak, Hickory, Sugar Tree, and Ash; undergrowth, same and Hazel.
	From the corner to sections 4, 5, 32 and 33, on the North Boundary of the Township, I run
	South, on a *true* line between sections 4 and 5, Variation 18° 00′ East,
2.10	A White Oak, 15 in. dia.
4.00	Set a post on the right bank of Chickeeles river for corner to fractional sections 4 and 5, from which A Bur Oak, 16 in. dia. bears N. 25 E. 34 links dist. A Black Oak, 20 in. dia. bears N. 33 W. 21 links dist.
	From this corner the post corner to fractional sections 4 and 5, on the left bank of the river, bears S. ½ W. To obtain the distance across the river I run (from the corner on the right bank) N. 89° 30′ W. 326 links to a point from which the post corner to fractional sections 4 and 5, on the left bank, bears

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	S. 18° 30′ E. which gives for the distance 9.46 chains. The length of the line between sections 4 and 5 will therefore be as follows, viz:

Part South of the river	66.50	chains.
Part across the river	9.46	
Part North of the river	4.00	
Aggregate	79.96	

	From the corner to fractional sections 4 and 33, on the right bank of Chickeeles river, I run down stream with the meanders of the right and N. W. bank of said river as follows, viz:
	In section 4—
	S. 41° 45′ W. 5.35 chains to the corner to fractional sections 4 and 5; thence, in section 5
	S. 72 W. 11.00 chains, thence
	S. 55 W. 20.00 " "
	S. 40 W. 20.00 " at this point the bluff comes to the river; thence
	S. 42 W. 18.00 " thence
	S. 40 W. 18.00 " "
	S. 18¼ W. 19.75 " to the corner to fractional sections 5 and 8.
	Land, rolling along the last three courses, which are under a bluff bank from 20 to 30 feet high; the bottom, along the first three courses of meanders, good rich land,
	Timber, Oak, Hickory, Ash, Elm, and Buckeye; undergrowth, same, and vines in the bottom.
	From the corner to fractional sections 5 and 8, on the right bank of the river, I continue the meanders down stream, along fractional section 8, as follows, under a bluff blank from 20 to 30 feet high:
	S. 26 W. 9.70 chains, thence
	S. 10 W. 15.00 " "
	South 15.00 " to the head of rapids; thence
	S. 12 E. 2.55 " to the corner to fractional section 8 and N. E. corner of Samuel Williams's claim. Mark the Black Oak witness tree to this corner, bearing N. 75 W. 33 links distant, "Section 8."
	Land rolling, and rather broken along the river,
	Timber, principally Oak.
	February 17th, 1854.
	Private claim surveyed after public survey.
	Survey of a claim of 640 acres, confirmed by law to Daniel Reed.
	Begin at the corner to fractional sections 5 and 8, on the left bank of Chickeeles river,

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Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	The corner post standing, and witness trees agree with the description furnished me, viz: A Blue Ash, 24 in. dia. bears N. 66 E. 4 links dist. An Elm, 24 in. dia. bears S. 56 E. 20 links dist.
	From this corner I run down stream with the meanders of the left and East bank of said river S. 21 W. 16.00 chains to

a point where set a post on the left and East bank of Chickeeles river, for the S. W. corner of the said Reed's claim, from which
A Black Oak, 16 in. dia. bears N. 44 E. 37 links dist.
This tree marked with a blaze 15 inches long, 6 inches wide, facing the corner post, with two notches—one at the upper end and the other at the lower end of the blaze; also marked with a marking iron on the face of the blaze the letters D. R. (Daniel Reed) W. P. C. (Witness Private Claim,)
A Bur Oak, 20 in. dia. bears S. 47 E. 45 links dist.
Marked with a blaze and notch at the lower end of the blaze facing the corner post, with the letters R. 2 W. T. 25 N. sec. 8,
From the corner post I run
S. 54 E. along the S. W. Boundary line of said claim,
Variation 17° 40′ East,

10.51	A Bur Oak, 16 in. dia.
20.67	A Black Oak, 20 in. dia.
31.00	Leave river bottom and enter upland, bearing N. and S.
44.73	A White Oak, 24 in. dia.
57.34	A White Oak, 20 in. dia.
77.90	Set a post for corner of this claim and fractional section 8, from which

A White Oak, 16 in. dia. bears N. 40 W. 31 links dist.
This tree marked with a baze and two notches facing the corner post; one notch above and the other below the blaze. Mark the letters W. P. C. (Witness Private Claim) on the the face of the blaze,
A Black Oak, 20 in. dia. bears S. 10 W. 21 links dist.
A Bur Oak, 15 in. dia. bears S. 45 E. 13 links dist.
Both trees marked with a blaze and notch facing the post, and S. 8, with a marking iron.
From this corner I run
N. 36 E. along the South Eastern line of this claim,
Variation 17° 40′ East,

3.41	A White Oak, 15 in. dia.
5.45	Intersected the line between sections 8 and 9, where set a post for corner to fractional sections 8 and 9, from which

A White Oak, 16 in. dia. bears S. 25 W. 22 links dist.
A Bur Oak, 20 in. dia. bears S. 37 E. 18 links dist.

[52]

Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
	From this corner I run *South*, with the line between said sections, 23.70 chains to the corner to sections 8, 9, 16, 17.
33.73	A White Oak, 15 in. dia.
41.17	A Bur Oak, 16 in. dia.
57.31	A White Oak, 20 in. dia.
60.57	A Black Oak, 30 in. dia.
64.00	Leave timber and enter prairie, bearing N. and S.
75.17	Intersected the line between sections 4 and 9, where set a post with mound and trench for corner to fractional sections 4 and 9,

Plant N. E. a Hickory nut, S. E. 4 Apple seeds.
To obtain the distance on the line between sections sections 4 and 9, from the fractional section corner just established, to the corner to sections 3, 4, 9, 10, I run as follows:
North, 4.00 chains (to avoid the pond) to a point; thence *East* on an offset line 12.00 chains to a point; thence *South* 4.00 chains to the line between said sections 4 and 9; thence *East* with said line, and at 39.33 chains, the corner to sections 3, 4, 9, 10, the distance being counted from the corner to fractional sections 4 and 9, in the S. E. line of Daniel Reed's claim,

80.00	To a point for the East corner of the claim. Set a lime

stone 10 inches square and 6 inches thick, and post with mound and trench, as per instructions, for corner to said claim and to fractional section 4. From the corner, a White Oak, 16 in. dia. standing in the edge of the timber, bears N. 65 W. 555 links distant. Mark said tree with a blaze and two notches, one above and the other below the blaze, facing the corner. With a marking iron cut the letters W. P. C. (Witness Private Claim) on the face of the blaze. This corner about 3.00 chains N. W. of a small pond. Thence I run
N. 54 W. along the N. E. Boundary line of this claim,
Variation 17° 40′ East,

5.50	Leave prairie and enter timber, bearing N. E. and S. W.
10.53	A Bur Oak, 15 in. dia.
25.34	A Black Oak, 16 in. dia.
54.07	Intersected the line between sections 4 and 5,

Here set a post for corner to fractional sections 4 and 5, from which
A Black Oak, 16 in. dia. bears N. 43 E. 22 links dist.
A White Oak, 20 in. dia. bears N. 37 W. 17 links dist.
From this corner I run *North* with the line between said sections 4 and 5, and at 30.81 chains, the corner to fractional sections 4 and 5, on the left and South bank of Chickeeles river,

[53]

Township 25 N. Range 2 W. Willamette Meridian.

CHAINS.	
64.00	Leave upland, and enter river bottom, bearing N. E. and S. W.
65.50	A Bur Oak, 20 in. dia.
71.53	A Bur Oak, 16 in. dia.
75.36	A Walnut, 36 in. dia.
77.90	Set a post on the left and S. E. bank of Chickeeles river for corner of this claim and fractional section 5, from which

A White Oak, 16 in. dia. bears N. 60 E. 31 links dist.
Marked with a blaze and notch facing the post, and section 5 on the face of the blaze,
A Bur Oak, 15 in. dia. bears S. 40 E. 37 links dist.
Marked with a blaze and two notches facing the post. The letters W P. C. (Witness Private Claim) cut with a marking iron on the face of the blaze,
From this corner I run up stream with the meanders of the left and S. E. bank of the river in fractional section 5,

N. 37 E.	1.00	chains,	thence
N. 50 E.	8.50	"	"
N. 40 E.	5.60	"	"
N. 54 E.	10.70	"	to the corner to fractional sections

4 and 5, on the left bank of the river,
From the corner to fractional section 5 and the upper corner to the claim on the left bank of Chickeeles river, I run down stream with the meanders of the left bank of said river, within the claim, as follows:

S. 37 W.	16.00	chains,	thence
S. 44 W.	22.00	"	"
S. 38 W.	26.72	"	to the original corner to fractional

sections 5 and 8, on the left and East bank of Chickeeles river, and place of beginning.
Land, much the largest portion of this claim gently rolling upland; good, 2d rate timber, Oak, Walnut, Hickory, and Sugar Tree. The bottom land along the river is dry rich land, not subject to inundation.
Timber, Walnut, Oak, Hickory, and Hackberry; undergrowth, same, briers and vines.

February 18th, 1854.

[54]

GENERAL DESCRIPTION.

The quality of the land in this Township is considerably above the common average. There is a very fair proportion of rich bottom land, chiefly situated on both sides of Chickeeles river, which is navigable through the Township for steamboats of light draft, except over the rapids in section 8. These rapids are 37 chains long; estimated fall about 10 feet.

The uplands are generally rolling, good 1st and 2d rate land, and well adapted for cultivation. Elk river is a beautiful stream of clear water, running through the Southern part of the Township, and emptying into Chickeeles river, in section 31. There is a fine mill-seat on this stream in section 22.

Timber, chiefly Oak, Beech, Hickory, Hackberry, and Sugar Tree, and is very equally distributed over the Township, except in the prairie embracing parts of sections 3, 4, 9, 10, 15, and 16.

The town of Williamsburg was laid out by Samuel Williams, some two years since, on the right bank of Chickeeles river, a little below the foot of the rapids. It now contains sixteen houses, and others are being built; has a good landing in front, with a ferry, and has the appearance of thrift and prosperity.

There are several good quarries of stone (principally lime) along the Chickeeles and Elk rivers, which will afford inexhaustible quantities of excellent building materials. On the line between sections 1 and 12, I discovered gold dust and auriferous quartz, and in section 17, on the left bank of Chickeeles river, opposite Williamsburg, a valuable coal bank. There are three settlements—one on the N. W. quarter of section 10, one on the N. W. quarter of section 15 and N. E. quarter of section 16, and the other on the N. E. quarter of section 23 and N. W. quarter of section 24.

A valuable salt spring was discovered crossing the South Boundary of section 31, running N. W.; also the remains of an Indian village on the left bank of Chickeeles river, in section 30. Fossil remains on the West bank of a small lake in section 26, and ancient works on the left bank of the Elk river, in the N. E. quarter of section 27.

LIST OF NAMES.

A list of names of the individuals employed to assist in running, measuring, or marking the lines and corners described in the foregoing field notes of Township No. 25 North of the base line of Range No. 2 West of the Willamette meridian, showing the respective capacities in which they acted:

PETER LONG, Chainman.
JOHN SHORT, Chainman.
GEORGE SHARP, Axeman.
ADAM DULL, Axeman.
HENRY FLAGG, Compassman.

[55]

We hereby certify that we assisted Robert Acres, deputy surveyor, in surveying the exterior boundaries and subdividing Township number twenty-five North of the baseline of Range number two west of the Willamette meridian, and that said Township has been in all respects, to the best of our knowledge and belief, well and faithfully surveyed, and the boundary monuments planted according to the instructions furnished by the Surveyor General.

PETER LONG, *Chainman.*
JOHN SHORT, *Chainman.*
GEORGE SHARP, *Axeman.*
ADAM DULL, *Axeman.*
HENRY FLAGG, *Compassman.*

Subscribed and sworn to by the above named persons, before me, a Justice of the Peace for the county of , in the State [or Territory] of , this day of , 185

HENRY DOOLITTLE,
Justice of the Peace.

I, Robert Acres, deputy surveyor, do solemnly swear that, in pursuance of a contract with surveyor of the public lands of the United States in the State [or Territory] of , bearing date the day of 185 , and in strict conformity to the laws of the United States and the instructions furnished by the said Surveyor General, I have faithfully surveyed the exterior boundaries [or sub-division and meanders, as the case may be] of Township number twenty-five North of the base line of Range number two West of the Willamette meridian, in the aforesaid, and do further solemnly swear that the foregoing are the true and original field notes of such survey.

ROBERT ACRES,
Deputy Surveyor.

Subscribed by said Robert Acres, deputy surveyor, and sworn to before me, a Justice of the Peace for county, in the State [or Territory] of , this day of , 185 .

HENRY DOOLITTLE,
Justice of the Peace.

To each of the original field books, the Surveyor General will append his official approval, according to the following form, or so varied as to suit the facts in the case:

SURVEYOR'S OFFICE AT ,
185 .

The foregoing field notes of the survey of [here describe the survey,] executed by Robert Acres, under his contract of the day of ,

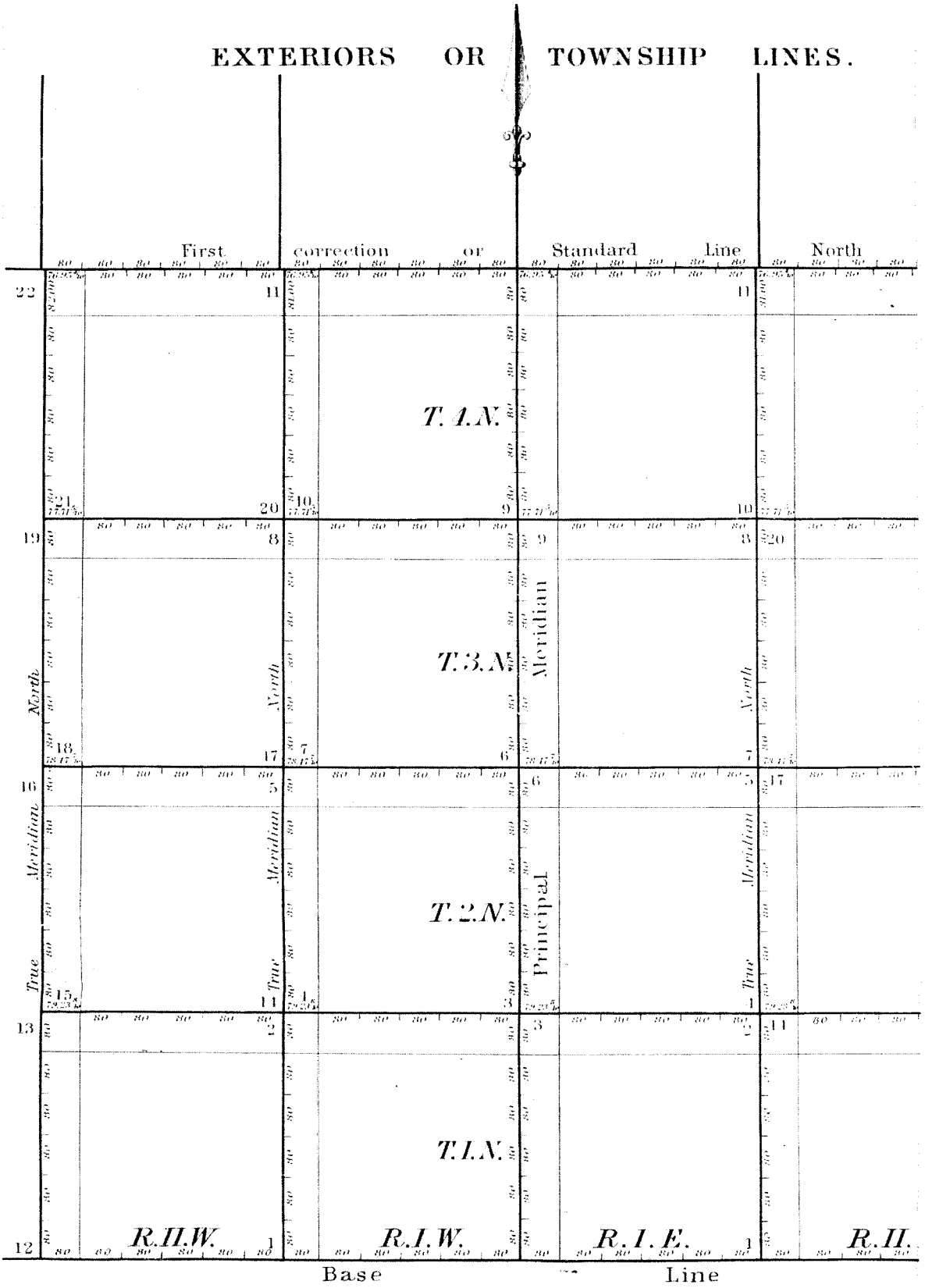
[56]

185 , in the month of , 185 , having been critically examined, the necessary corrections and explanations made, the said field notes, and the surveys they describe, are hereby approved.

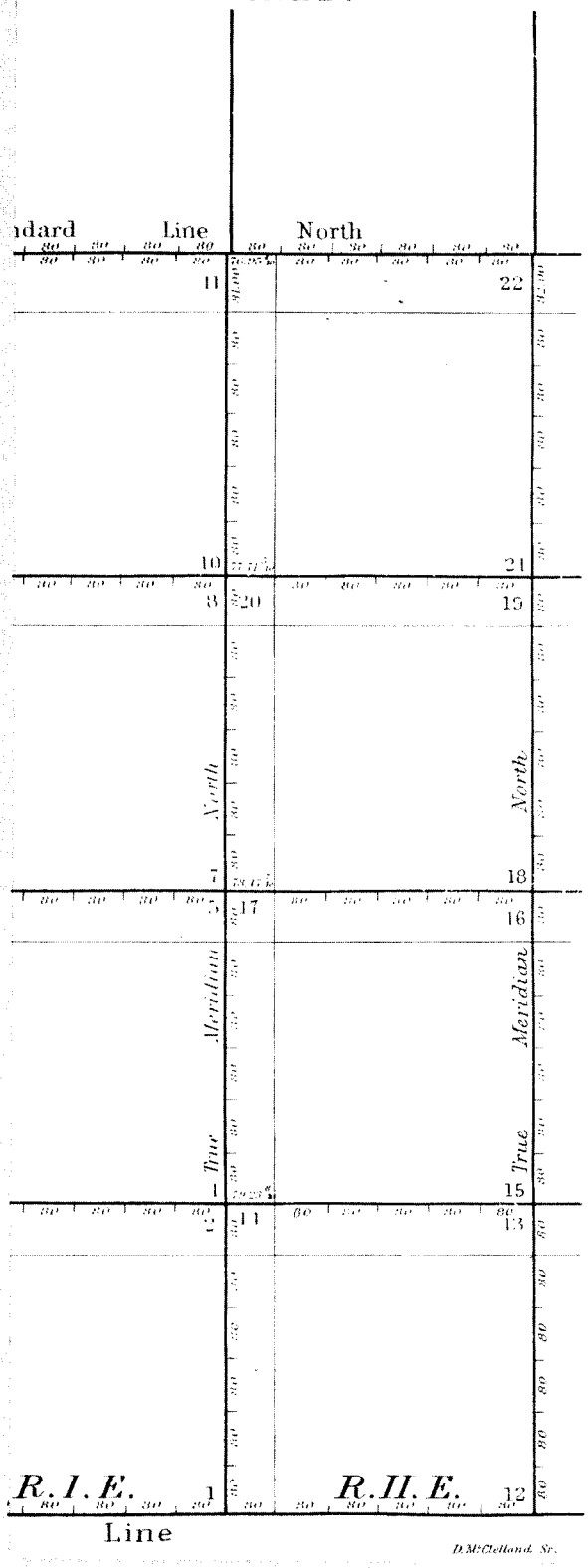
A.B.
Surveyor General.

Diagram A.

EXTERIORS OR TOWNSHIP LINES.



WNSHIP LINES.



D.McClelland Sr.

The upright figures (made thus 1.2.3) commencing near the Principal Meridian and Base line with N° 1, indicate the perambulations of the Surveyor in running the Townships and Correction lines.

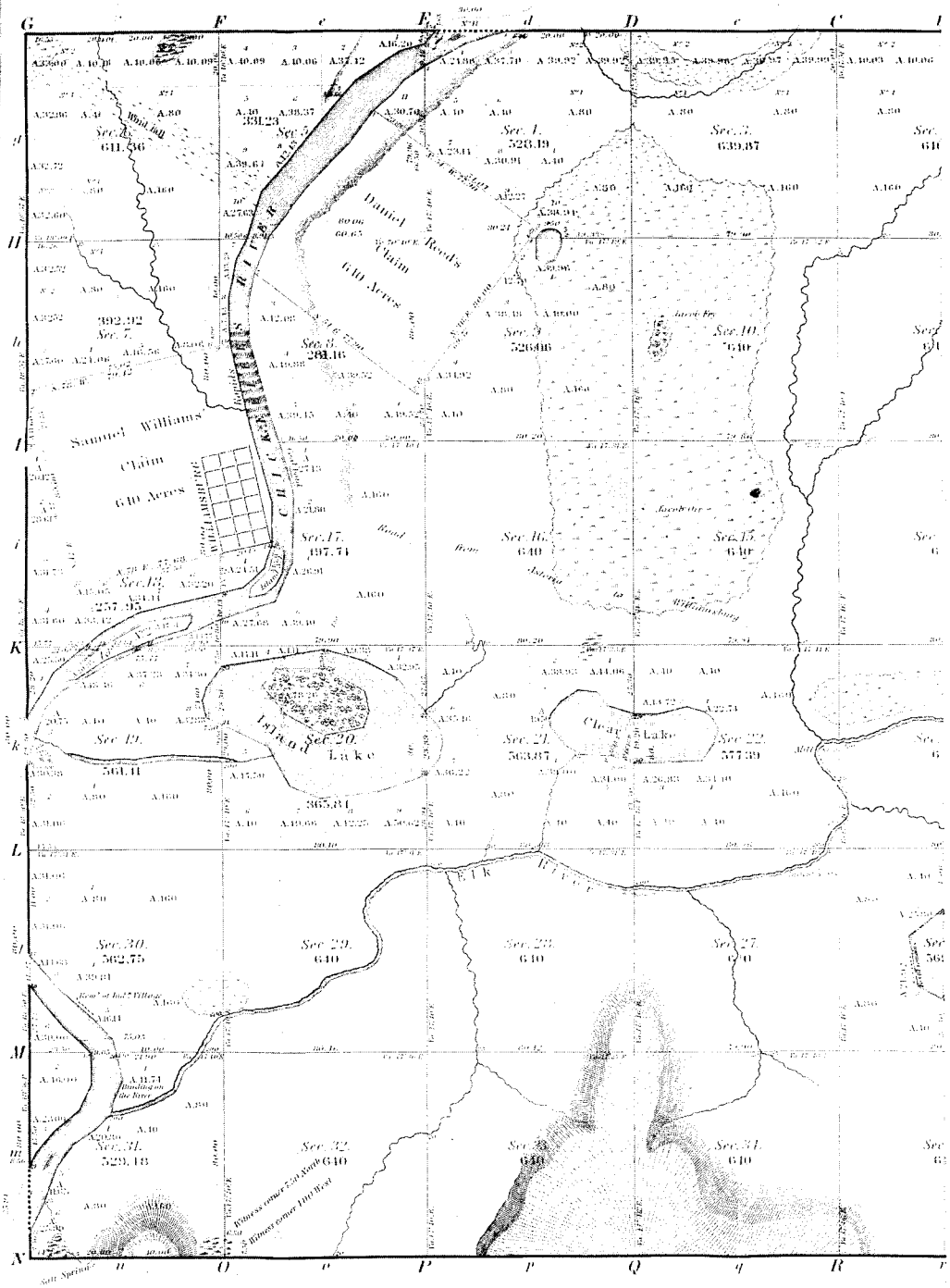
The Correction or Standard lines North of the Base are every 4 townships, and South of the Base every 5 townships.

The excess or deficiency of measurement on northern and southern boundaries is thrown on the westernmost half mile.

The measurements between Meridian lines will, of course, always vary according to the latitude of the survey, besides being liable to be rendered inexact where the country is very hilly or broken. The convergency of the range lines as shown by the measurements on this diagram, is according to calculation, as it exists between the parallels of 46° and 47° N.L.

Diagram B.

TOWNSHIP No. 25 NORTH RANGE No. 2 WEST WILLAME

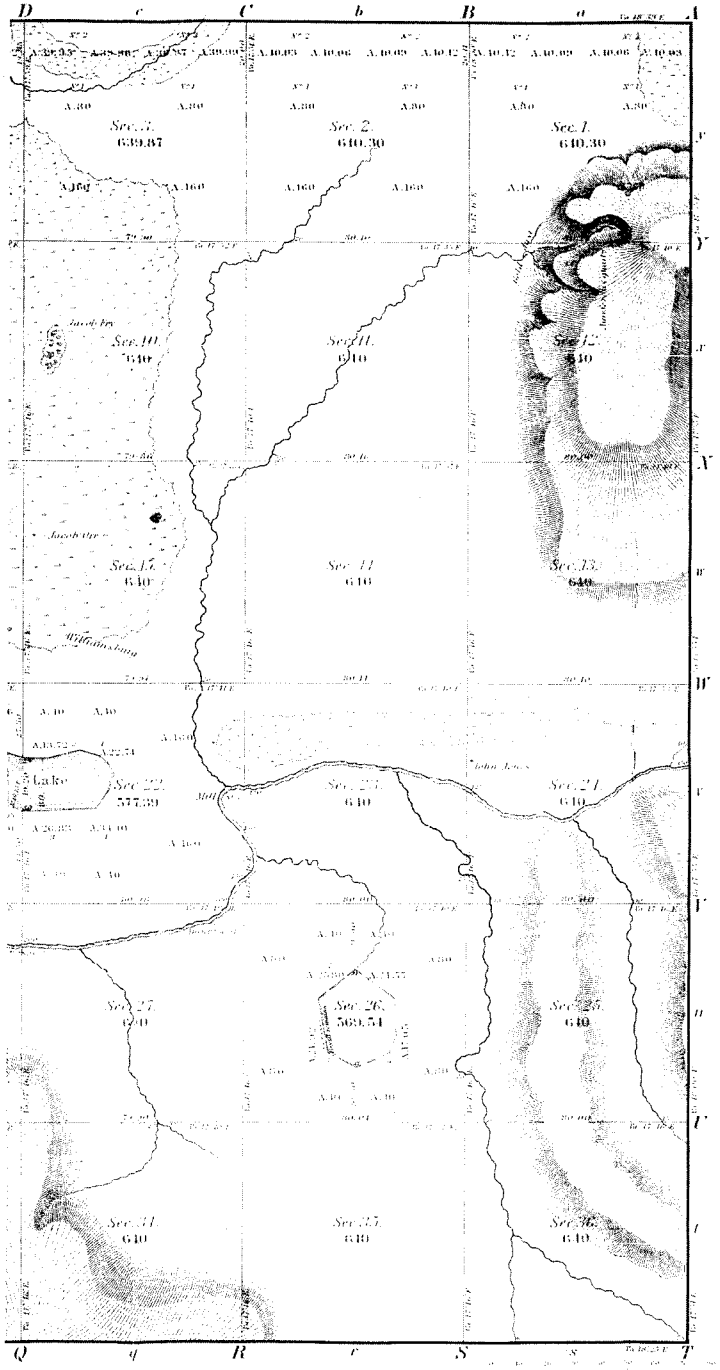


Surveys Designated	By Whom Surveyed	Date of Contract	Amount of Surveys M. Ch. L.K.	When Surveyed
Township lines				
Subdivisions				

The above
notes of the su
Surveys

ram B.

Nº 2 WEST WILLAMETTE MERIDIAN.



Aggregate Area of Public lands	20598.26
Private Surveys	1280.00
Total number of Acres	21878.26
Estimated Area of river and Lakes	951.98
Aggregate	22830.24

When Surveyed

The above Map of Township Nº of Range Nº Meridian is strictly conformable to the field notes of the survey thereof on file in this office, which have been examined and approved

Surveyor Generals Office at

185

Gen. Genl.

D. McClelland Sc. Wash. D.C.

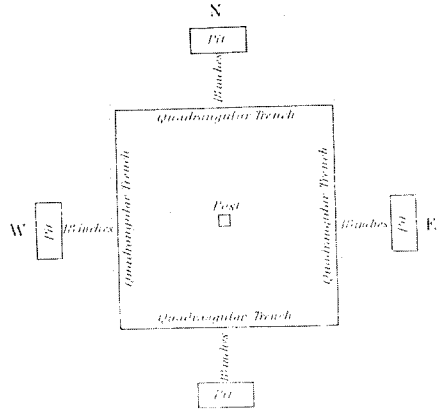
C.

Diagram for the

Illustration of Mound, Stake, and Stone cor

Position of Corner Mound common to two Townships or two Sections.

Plan.



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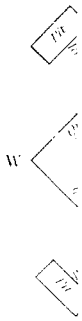
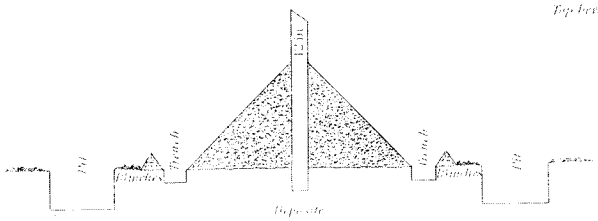
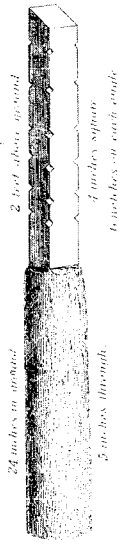


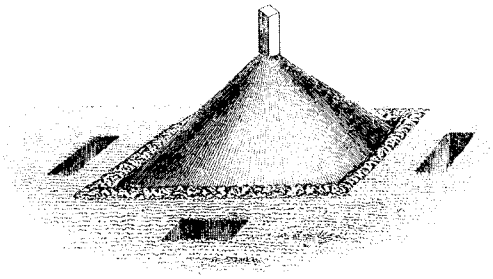
Section.



Township Corner Post
Top bevelled to turn rain



Elevation.

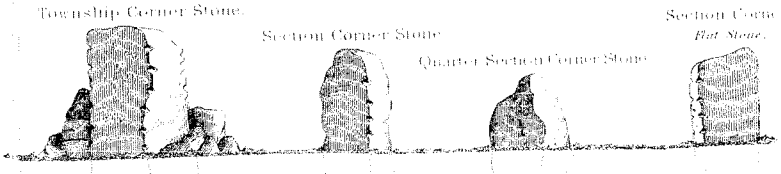


Township Corner Stone.

Section Corner Stone

Quarter Section Corner Stone

Section Corne
Flat Stone.



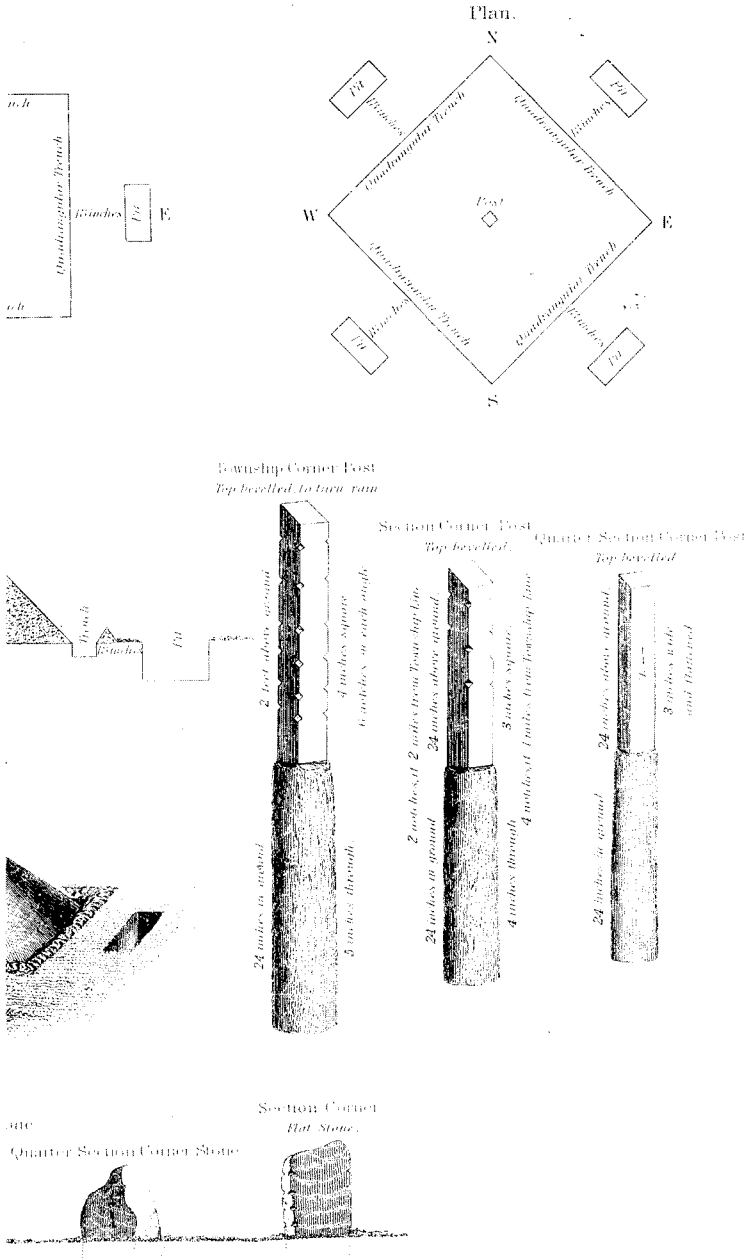
C.

Diagram for the

ıd, Stake, and Stone corner boundaries.

ıd common
o Sections.

Position of Corner Mound common
to four Townships or Four Sections.



To the copies of the field notes transmitted to the seat of government, the Surveyor General will append to each Township the following certificate:

I certify that the foregoing transcript of the field notes of the survey of the [here describe the character of the surveys, whether meridian, base line, standard parallel, exterior Township lines, or subdivision lines, and meanders of a particular Township] in the State [or Territory] of , has been correctly copied from the original notes on file in this office.

A. B.
Surveyor General.

TABLE

Showing the difference of latitude and departure in running 80 chains, at any course from 1 to 60 minutes.

Minutes.	Links.	Minutes.	Links.	Minutes.	Links.
1	2⅓	21	49	41	95⅔
2	4⅔	22	51⅓	42	98
3	7	23	53⅔	43	100⅓
4	9⅓	24	56	44	102⅔
5	11⅔	25	58⅓	45	105
6	14	26	60⅔	46	107⅓
7	16⅓	27	63	47	109⅔
8	18⅔	28	65⅓	48	112
9	21	29	67⅔	49	114⅓
10	23⅓	30	70	50	116⅔
11	25⅔	31	72⅓	51	119
12	28	32	74⅔	52	121⅓
13	30⅓	33	77	53	123⅔
14	32⅔	34	79⅓	54	126
15	35	35	81⅔	55	128⅓
16	37⅓	36	84	56	130⅔
17	39⅔	37	86⅓	57	133
18	42	38	88⅔	58	135⅓
19	44⅓	39	91	59	137⅔
20	46⅔	40	93⅓	60	140

(This Instructions Circular is copied from an original document now in the possession of the National Archives. It was reprinted in 1871 with only the printing style changed and Roman numerals used in paragraphing in place of Arabic numerals.)

INSTRUCTIONS TO THE SURVEYORS GENERAL OF THE UNITED STATES, RELATING TO THEIR DUTIES AND TO THE FIELD OPERATIONS OF DEPUTY SURVEYORS.

PRESCRIBED, ACCORDING TO LAW, BY THE COMMISSIONER OF THE GENERAL LAND OFFICE.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1864.

INSTRUCTIONS

TO THE

SURVEYORS GENERAL OF PUBLIC LANDS OF THE UNITED STATES.

General Land Office, *June* 1, 1864.

1. THE SURVEYING MANUAL AND INSTRUCTIONS OF THE COMMISSIONER ARE MADE A PART OF THE SURVEYING CONTRACTS BY LAW.

By the second section of the act of Congress entitled "An act to reduce the expenses of the survey and sale of the public lands in the United States," approved May 30, 1862, it is provided, "That the printed Manual of Instructions relating to the public surveys, prepared at the General Land Office, and bearing date February twenty-second, eighteen hundred and fifty-five the instructions of the Commissioner of the General Land Office, and the special instructions of the surveyor general, when not in conflict with said printed Manual or the instructions of said Commissioner, *shall be taken and deemed a part of every contract for surveying the public lands of the United States.*"

In pursuance of law, the following instructions are prescribed for your government and that of your deputies in surveying the public lands:

2. SURVEYS TO BE EXECUTED BY DEPUTY SURVEYORS IN PERSON.

Your attention is especially directed to the last clause of the printed form of contract furnished by this office, which stipulates "that no payment shall be made for any surveys not executed by the said deputy surveyor in his own proper person." It has been the practice of deputies to take contracts for more surveying than they could perform in person, and then employ one or more compassmen with their auxiliaries to do the work. The object of the stipulation referred to in the contract is to prevent a continuance of this practice.

Deputy surveyors are required to verify by their oath that the surveys embraced in their contracts have been executed in strict conformity with instructions, the requirements of the Surveying Manual, and the laws of the United States. The deputy cannot consistently make this oath if the work is done by separate parties in other parts of the field from where he is operating.

That there may be no misunderstanding upon this point, you are hereby instructed not to enter into contract with any one deputy for a greater amount of surveying than it may reasonably be expected he will be able to execute in one season, under his own immediate and personal direction, with *one surveying party only*; and deputy surveyors will be notified in advance that accounts for surveying done in violation of this rule will not be allowed.

When two deputies enter into joint contract for certain surveys, and *only one* of them goes into the field, if that one, with a single surveying party, executes all the work in person, his affidavit alone as surveyor, attached to the field notes, will be deemed sufficient, and no impediment to the payment of his account will result therefrom.[1]

If two deputies, joint parties in a contract, *both* go into the field, each with a separate surveying party, the field notes must show clearly the particular surveying done by each deputy. The date and the name of the deputy will be stated at the beginning and end of the notes of every continuous part of such survey execued by him, so that it may be distinctly seen by whom each mile of line was run.[2]

The following form of affidavit is prescribed, to be attached to the field notes in cases of joint surveys, in lieu of the one heretofore used, to wit:

"I, A B, deputy surveyor, do solemnly swear that, in pursuance of a joint contract, wherein A B and C D are joint contractors with S. G., United States surveyor general for _____, bearing date the _____ day of _____ 18 , I have well, faithfully, and truly, in my own proper person, and in strict conformity with the instructions furnished by the surveyor general, the Surveying Manual, and the laws of the United States, surveyed all those parts or portions of _____ as are represented in the foregoing field notes as having been surveyed under my direction; and I do further solemnly swear that all the corners of said surveys have been established and perpetuated in strict accordance with the Surveying Manual and printed instructions, and that the foregoing are the true and original field notes of such survey."[3]

The separate affidavit of each deputy, in the above form, well be attached to the field notes of joint surveys.

3. OPERATIONS IN THE FIELD, WHEN TO COMMENCE.

The practice of anticipating the appropriations is deemed unwise and contrary to the spirit of the law. The surveys should not be commenced in advance of the year for which the means is provided by Congress, and no moneys can be used to pay for work done before they were appropriated. This must be regarded as an invariable rule to be rigidly observed in future.

The object of this restriction is to keep back the surveying operations to the legitimate period of time contemplated in the appropriations. These appropriations are made with reference to the

current necessities of given years, and if allowed to be absorbed in advance, the purposes of Congress in providing stated sums annually to carry forward the public surveys would be defeated. In order to enable deputy surveyors to avail themselves of the whole season belonging to the fiscal year, however, they may be permitted to commence their operations as soon after the first day of May in each year as

1. When one Deputy does the work under a joint contract, he may verify.
2. Active Deputies under joint contract each to verify.
3. Form of affidavit for joint surveys.

notice is received from this office that the appropriations have been made. You will be promptly notified, by mail or telegraph, as circumstances may determine, when the appropriations are passed, and no surveying chargeable to such appropriations must be done before receiving this notice.

4. CONTRACTS MUST BE APPROVED BY THE COMMISSIONER.

The first section of the act of May 30, 1862, provides that contracts for the survey of the public lands shall not become binding upon the United States until approved by the Commissioner of the General Land Office, except in such cases as the Commissioner shall otherwise especially order.

5. REVENUE STAMPS TO BE ATTACHED TO CONTRACTS AND BONDS.

The requirements of the internal revenue law make it necessary that five *separate stamps* be attached to the several parts of every contract and of a deputy surveyor, to wit:

1. To the *contract*, five-cent stamp; 2. To the *affidavit* of the deputy surveyor, five cents; 3. To the *bond*, fifty cents; 4. To the *certificate* as to the sufficiency of the bond, ten cents; 5. To the *oath* of allegiance, five cents.

Surveyors general are reminded that the sufficiency of the sureties to the bonds of deputy surveyors must be certified BY THE PROPER OFFICER OF A COURT HAVING A SEAL.

6. WHEN DESIRED BY SETTLERS, SURVEYS MAY BE MADE BY THE SURVEYOR GENERAL AT THEIR EXPENSE IN CERTAIN CASES.

By section 10 of an act entitled "An act to reduce the expenses of the survey and sale of the public lands in the United States," approved May 30, 1862, it is provided, "That when the settlers in any township or townships, not mineral or reserved by Government, shall desire a survey made of the same under the authority of the surveyor general of the United States, and shall file an application therefor in writing, and deposit in a proper United States depository, to the credit of the United States, a sum sufficient to pay for such survey, together with all expenses incident thereto, without cost or claim for indemnity on the United States, it shall and may be lawful for said surveyor general, under such instructions as may be given him by the Commissioner of the General Land Office, and in accordance with existing laws and instructions, to survey such township or townships, and make return thereof to the general and proper local land office: *Provided,* The townships so proposed to be surveyed

are within the range of the regular progess of the public surveys embraced by existing standard lines or bases for the township and subdivisional surveys."—(Sec. 10, p. 410, vol. 12, U. S. Laws.)

Applications for surveys under this law must be made to the surveyor general in writing, upon the receipt of which he will furnish the applicant with an estimate of how much the desired survey will cost. On receiving a certificate of deposit of a United States depositary, showing that the required sum has been deposited with him in a proper manner to pay for the work, you will contract with a competent United States deputy surveyor, and have the survey made and returned in the same manner as other public surveys are.

You are especially enjoined in all cases to state explicitly in your letters furnishing estimates to applicants, that the payment of the amount required for the survey will not give the depositor any priority of claim or right to purchase the land, or in any manner affect the claim or claims of any party or parties thereto; and that, when surveyed, it will be subject to the same general laws and regulations in relation to the disposition thereof as other public lands are.

The money should be deposited to the credit of the Treasurer of the United States on account of the proper appropriations. A separate estimate is required and a separate deposit must be made for *office work and field work*; one to be placed to the credit of the appropriation "for compensation of the surveyor general and the clerks in his office," and the other to the credit of the appropriation "for continuing the public surveys." The depositary will issue certificates in triplicate, one of which will be transmitted to this office with the contract and bond of the deputy surveyor.

The account will be adjusted and paid in the same manner as other surveying accounts. Should the amount deposited exceed the cost of survey and all expenses incident thereto, including office work, an account setting forth the fact of such excess may be rendered by the depositor, certified by the surveyor general, and transmitted to this office with the final surveying returns, to be reported for payment.

Where a township is surveyed under the provisions of the aforesaid act, the survey must include all the *surveyable* public land in such township.

7. SMALL ISLANDS MAY BE SURVEYED AT THE COST OF APPLICANTS.

Many applications are received at this office for the purchase of small unsurveyed islands which were omitted when the adjacent lands were surveyed. These islands are usually of too little value to justify the Government in incurring the expense of survey; but where a party desires the survey made and is willing to pay the cost thereof in advance, upon the conditions set forth in these instructions, it may be done under the provisions of the tenth section of the act of May 30, 1862.

The party desiring the survey to be made must file a written application with the surveyor general, giving an intelligible description of the locality of the island, its distance from the main shore, the width

of the narrowest channel between it and the main land, with an estimate of its area.

Upon receiving such application, made in the manner indicated, you will examine the records and data in your office, and if it appears that the island is public land and has not already been surveyed, you will furnish the applicant an estimate of the cost of surveying it, as directed under the

sixth head in these instructions, stating explicitly that the depositing of the money will not in any manner affect the rights of parties in said lands, nor give any priority of claim to the depositor.

You will observe particularly that two separate deposits are to be made—one on account of the appropriation for field work, and one on account of the appropriation for office work—a separate certificate for each to be transmitted to this office with the contract and bond of the deputy surveyor.

It will be understood that these instructions relate only to isolated islands, or islands that were omitted when the public surveys were extended over the adjacent lands, and do not apply to islands falling within the regular course of current surveys, which must be included in the contracts for surveying the public lands.

As a general rule, a body of land separated from the main land by a *perpetual* natural channel may be regarded as an island for the purposes contemplated in these instructions.

8. SURVEY OF SWAMP LANDS.

Contracts with deputy surveyors must of course embrace any "swamp and overflowed" lands which, in alluvial regions, are intermingled with the arable or fast lands. Over all such lands the lines of the public surveys must be extended, as the selections in such cases are made according to the character of the *smallest legal subdivision*. If the greater part of such subdivision is "swamp and overflowed," it goes to the swamp grant; if otherwise, it is excluded from such grant, and is retained by the Government.

In the survey of all lands of this mixed character, the deputies must be charged to give in their field notes a specific and full description of the land, indicating the *causes* of its being unfit for cultivation in its natural condition, with the character of the timber, shrubs, or plants growing on the tract, and the contiguity of the premises to rivers, water-courses, or lakes, naming them respectively. The swamp grant does not embrace tracts in which the inundation is casual, but only those where the overflow would totally destroy crops and prevent the raising of the same without artificial means, such as levees, draining, &c. The essentiality must be obvious to you of the requirement of full data in these respects, in order to enable the Department properly to adjust swamp and other interests.

Where the State authorities desire to have swamp lands surveyed at their expense, the same may be done in accordance with instructions on page 5 for surveys under the provisions of the tenth section of the act of May 30, 1862; but all applications for separate surveys

of swamp lands must be submitted to this office, with a full report and a diagram illustrating the locality, and the approval of the Commissioner first obtained.

9. CERTAIN RIVERS TO BE MEANDERED ON ONE BANK ONLY.

Rivers not embraced in the class denominated "navigable"under the statute, but which are well-defined natural arteries of internal communication, and have a uniform width, will only be meandered on *one bank*. For the sake of uniformity, the surveyor will traverse the *right bank* when not impracticable; but where serious obstacles are met with, rendering it difficult to course along the right bank, he may cross to the left bank and continue the meanders as far as necessary; but all changes from one bank to the other will be made at the point of intersection of some line of the public surveys with the stream being meandered.

The subdividing deputies will be required to establish meander corners on both banks of such meanderable streams at the intersection of all section lines, and the distances across the river will be noted in the field book.

In meandering water-courses, where a distance is more than *ten chains* between stations, even chains only should be taken; but if the distance is less than ten chains, and it is found convenient to employ chains and links, the number of links should be a multiple of ten, thereby saving time and labor in testing the closings both in the field and in the surveyor general's office.

10. WHAT LAKES ARE NOT TO BE MEANDERED.

Paragraph numbered three, on page 13 of the Manual, in regard to the meandering of lakes, &c., is modified as follows:

Lakes embracing an area of less than *forty acres* will not be meandered. Long, narrow or irregular lakes of larger extent, but which embrace *less than one-half* of the smallest legal subdivision, will not be meandered. Shallow lakes or bayous, likely in time to dry up or be greatly reduced by evaporation, drainage, or other cause, will not be meandered, however extensive they may be.

Deputy surveyors will be allowed pay for the distance across lakes or ponds not meandered, where they are required to continue the lines of the public surveys across them; but no offsets or lines run in triangulating will be paid for.

Where the distance across a lake or other body of water is ascertained by offsetting, it is not enough to say in the field notes "8.65 over lake and set a meander corner," but the *mode* by which the distance is ascertained must be stated and described in full.

Posts will be established by the subdividing deputy at the intersections of all the public lines with these lakes the same as if they were to be meandered.

11. CORNER POSTS AND CORNER STONES.

In loose or alluvial soil, section, quarter-section, or meander posts may be driven into the ground, instead of digging holes and planting

them as required in the Manual; but no posts will be so driven unless, from the character of the soil, they will thereby be rendered more firm and enduring.

All corner stones fourteen inches long, or more, and less than eighteen inches in length, should be set two-thirds of their length in the ground; if more than eighteen inches long, they should be set three-quarters of their length in the ground.

12. QUARTER SECTION CORNERS NOT TO BE ESTABLISHED IN CERTAIN CASES.

Quarter section corners are not required to be established on the *west* boundary of the *western tier of sections* in a township, nor on the *north* boundary of the northern tier of sections in a township *south of and bordering on a standard parallel or base line*. The resurvey of township, standard, or base lines, by the deputy surveyor, for the purpose of establishing such quarter posts, is unnecessary and will not be paid for.

13. POSTS IN MOUNDS.

All posts in mounds will hereafter be planted or driven into the ground to the depth of twelve inches, at the precise corner point; and the charcoal-charred stake or marked stone required in the Manual will be deposited twelve inches below the surface, against the north side of the post when the deputy is running north, and against the west side when the deputy is running west, &c.

Township mounds will be five feet in diameter at their base and two and a half feet in perpendicular height. Posts in township mounds are therefore required to be four and a half feet in length, so as to allow twelve inches to project above the mound.

Mounds at section, quarter section, and meander corners, will be four and a half feet in diameter at their base and two feet in perpendicular height, the posts being four feet in length, leaving twelve inches to project above the mound.

The planting of seeds between the pits and trenches, as directed on page 11 of the Manual, is not required.

14. PITS IN LIEU OF TRENCHES.

The quadrangular trench required in connection with the construction of mounds is dispensed with. The *pits* will be continued, and should be of uniform dimensions. The pits for a township mound will be eighteen inches wide, two feet in length, and at least twelve inches deep, located six feet from the post. At section corners the pits will be eighteen inches *square*, and not less than twelve inches in depth.

At township corners common to *four* townships, the pits will be dug on the lines and lengthwise to them. On base and standard lines, where the corners are common to only *two* townships or sections, three pits only will be dug—two in line on either side of the post, and one on the line north or south of the corner, as the case may be. By this means the standard and closing corners will be readily distinguished from each other.

15. NOTCHING SECTION CORNER POSTS.

Posts or stones at the corners of sections in the interior of townships will have as many notches on the *south* and *east* edges as they are miles from the south and east boundaries of the township, instead of being notched on all four edges, as directed on pages 8 and 9 of the Manual.

16. MARKING LINES.

In addition to the instructions under this head on page 4 of the Manual, the following requirements will be observed, to wit:

Where trees two inches or more in diameter are found, the required blazes must not be omitted.

Bushes on or near the line should be bent at right angles therewith, and receive a blow of the axe at about the usual height of blazes from the ground sufficient to leave them in a bent position, but not to prevent their growth.

On *trial* or *random lines,* when it is necessary to lop bushes, they should be bent *in the direction of the line,* to prevent mistaking random for true lines.

17. BEARING TREES.

Where a tree not less than two and a half inches in diameter can be found for a bearing tree within 300 links of the corner, it should be preferred to the trench or pit. The *quadrangular trench* required on page 9 of the Manual as a substitute, where the requisite number of "bearing trees" is not found, is dispensed with, and a *pit* two feet square and not less than twelve inches deep is required in lieu thereof.

18. MODE OF CORRECTING BACK RANDOM LINES.

The manner of running random and true lines illustrated in the specimen field notes, marked "B," in the Manual, is hereby modified so as to conform to the directions on page 23; that is, the deputy, having run a random line, will correct back "by calculating a course that will run a true line back to the corner post from which the random started." For instance: instead of saying "west on a true line," &c., with an *altered* variation, say "north 89° 47′ west on a true line," &c., with *same* variation.

19. ABBREVIATIONS IN THE FIELD NOTES.

The following additional abbreviations are authorized to be used in the field notes, to wit:

For quarter section corner, use "¼ sec. cor.;" for variation, "va.;" for 14 inches long, 12 inches wide, and 3 inches thick, in describing a corner stone, use 14 x 12 x 3, being particular to always observe the same order of length, width, and thickness.

20. PRESCRIBED LIMITS FOR CLOSINGS AND LENGTH OF LINES IN CERTAIN CASES.

1. Every north-and-south section line, except those terminating in the north boundary of the township, must be *eighty chains* in length.

2. The east-and-west *section lines*, except those terminating in the west boundary of the township, are to be within *one hundred links* of the actual distance established on the south boundary line of the township for the width of said tier of sections.

3. The north boundary and south boundary of any one section, except in the extreme western tier, are to be within *one hundred links* of equal length.

4. The meanders within each fractional section, or between any two meander posts, or of a pond or island in the interior of a section, must close within one chain and fifty links.

5. In running *random* township exteriors, if such random lines fall short or overrun in length, or intersect the eastern or western boundary, as the case may be, of the township, at more than *three chains and fifty links* north or south of the true corner, the lines must be retraced, even if found necessary to remeasure the meridional boundaries of the township.

It will be particularly observed that no changes in regard to surveying operations are made by these instructions excepting those specially stated and authorized. In every other particular the Manual and existing instructions of the Commissioner remain in full force.

Very respectfully,

Your ob't servant,
J. M. Edmunds,
Commissioner.

XXXIV.

(This circular is copied from the original, Microcopy No. 27, National Archives. A copy was sent to all Surveyors General.)

CIRCULAR

Department of the Interior
General Land Office
July 28, 1866

Sir,

The experience of this office having demonstrated the desireableness of a change in the system adopted for the numbering of fractional lots of the public lands as illustrated in "Diagram B" accompanying the printed Manual of Surveying Instructions issued February 22, 1855, it has been decided to substitute in lieu thereof a more simple and less inconvenient system.

It is now proposed to employ but one continuous series of numbers in each section containing fractional lots, to embrace all lots made fractional by any cause, and not containing the recognized legal quantity of some legal subdivision; but those subdivisions in the exterior halves of sections in the north and west tiers of sections in a township, which contain eighty or forty acres, will not be numbered in the future preparation of plats. The printed instructions on pages 25 and 26 of the aforesaid Manual are hereby modified to that extent.

Accompanying this letter is a "Diagram B" illustrating the proposed change in numbering and which is designated in red ink on the same.

Where islands are situated in two or more sections the lots should be embraced in the series of numbers of the respective sections in which they are located. Islands situated wholly within a section may be numbered as one lot unless the area exceed 160 acres in which case they should be divided by extending the subdivisional lines across them and then numbered.

You are requested to acknowledge the receipt of this letter and cause these instructions to be carried out in your office.

I am Very Respectfully
Your Ob't Servant
J. M. Edmunds
Commissioner

(Ed. Note: This circular was sent to the Surveyors General of California, Oregon, Washington, Dakota, Minnesota, Kansas and Nebraska, New Mexico and Idaho. Copies were sent to Florida on June 22, 1869, and to Louisiana on December 3, 1878. A copy of Diagram "B" accompanied the circular.)

XXXV.

(This copy of Circular No. 22 is taken from the original, Microcopy No. 27, National Archives. A copy was sent to all Surveyors General.)

(CIRCULAR No. 22.)

Department of Interior,

General Land Office,

June 10, 1868.

As inquiries arise in regard to the Survey of Islands in Lakes or Rivers in Districts where the office of Surveyor General has been discontinued, the following is communicated as the proper mode of proceeding to have the same surveyed and obtain title:

1st. Islands may be surveyed at the expense of the party applying under the provisions of the Act of Congress approved 30th May, 1862, "to reduce the expenses of the Survey and Sale of the Public Lands of the United States," U. S. Statutes, vol. 12, p. 410, in the 10th Section of which it is declared: "That when the settlers in any Township or Townships, not mineral or reserved by Government, shall desire a survey made of the same under the authority of the Surveyor General of the United States, and shall file an application therefor in writing, and deposit in a proper United States Depository, to the credit of the United States, a sum sufficient to pay for such survey, together with all the expenses incident thereto, without cost or claim for indemnity on the United States, it shall and may be lawful for said Surveyor General, under such instructions as may be given him by the Commissioner of the General Land Office, and in accordance with existing laws and instructions, to survey such Township or Townships, and make return thereof to the General and proper local Land Office; provided the Townships so proposed to be surveyed are within the range of the regular progress of the public surveys embraced by existing standard lines or bases for the Township and subdivisional surveys."

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Application for the survey should be addressed to the Commissioner of the General Land Office, and be accompanied by the affidavits of at least two reliable and disinterested parties, showing that thirty days' notice had been given the coterminous proprietors of the intention to apply for the survey of such Island, stating the area, character, and situation of the Island in the Lake or River, with reference to the description of the Section, Township, and range of the public surveys, the same to be illustrated by a diagram. The width and depth of the channel, on either side between the Island and the main shore, should be shown, and it should be stated whether the configuration of either share of the mainland has materially changed since the original survey of the water front on the mainland.

2d. The applicant should designate some competent and reliable Surveyor, and send to this Office a statement from him, in writing, of the amount for which he is willing to execute the field work of the survey.

If, upon examination of the evidence filed in support of the application, the Island is deemed a proper subject of survey, the applicant will be notifid of the amount necessary to be deposited with a United States Depositary to the credit of the Treasurer of the United States on account of the Appropriation

_____

_____

_____

to defray the expense of the field work of the survey, and of a separate deposit on the account of the Appropriation _____

_____

for Clerk hire in the examination of the returns and the necessary protraction of plats.

Upon such deposits being made the United States Depositary is required to issue Certificates of Deposit in triplicate, one to be transmitted to this Office, upon the receipt of which, all the other requirements having been complied with, the Commissioner will issue the necessary instructions to the Surveyor to enable him to execute the field work of survey in accordance with the public land system.

3d. It is proper to state that the fact of having borne the expense of survey will give no priority of claim or right, under existing laws, to purchase the land, or

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in any manner affect the vested interest of any party thereto, should such exist, as the Island, when surveyed, will be subject to disposal according to the Laws of Congress and the Regulations of this Office relative to the disposal of lands embraced in fagmentary surveys.

Respectfully
Jos S. Wilson
Commissioner

XXXVI.

(This Circular is copied from the original, Microcopy No. 27, National Archives. A copy of it was sent to all Surveyors General.)

CIRCULAR.

Department of the Interior

GENERAL LAND OFFICE,

Washington, D. C., July 13, 1874.

As inquiries arise in regard to the survey of the beds of meandered lakes or other similar bodies of water in districts where the office of Surveyor General has been discontinued, the following is communicated as defining the conditions under which such lake beds are regarded as surveyable, and as giving the proper mode of proceeding to have the same surveyed and to obtain title thereto:

The beds of lakes, (not navigable,) sloughs, and ponds over which the lines of the public surveys were not extended at the date of the original survey, but which from the presence of water at the date of such survey were meandered, are held to be the property of the United States; and whenever, by evaporation or the operation of any other cause, natural or artificial, the waters of such lake, slough, or pond have so *permanently* receded or dried up as to leave within the unsurveyed area dry land fit, in ordinary seasons, for agricultural purposes, such dry land is subject to survey and sale under the general laws regulating the disposal of the public domain.

Such surveys will be ordered and, upon approval, disposition proceeded with in the following cases:

1st. Where the waters have so far permanently receded or disappeared as to permit, during the ordinary surveying season, (not on the ice,) the actual extension of the lines of survey, and the establishment and marking of corners in the manner required by law, over the whole area of the bed of such former lake.

2d. Where the waters have not generally disappeared, but where they have so far permanently receded as to leave a margin of dry land fit for cultivation between the original meandered lines and the remaining waters of sufficient area to admit of the survey and of the estabishment of at least three of the corners of a quarter-section.

3d. The Commissioner of the General Land Office will consider the question of ordering a survey of margins not admitting the laying off of one hundred and sixty acres, but not less than forty acres.

Parties desiring the survey of such lands may make application in writing to the Commissioner of the General Land Office therefor, stating the approximate area, and the situation of the tract with reference to the section, township, and range of the public surveys, the same to be illustrated by a diagram; the fact that the waters have disappeared in the manner or to the extent as specified in one of the three several above-specified cases—such statement to be accompanied with the affidavit of at least two credible and disinterested witnesses as to the disappearance of the waters, the probable quantity of land capable of being surveyed in the whole area lying between the original meandered line and the then margin of the waters, and showing what proportion of such area is fit for agricultural purposes. To insure prompt attention and decision by this Office, both the statement and affidavits required must be *full and specific.*

If, upon examination of such statement, diagram, and proof, it is found that such survey my be properly allowed, the parties applying will be so notified, and upon their designating to this Office the name and residence of some competent and reliable surveyor, together with a statement from him in writing of the amount for which he is willing to execute the field-work of the survey, and a certificate of some United States depositary that the amount specified has been deposited to the credit of the United States "on account of individual depositors," the Commissioner will then issue the necessary instructions to the surveyor to enable him to execute the field-work of survey in accordance with the public land system.

To correct what seems to be a very general misapprehension as to the manner in which persons may proceed to perfect title who have made actual settlement on lands of the character herein designated, and who claim or propose to claim under the pre-emption laws of the United States, it is remarked that in no event and at no stage of the proceedings can their declaratory statements be received or filed in this Office. Such declaratory statements must be filed in the local land office, and cannot be there received until after such survey has been made and the approved plat thereof filed in the local office.

It is proper to further state that the fact of having borne the expense of survey will give no priority of claim or right, under existing laws, to purchase the land, or in any manner affect the vested interest of any party thereto, should such exist, as the land, when surveyed, will be subject to disposal according to the laws of Congress and the regulations of this Office relative to the disposal of lands embraced in fragmentary surveys.

In case the lake bed is small and is so situated that no township, section, or quarter-section corners will need to be established by reason of such lake being situated within a given section or sections fully surveyed, no deposit will be required; and upon proof being furnished this Office as above of the disappearance of the water, the premises will be platted, and the land can then be disposed of under the existing laws.

Respectully,
S. S. BURDETT,
Commissioner

XXXVII.

(This Circular letter was copied from the original, Microcopy No. 27, National Archives. A copy was sent to all Surveyors General.)

CIRCULAR

Department of the Interior
General Land Office
Washington D.C. April 17, 1879

Sir:

Experience has shown that it is often necessary to order the suspension of plats of survey in the local land offices and frequently the cancellation of the survey. The filing of the triplicate plats of surveys in the local land offices, before the duplicates have been approved by this office, has frequently led to complications of title and individual hardship to persons making entries according to such surveys, in cases where it has been necessary to set aside or cancel them.

For these reasons you will not, after the receipt of this order, file the duplicate plats in the local land offices until the duplicates have been examined in this office and approved, and you officially notified to that effect.

Very respectfully
Your Obedient Servant
J. A. Williamson
Commissioner

XXXVIII.

(This Circular is copied from a printed copy of the original, Microcopy No. 27, National Archives. It was routinely sent in response to inquiries about subdividing sections.)

DEPARTMENT OF THE INTERIOR,

GENERAL LAND OFFICE,

November 1, 1879.

This Office being in receipt of many letters making inquiry in regard to the proper method of subdividing sections of the public lands and restoring lost corners of the public surveys, the following general rules have been prepared as a reply to such inquiries. The rules for subdivision are based upon the laws governing the survey of the public lands. There being no special law in regard to the re-establishment of lost corners, the rule given below is to be considered merely as an expression of the opinion of this Office on the subject. When cases arise which are not covered by these rules and the advice of this Office in the matter is desired, the letter of inquiry should, in every instance, contain a description of the particular tract or corner with reference to township, range, and section of the public surveys, to enable the Office to consult the record.

SUBDIVISION OF SECTIONS.

Under the provisions of the Act of Congress approved February 11, 1805, the course to be pursued in the subdivision of sections is to run straight lines from the established quarter-section corners—United States surveys—to the opposite corresponding corners, and the point of intersection of the lines so run will be the corner common to the several quarter-sections, or, in other words, the legal center of the section.

In the subdivision of fractional quarter-sections where no opposite corresponding corners have been or can be fixed, the subdivision lines should be ascertained by running from the established corners due north, south, east, or west lines, as the case may be, to the water-course, Indian boundary line, or other external boundary of such fractional section.

The law presupposes the section lines surveyed and marked in the field by the United States deputy surveyors to be due north and south or east and west lines, but in actual experience this is not always the case; hence, in order to carry out the spirit of the law, it will be necessary, in running the subdivisional lines through fractional sections, to adopt mean courses where the section lines are not due lines, or to run the subdivision line parallel to the section line when there is no opposite section line.

Upon the lines closing on the north and west boundaries of a township, the quarter-section corners are established by the United States deputy surveyors at precisely forty chains to the north or west of the last interior section corners, and the excess or deficiency in the measurement is thrown on the outer tier of lots, as per Act of Congress approved May 10, 1800.

In the subdivision of quarter-sections the quarter-quarter corners are to be placed at points equidistant between the section and quarter-section corners and between the quarter corners and the common center of the section, *except* on the last half mile of the lines closing on the north or west boundaries of a township, where they should be placed at twenty chains, proportionate measurement, to the north or west of the quarter-section corner.

The subdivision lines of fractional quarter-sections should be run from points on the section lines intermediate between the section and quarter-section corners due north, south, east, or west, to the lake, water-course, or reservation which renders such tracts fractional.

When there are double sets of section corners on township and range lines, the quarter corners for the sections south of the township lines and east of the range lines are not established in the field by the United Stated surveyors, but in subdividing such sections said quarter corners should be so placed as to suit the *calculations of the areas of the quarter-sections adjoining the township boundaries* as expressed upon the official plat, adopting proportionate measurements where the present measurements of the north or west boundaries of the sections differ from the original measurements.

RE-ESTABLISHMENT OF LOST CORNERS.

The original corners, when they can be found, must stand as the true corners they were intended to represent, even though not exactly where strict professional care might have placed them in the first instance.

Missing corners should be re-established in the identical localities they originally occupied. When the point cannot be determined by the existing landmarks in the field, resort must be had to the field notes of the original survey. The law provides that the lengths of the lines as stated in the field notes shall be considered as the true lengths thereof, and the distances between corners set down in the field notes constitute proper data from which to determine the true locality of a missing corner; hence the rule that all such should be restored at distances proportionate to the original measurements between existing original corners. That is, if the measurement between two existing corners differs from that stated in the field notes, the excess or deficiency should be distributed proportionately among the intervening section lines between the said existing corners standing in their original places. Missing corners on standard, township, and range lines should be restored by proportionate measurement between the nearest existing original corners on those lines. Missing section corners in the interior of townships should be re-established at proportionate distances between the nearest existing original corners *north* and *south* of the missing corners.

As has been observed, no existing original corner can be disturbed, and it will be plain that any excess or deficiency in measurements between existing corners cannot in any degree affect the distances beyond said existing corners, but must be added or subtracted proportionately to or from the intervals embraced between the corners which are still standing.

J. M. ARMSTRONG,
Acting Commissioner

(The 1881 Manual is copied from an original volume now in the possession of the BLM, Oregon State Office, Portland.)

INSTRUCTIONS OF THE COMMISSIONER OF THE GENERAL LAND OFFICE TO THE SURVEYORS GENERAL OF THE UNITED STATES RELATIVE TO THE SURVEY OF THE PUBLIC LANDS AND PRIVATE LAND CLAIMS.

MAY 3, 1881.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1881.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D.C., May 3, 1881.

GENTLEMEN: The following instructions, including full and minute directions for the execution of surveys in the field, are issued under the authority given me by sections 453, 456, 2398, and 2399 United States Revised Statutes, and must be strictly complied with by yourselves and your deputy surveyors.

Very respectfully,

J. A. WILLIAMSON,
Commissioner.

To SURVEYORS GENERAL OF THE UNITED STATES.

INTRODUCTORY.

The present system of survey of the public lands was inaugurated by a committee appointed by the Continental Congress, and consisting of the following delegates:

Hon. THOS. JEFFERSON, *Chairman* .....Virginia.
Hon. HUGH WILLIAMSON.....North Carolina.
Hon. DAVID HOWELL .....Rhode Island.
Hon. ELBRIDGE GERRY.....Massachusetts.
Hon. JACOB READ .....South Carolina.

On the 7th of May, 1784, this committee reported "An ordinance for ascertaining the mode of locating and disposing of lands in the western territory, and for other purposes therein mentioned." This ordinance required the public lands to be divided into "hundreds" of ten geographical miles square, and those again to be subdivided into lots of one mile square each, to be numbered from 1 to 100, commencing in the northwestern corner, and continuing from west to east and from east to west consecutively. This ordinance was considered, debated, and amended, and reported to Congress April 26, 1785, and required the surveyors "to divide the said territory into townships of 7 miles square, by lines running due north and south, and others crossing these at right angles. * * * The plats of the townships, respectively, shall be marked by subdivisions into sections of 1 mile square, or 640 acres, in the same direction as the external lines, and numbered from 1 to 49. * * * And these sections shall be subdivided into lots of 320 acres." This is the first record of the use of the terms "township" and "section."

May 3, 1785, on motion of Hon. William Grayson, of Virginia, seconded by Hon. James Monroe, of Virginia, the section respecting the extent of townships was amended by striking out the words "seven miles square" and substituting the words "six miles square " The record of these early sessions of Congress are not very full or complete; but it does not seem to have occurred to the members until the 6th of May, 1785, that a township six miles square could not contain 49 sections of 1 mile square. At that date a motion to amend was made, which provided, among other changes, that a township should contain 36 sections; and the amendment was *lost.* The ordinance as finally passed, however, on the 20th of May, 1785, provided for townships, 6 miles square, containing 36 sections of 1 mile square. The first public surveys were made under this ordinance. The townships, 6 miles square, were laid out in ranges, extending northward from the Ohio River, the townships being numbered from south to north, and the ranges from east to west. The region embraced by the surveys under this law forms a part of the present State of Ohio, and is usually styled "The Seven Ranges." In these initial surveys only the *exterior lines* of the townships were surveyed, but the plats were marked by subdivisions into sections of 1 mile square, and mile corners were established on the township lines. The sections were numbered from 1 to 36, commencing

with No. 1 in the southeast corner of the township, and running from *south to north* in each tier to No. 36 in the *northwest* corner of the township, as shown in the following diagram:

36	30	24	18	12	6
35	29	23	17	11	5
34	28	22	16	10	4
33	27	21	15	9	3
32	26	20	14	8	2
31	25	19	13	7	1

The surveys were made under the direction of the Geographer of the United States.

The act of Congress approved May 18, 1796, provided for the appointment of a surveyor-general, and directed the survey of the lands northwest of the Ohio River, and above the mouth of the Kentucky River, "in which the titles of the Indian tribes have been extinguished." Under this law *one-half* of the townships surveyed were subdivided into sections "by running through the same, each way, parallel lines at the end of every two miles, and by making a corner on each of said lines at the end of every mile," and it further provided that "the sections shall be numbered, respectively, beginning with the number one in the northeast section and proceeding west and east alternately, through the township, with progressive numbers till the thirty-sixth be completed." This method of numbering sections, as shown by the following diagram, is still in use:

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
30	29	28	27	26	25
31	32	33	34	35	36
31	25	19	13	7	1

The act of Congress approved May 10, 1800, required the "townships west of the Muskingum, which * * * are directed to be sold in quarter townships, to be subdivided into half sections of three hundred and twenty acres each, as nearly as may be, by running parallel lines through the same from east to west, and from south to north, at the distance of one mile from each other, and marking corners, at the distance of each half mile on the lines running from east to west, and at the distance of each mile on those running from south to north.* *

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* And the interior lines of townships intersected by the Muskingum, and of all the townships lying east of that river, which have not been heretofore actually subdivided into sections shall also be run and marked. * * * And in all cases where the exterior lines of the townships thus to be subdivided into sections or half sections shall exceed, or shall not extend, six miles, the excess or deficiency shall be specially noted, and added to or deducted from the western and northern ranges of sections or half sections in such township, according as the error may be in running the lines from east to west or from south to north."

The act of Congress approved February 11, 1805, directs the subdivision of the public lands into quarter sections, and provides that all the corners marked in the public surveys shall be established as the proper corners of sections or subdivisions of sections, which they were intended to designate, and that corners of half and quarter sections *not marked* shall be placed as nearly as possible "equidistant from those two corners which stand on the same line." This act further provides that "The boundary lines actually run and marked * * * shall be established as the proper boundary lines of the sections or subdivisions for which they were intended; and the length of such lines as returned by * * * the surveyors * * * shall be held and considered as the true length thereof, and the boundary lines which shall not have been actually run and marked as aforesaid shall be ascertained by running straight lines from the established corners to the opposite corresponding corners; but in those portions of the fractional townships, where no such opposite or corresponding corners have been or can be fixed, the said boundary line shall be ascertained by running from the established corners due north and south or east and west lines, as the case may be, to the * * * external boundary of such fractional township."

The act of Congress approved April 25, 1812, provided "That there shall be established in the Department of the Treasury an office to be denominated the General Land Office; the chief officer of which shall be called the Commissioner of the General Land Office, whose duty it shall be, under the direction of the head of the department, to superintend, execute, and perform all such acts and things touching or respecting the public lands of the United States, and other lands patented or granted by the United States, as have heretofore been directed by law to be done or performed in the office of the Secretary of State, of the Secretary and Register of the Treasury, and of the Secretary of War, or which shall hereafter by law be assigned to the said office."

The act of Congress approved April 24, 1820, provides for the sale of public lands in half quarter sections, and requires that "in every case of the division of a quarter section the line for the division thereof shall run north and south * * * and fractional sections, containing 160 acres and upwards, shall, in like manner, as nearly as practicable, be subdivided into half quarter sections, under such rules and regulations as may be prescribed by the Secretary of the Treasury; buy fractional sections containing less than 160 acres shall not be divided."

The act of Congress approved May 24, 1824, provides "That whenever, in the opinion of the President of the United States, a departure from the ordinary mode of surveying land on any river, lake, bayou, or watercourse would promote the public interest, he may direct the surveyor-general in whose district such land is situated, and where the change is intended to be made, under such rules and regulations as the President may prescribe, to cause the lands thus situated to be surveyed

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in tracts of two acres in width, fronting on any river, bayou, lake, or watercourse, and running back the depth of forty acres."* * *

The act of Congress approved May 29, 1830, provides for the fine and imprisonment of any person obstructing the survey of the public lands, and for the protection of surveyors, in the discharge of their official duties, by the United States marshal, with sufficient force, whenever necessary.

The act of Congress approved April 5, 1832, directed the subdivision of the public lands into quarter-quarters; that in every case of the division of a half-quarter section the dividing line should run east and west, and that fractional sections should be subdivided under rules and regulations prescribed by the Secretary of the Treasury. Under the latter provision the Secretary directed that fractional sections containing less than 160 acres, or the residuary portion of a fractional section, after the subdivision into as many quarter-quarter sections as it is susceptible of, may be subdivided into lots, each containing the quantity of a quarter-quarter section as nearly as practicable, by so laying down the line of subdivision that they shall be 20 chains wide, which distances are to be marked on the plat of subdivision, as are also the areas of the quarter-quarters and residuary fractions.

The two acts last above mentioned provided that the corners and contents of half-quarter and quarter-quarter sections should be ascertained, as nearly as possible, in the manner and on the principles directed and prescribed in the act of Congress approved February 11, 1805.

The act of Congress approved July 4, 1836, provided for the reorganization of the General Land Office, and that the executive duties of said office "shall be subject to the supervision and control of the Commissioner of the General Land Office under the direction of the President of the United States." The repealing clause is, "That such provisions of the act of the twenty-fifth of April, in the year one thousand eight hundred and twelve, entitled 'An act for the establishment of a General Land Office in the Department of the Treasury' and of all acts amendatory thereof, as are inconsistent with the provisions of this act, be, and the same are hereby, repealed."

From the wording of this act it would appear that the control of the General Land Office was removed from the Treasury Department, and that the Commissioner reported direct to the President, but, as a matter of fact, the Secretary of the Treasury still had supervisory control, for the act of Congress approved March 3, 1849, by which the Department of the Interior was established, provided "That the Secretary of the Interior shall perform all the duties in relation to the General Land Office, of supervision and appeal, now discharged by the Secretary of the Treasury * * *." By this act the General Land Office was transferred to the Department of the Interior, where it still remains.

In 1855 a manual of instructions to surveyors general was prepared, under the direction of the Commissioner of the General Land Office, by John M. Moore, then principal clerk of surveys, and the act of Congress approved May 30, 1862, provided "That the printed manual of instructions relating to the public surveys, prepared at the General Land Office, and bearing the date February twenty-second, eighteen hundred and fifty-five, the instructions of the Commissioner of the General Land Office, and the special instructions of the surveyor-general, when not in conflict with said printed manual or the instructions of said Commissioner, shall be taken and deemed to be a part of every contract for surveying the public lands of the United States."

The instructions contained in this volume are issued under the author-

ity given in the clause in said act providing that "The instructions of the Commissioner of the General Land Office * * * shall be taken and deemed to be a part of every contract for surveying the public lands of the United States."

The following comprise so much of the general laws relating to the survey of the public domain as it is deemed necessary to incorporate in this volume, reference being made by chapter and section to the codification of the Public Land Laws, prepared pursuant to acts of Congress approved March 3, 1879, and June 16, 1880, and by section number to the Revised Statutes of the United States.

[The remainder of page 9 and pages 10 through 17 deleted. These pages contain sections of the Revised Statutes pertaining to the public land surveys, and forms of contracts between Surveyors General and their Deputies.]

SYSTEM OF RECTANGULAR SURVEYING.

1. The public lands of the United States are ordinarily surveyed into rectangular tracts, bounded by lines conforming to the cardinal points.

2. The public lands shall be laid off, in the first place, into bodies of land of 24 miles square, as near as may be. This shall be done by the extension of standard lines from the principal meridian every 24 miles, and by the extension, from the base and standard lines, of auxiliary meridians every 24 miles. Thereafter they shall be laid off into bodies of land of 6 miles square, as near as may be, called *townships*, containing as near as may be 23,040 acres. The townships shall be subdivided into 36 tracts, called sections, each containing as near as may be 640 acres. Any number or series of contiguous townships, situate north or south of each other, constitute a *range*.

The law requires that the lines of the public surveys shall be governed by the true meridian, and that the townships shall be *six miles square*—two things involving in connection a mathematical impossibility—for, strictly to conform to the meridian, necessarily throws the township out of square, by reason of the convergency of meridians, and hence, by adhering to the true meridian, results the necessity of departing from the strict requirements of law, as respects the precise area of townships and the subdivisional parts thereof, the township assuming something of a trapezoidal form, which inequality develops itself more and more as such, the higher the latitude of the surveys. It is doubtless in view of these circumstances that the law provides (see section 2 of the act of May 18, 1796) that the sections of a mile square shall contain the quantity of 640 acres, *as nearly as may be*; and, moreover, provides (see section 3 of the act of May 10, 1800) in the following words: "And in all cases where the exterior lines of the townships, thus to be subdivided into sections or half sections, shall exceed, or shall not extend 6 miles, the excess or deficiency shall be specially noted, and added to or deducted from the western or northern ranges of sections or half sections in such township, according as the error may be in running the lines from east to west, or from south to north; the sections and half sections bounded on the northern and western lines of such townships shall be sold as containing only the quantity expressed in the returns and plats, respectively, and all others as containing the complete legal quantity."

The accompanying diagram, marked A, and the specimen field-notes pertaining to the same, will serve to illustrate the method of running lines to form tracts of land 24 miles square, as well as the method of running out the exterior lines of townships, and the order and mode of subdividing townships will be found illustrated in the accompanying specimen field-notes, conforming with the township diagram B. The method here presented is designed to insure as full a compliance with all the requirements, meaning, and intent of the surveying laws as, it is believed, is practicable.

The section lines are surveyed from *south* to north on true meridians, and from *east* to west, in order to throw the excesses or deficiencies in measurements on the north and west sides of the township, as required by law. In case where a

township has been partially surveyed, and it is necessary to complete the survey of the same, or where the character of the land is such that only the north or west portions of the township can be surveyed, this rule can not be strictly adhered to, but, in such cases, must be departed from only so far as is absolutely necessary. It will also be necessary to depart from this rule where surveys close upon

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State or Territorial boundaries, or upon surveys extending from different meridians.

3. The townships are to bear numbers in respect to the base line, either north or south of it; and the tiers of townships called "ranges" will bear numbers in respect to the meridian line according to their relative position to it, either on the east or west.

4. The thirty-six sections into which a township is subdivided are numbered, commencing with number one at the *northeast* angle of the township, and proceeding west to number six, and thence proceeding east to number twelve, and so on, alternately, until the number thirty-six in the southeast angle. In all cases of surveys of fractional townships, the sections should bear the same numbers as they would if the township was full.

5. Standard parallels shall be established at intervals of every 24 miles, north and south of the base line, and auxiliary meridians at intervals of every 24 miles, east and west of the principal meridian; the object being to confine the errors resulting from convergence of meridians, and inaccuracies in measurements, within the tracts of lands bounded by the lines so established.

6. The survey of all principal base and meridian, standard parallels, and auxiliary meridian, and township lines must be made with an instrument operating independently of the magnetic needle. Burt's *improved solar compass*, or other instrument of equal utility, must be used of necessity in such cases; and it is deemed best that such instrument should be used under all circumstances. Where the needle can be relied on, however, the ordinary compass may be used in subdividing and meandering. Whenever deputies use instruments with magnetic apparatus only, they must test the accuracy of their work and the condition of their instruments by at least three observations upon a circumpolar star, upon different days, between the commencement and the close of surveying operations in any given township. Deputies using instruments with solar apparatus are not required to make observations of the star Polaris, but they must test their instruments by taking the latitude daily, weather permitting, in running base, standard, meridian, and range lines, and upon three different days during the execution of subdivisional surveys in each township. They must make complete records in their field-notes, under proper dates, of the making of all observations in compliance with these instructions, showing the style and condition of the instrument in use, and the angle formed, by comparing the line run with the meridian as by observation determined.

7. The construction and adjustments of all surveying instruments used in the surveying of the public lands of the United States must be tested at least once a year, and oftener if necessary, by comparison with the true meridian, established under the direction of the surveyor general of the district; and the instruments must be so modified in construction, or in such a way corrected, as may be necessary to produce the closest possible approximation to accuracy and uniformity in the operation of all such instruments. A record will be made of such examinations, showing the number and style of the instrument, name of the maker, the quantity of instrumental error discovered by comparison, in either solar or magnetic apparatus, or both, and means taken for correction. The surveyor-general will allow no surveys to be made until the instruments to be used therefor have been approved by him.

8. The township lines and the subdivison lines will usually be measured by a two-pole chain of 33.03 feet in length, consisting of 50 links, and each link being 7 inches and ninety-two hundredths of an inch long.

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On uniform and level ground, however, the four-pole chain may be used. The measurements will, however, always be represented according to the four-pole chain of 100 links. The four-pole chains must be adjusted to lengths of 66.06 feet. The object in adding six-hundredths of a foot to the 66 feet of a four-pole chain is to assure thereby that 66 feet will be set off upon the earth's surface without the application of a greater strain than about 20 pounds by the chainmen, thus providing for loss by vertical curvature of the chain, and at the same time avoiding the uncertain results attending the application of strains taxing its elasticity. The deputy surveyor must provide himself with a measure of the standard chain kept at the office of the surveyor-general, to be used by him as a field standard. The chain in use must be compared and adjusted with this field standard each working day, and such field standard must be returned to the surveyor-general's office for examination when his work is completed.

OF TALLY PINS.

9. You will use eleven tally pins made of steel, not exceeding 14 inches in length, weighty enough toward the point to make them drop perpendicularly, and having a ring at the top, in which is to be fixed a piece of red cloth, or something else of conspicuous color, to make them readily seen when stuck in the ground.

PROCESS OF CHAINING.

10. In measuring lines with a two-pole chain, every *five* chains are called *"a tally;"* and in measuring lines with a four-pole chain, every *ten* chains are called *"a tally,"* because at that distance the last of the ten tally pins with which the forward chainman set out will have been stuck. He then cries "tally;" which cry is repeated by the other chainman, and each registers the distance by slipping a thimble, button, or ring of leather, or something of the kind, on a belt worn for that purpose, or by some other convenient method. The hind chainman then comes up, and having counted in the presence of his fellow the tally pins which he has taken up, so that both may be assured that none of the pins have been lost, he then takes the forward end of the chain, and proceeds to set the

pins. Thus the chainmen alternately change places, each setting the pins that he has taken up, so that one is forward in all the odd, and the other in all the even tallies. Such procedure, it is believed, tends to insure accuracy in measurement, facilitates the recollection of the distances to objects on the line, and renders a mis-tally almost impossible.

LEVELING THE CHAIN AND PLUMBING THE PINS.

11. The length of every line you run is to be ascertained by precise horizontal measurement, as nearly approximating to an air line as is possible in practice on the earth's surface. This all-important object can only be attained by a rigid adherence to the three following observances:

1. Ever keeping the chain *stretched* to its utmost degree of tension on even ground.

2. On uneven ground, keeping the chain not only stretched as aforesaid, but horizontally *leveled.* And when ascending and descending steep ground, hills, or mountains, the chain will have to be *shortened* to

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one-half its length (and sometimes more), in order accurately to obtain the true horizontal measure.

3. The careful plumbing of the tally pins, so as to attain precisely *the spot* where they should be stuck. The more uneven the surface, the greater the caution needed to set the pins.

MARKING LINES.

12. All lines on which are to be established the legal corner boundaries are to be marked after this method, viz: Those trees which may intercept your line must have two chops or notches cut on each side of them without any other marks whatever. These are called *"sight trees"* or *"line trees."* A sufficient number of other trees standing within 50 links of the line, on either side of it, are to *be blazed* on two sides diagonally, or quartering toward the line, in order to render the line conspicuous, and readily to be traced, the blazes to be opposite each other, coinciding in direction with the line where the trees stand very near it, and to approach nearer each other the farther the line passes from the blazed trees. Due care must ever be taken to have the lines so well marked as to be readily followed, and to cut the blazes deep enough to have recognizable scars as long as the trees stand.

Where trees 2 inches or more in diameter are found, the required blazes must not be omitted.

Bushes on or near the line should be bent at right angles therewith, and receive a blow of the ax at about the usual height of blazes from the ground sufficient to leave them in a bent position, but not to prevent their growth.

ON TRIAL, OR RANDOM LINES,

the trees are not to be blazed, unless occasionally, from indispensable necessity, and then it must be done so guardedly as to prevent the possibility of confounding the marks of the trial line with the *true.* But bushes and limbs of trees may be lopped, and *stakes set* on the trial or random line, at every *ten* chains, to enable the surveyor on his return to follow and correct the trial line and establish therefrom the *true line.* To prevent confusion, the temporary stakes set on the trial or random lines must be *pulled up* when the surveyor returns to establish the true line.

INSUPERABLE OBJECTS ON LINE— WITNESS POINTS.

13. Under circumstances where your course is obstructed by impassable obstacles, such as ponds, swamps, marshes, lakes, rivers, creeks, &c., you will prolong the line across such obstacles by taking the necessary right angle offsets; or, if such be inconvenient, by a traverse or trigonometrical operation, until you regain the line on the opposite side. And in case a north and south, or a true east and west, line is regained in advance of any such obstacle, you will prolong and mark the line back to the obstacle so passed, and state all the particulars in relation thereto in your field-book. And at the intersection of lines with both margins of impassable obstacles, you will establish a *witness point* (for the purpose of perpetuating the intersections therewith), by setting a post, and giving in your field-book the course and distance therefrom to two trees on opposite sides of the line, each of which trees you will mark with a blaze and notch facing the post; but on the margins of navigable water-courses, or navigable lakes, you will mark the trees with the proper number of the fractional section, township and range.

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The best marking tools adapted to the purpose must be provided for marking neatly and *distinctly* all the letters and figures required to be made at corners, *arabic* figures being used exclusively; and the deputy is always to have at hand the necessary implements for keeping his marking irons in order.

ESTABLISHING CORNERS.

To procure the faithful execution of this portion of a surveyor's duty is a matter of the utmost importance. After a true coursing and most exact measurements the establishment of corners is the consummation of the work. If, therefore, the corner be not perpetuated in a permanent and workmanlike manner the *great aim* of the surveying service will not have been attained.

The following are the different points for perpetuating corners, viz:

1. For township boundaries, at intervals of every 6 miles.

2. For section boundaries, at intervals of every mile, or 80 chains.

3. For quarter-section boundaries, at intervals of every half mile, or 40 chains. Exceptions, however, occur as fully set forth hereafter in that portion of the manual showing the manner of running township lines and method of subdividing.

4. Meander corners are established at all those points where the lines of the public surveys intersect the banks of

such rivers, bayous, lakes, or islands as are by law directed to be meandered.

DESCRIPTION OF CORNERS.

The following is the form and language to be used by deputy surveyors in describing the establishment of corners in their field-notes, and their work in the field must strictly comply with the same.

STANDARD TOWNSHIP CORNERS.

SEC. 1. [1]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground, for Standard Cor. to (e.g.) Tps. 5 N., R's 2 & 3 W., marked S. C. with 6 notches on N., E. & W. edges, dug pits 24 x 18 x 12 ins. crosswise on each line, N., E. & W. of stone 6 ft. dist. and raised a mound of earth, 2½ ft. high, 5 ft. base alongside.

SEC. 2. [2]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground, for Standard Cor. to (e.g.) Tps. 5 N., R's 2 & 3 W., marked S. C., with 6 notches on N., E. & W. edges, and raised a mound of stone alongside. Pits impracticable.

SEC. 3. [3]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground, for Standard Cor. to (e.g.) Tps. 5 N., R's 2 & 3 W., marked S. C., with 6 notches on N., E. & W. edges, from which

A _____, _____ ins. diam. bears N _____° E. _____ lks., dist. marked T. 5 N. R. 2 W. S. 31, B. T.

A _____, _____ ins. diam., bears N. _____° W. _____ lks., dist. marked T. 5 N. R. 3 W. S. 36, B. T.

A _____, _____ ins. diam., bears S _____° W. _____ lks. dist. marked T. 4 N. R. 3 W. S. 1, B. T.

SEC. 4. [4]Set a post, 4½ ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for Standard Cor. to (e.g.) Tps. 5 N., R's 2 & 3 W., marked S. C. T. 5 N. on N.

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R. 2 W. S. 31, on E. and

R. 3 W. S. 36 on W. faces, with 6 notches on N., E. & W. faces, dug pits, 24 x 18 x 12 ins. crosswise on each line, N., E. & W. of post, 6 ft. dist. and raised a mound of earth 2½ ft. high, 5 ft. base, around post.

SEC. 5. [5]Set a post, 4½ ft. long, 4 ins. square, 24 ins. in the ground, for Standard Cor. to (e.g.) Tps. 5 N., R's 2 & 3 W. marked

S. C. T. 5 N. on N.

R. 2 W. S. 31, on E. and

R. 3 W. S. 36 on W. faces, with 6 notches on N., E. & W. faces; from which

A _____, _____ ins. diam., bears N _____° E. _____ lks., dist. marked T. 5 N. R. 2 W. S. 31, B. T.

A _____, _____ ins., diam., bears N _____° W. _____ lks., dist. marked T. 5 N. R. 3 W. S. 36, B. T.

A _____, _____ ins. diam., bears S _____° W. _____ lks., dist. maeked T. 4 N. R. 3 W. S.1, B. T.

SEC. 6. [6]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Standard Cor. to (e.g.) Tps. 5 N., R's 2 & 3 W., dug pits. 24 x 18 x 12 ins. crosswise on each line, N., E. & W. of cor., 6 ft. dist. and raised a mound of earth 2½ feet high, 5 ft. base, over it. In E. pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked

S. C. T. 5 N. on N.

R. 2 W. S. 31, on E. and

R. 3 W. S. 36 on W. faces, with 6 notches on N., E. & W. faces.[6]

SEC. 7. [7]A _____, _____ ins. diam., which I marked (e.g.)

S. C. T. 5 N. on N.

R. 2 W. S. 31, on E. and

R. 3 W. S. 36 on W. faces, with 6 notches on N., E. & W. faces, dug pits 24 x 18 x 12 ins. crosswise on each line, N., E. & W. of tree 6 ft. dist., and raised a mound of earth around tree, for Standard Cor. to Tps. 5 N., R's 2 & 3 W.

SEC. 8. [8]A _____, _____ ins. diam., which I marked (e.g.)

T. 5 N. S. C. on N.

R. 2 W. S. 31, on E. and

R. 3 W. S. 36 on W. faces, with 6 notches on N., E. & W. faces, for Standard Cor. to Tps. 5 N., R's 2 & 3 W.; from which

A _____, _____ ins. diam., bears N _____° E. _____ lks. dist. marked T. 5 N. R. 2 W. S. 31, B. T.

A _____, _____ ins. diam., bears N _____° W. _____ lks. dist. marked T. 5 N. R. 3 W., S. 36, B. T.

A _____, _____ ins. diam., bears S _____° W. _____ lks. dist., marked T. 4 N. R. 3 W. S. 1, B. T.

CLOSING TOWNSHIP CORNERS.

SEC. 1. [1]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground for Closing Cor. to (e.g.) Tps. 4 N., R's 2 & 3 W., marked C. C. with 6 notches on S. E. & W. edges, dug pits, 24 x 18 x 12 ins., crosswise on each line, S., E. & W. of stone, 6 ft. dist., and raised a mound of earth, 2½ ft. high, 5 ft. base alongside.

SEC. 2. [2]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground for Closing Cor. to (e.g.) Tps. 4 N., R's 2 & 3 W., marked C. C. with 6 notches on S. E. and W. edges, and raised a mound of stone alongside. Pits impracticable.

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SEC. 3. [3]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground for Closing Cor. to (e.g.) Tps. 4 N., R's 2 & 3 W., marked C. C. with 6 notches on S., E., & W. edges; from which

A _____, _____ ins. diam. bears S _____° E. _____ lks. dist. marked T. 4 N. R. 2 W. S. 6, B. T.

A _____, _____ ins. diam. bears S _____° W. _____ lks. dist. marked T. 4 N. R. 3 W. S. 1, B. T.

A _____, _____ ins. diam. bears N _____° W. _____ lks. dist. marked T. 5 N. R. 2 W. S. 31, B. T.

SEC. 4. [4]Set a post, 4½ ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground for Closing Cor. to (e.g.) Tps. 4 N., R's 2 & 3 W., marked

1. Stone with Pits and Mound.
2. Stone with Mound of Stone.
3. Stone with Bearing Trees.
4. Post in Mound.
5. Post with Bearing Trees.
6. Mound without Post or Stone.
7. Tree Corner without Bearing Trees.
8. Tree Corner with Bearing Trees.

C. C. T. 4 N. on S.
R. 2 W. S. 6, on E. and
R. 3 W. S. 1 on W. faces, with 6 notches on S., E., & W. faces, dug pits 24 x 18 x 12 ins., crosswise on each line, S., E., & W. of post, 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base, around post.

SEC. 5. [5]Set a post, 4½ ft. long, 4 ins. square, 24 ins. in the ground, for Closing Cor. to (e.g.) Tps. 4 N., R's 2 & 3 W., marked
C. C. T. 4 N. on S.
R. 2 W. S. 6, on E. and
R. 3 W. S. 1 on W. faces, with 6 notches on S., E. & W. faces; from which
A _____, _____ ins. diam. bears S _____° E. _____ lks. dist. marked T. 4 N. R. 2 W. S. 6, B. T.
A _____, _____ ins. diam. bears S _____° W. _____ lks dist. marked T. 4 N. R. 3 W. S. 1, B. T.
A _____, _____ ins. diam. bears N _____° W. _____ lks. dist. marked T. 5 N. R. 2 W. S. 31, B. T.

SEC. 6. [6]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Closing Cor. to (e.g.) Tps. 4 N., R's 2 & 3 W., dug pits 24 x 18 x 12 ins. crosswise on each line, S., E., & W. of corner, 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base, over it. In E. pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked
C. C. T. 4 N. on S.
R. 2 W. S. 6, on E. and
R. 3 W. S. 1 on W. faces, with 6 notches on S., E. & W. faces.

SEC. 7. [7]A _____, _____ ins. diam., which I marked (e.g.)
C. C. T. 4 N. on S.
R. 2 W. S. 6, on E. and
R. 3 W. S. 1 on W. faces, with 6 notches on S., E. & W. faces, dug pits 24 x 18 x 12 ins. crosswise on each line S. E. & W. of tree, 6 ft. dist. and raised a mound of earth around tree, for Closing Cor. to Tps. 4 N. R's 2 & 3, W.

SEC. 8. [8]A _____, _____ ins. diam., which I marked (e.g.)
C. C. T. 4 N. on S.
R. 2 W. S. 6, on E. and
R. 3 W. S. 1 on W. faces, with 6 notches on S., E. & W. faces for Closing Cor. to Tps. 4 N., R's 2 & 3 W.; from which
A _____, _____ ins. diam. bears S _____° E. _____ lks. dist. marked T. 4 N. R. 2 W. S. 6, B. T.
A _____, _____ ins. diam. bears S _____° W. _____ lks. dist. marked T. 4 N. R. 3 W. S. 1, B. T.
A _____, _____ ins. diam. bears N _____° W. _____ lks. dist. marked T. 5 N. R. 2 W. S. 31, B. T.

SEC. 9. All Closing Township Corners must be connected with the nearest corner on the Standard line.

STANDARD SECTION CORNERS.

SEC. 1 . [1]Set a _____ stone _____ x _____ x ins., in the ground, for Standard Cor. to (e.g.) Secs. 35 & 36, marked S. C., with 1 notch on E. and 5 notches on W. edges, dug pits, 18 x 18 x 12 ins., N., E. & W. of stone, 5½ ft. dist., and raised a mound of earth, 2 ft. high, 4½ ft. base alongside.

SEC. 2. [2]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Standard Cor. to (e.g.) Secs. 33 & 34, marked S. C., with 3 notches on E. & W. edges, and raised a mound of stone alongside. Pits impracticable.

SEC. 3. [3]Set a stone _____ x _____ x _____ ins., _____ ins. in the ground, for Standard Cor. 5o (e.g.) Sec. 35 & 36, marked S. C., with 1 notch on E and 5 notches on W. edges; from which
A _____, _____ ins. diam. bears N _____° E. _____ lks. dist. marked T. 5 N. R. 3 W. S. 36, B. T.
A _____, _____ ins. diam. bears N _____° W. _____ lks. dist. marked T. 5 N. R. 3 W. S. 35, B. T.
A _____, _____ ins. diam. bears S _____° E. _____ lks. dist. marked T. 4 N. R. 3 W. S. 2, B. T.

SEC. 4. [4]Set a post, 4 ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Standard Cor. to (e.g.) Secs. 35 & 36, marked
S. C. T. 5 N. R. 3 W., on N.
S. 36, on E. and
S. 35 on W. faces, with 1 notch on E. and 5 notches on W. faces, dug pits, 18 x 18 x 12 ins., N., E. and W. of post, 5½ ft. dist. and raised a mound of earth 2 ft. high, 4½ ft. base round post.

SEC. 5. [5]Set a post 4 ft. long, 4 ins. square, 24 ins. in the ground, for Standard Cor. to (e.g.) Secs. 35 & 36, marked
S. C. T. 5 N. R. 3 W., on N.
S. 36, on E. and
S. 35 on W. faces, with 1 notch on E. and 5 notches on W. faces; from which
A _____, _____ ins. diam. bears N _____° E. _____ lks. dist. marked T. 5 N. R. 3 W. S . 36, B. T.
A _____, _____ ins. diam. bears N _____° W. _____ lks. dist. marked T. 5 N. R. 3 W. S. 35, B. T.
A _____, _____ ins. diam. bears S _____° E. _____ lks. dist. marked T. 4 N. R. 3 W. S. 2, B. T.

SEC. 6. [6]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Standard Cor. to (e.g.) Secs. 33 & 34, dug pits, 18 x 18 x 12 ins., N., E. and W. of corner, 5½ ft. dist., and raised a mound of earth 2 ft. high, 4¼ ft. base over it. In E. pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked
T. 5 N. R. 3 W., S. C. on N.
S. 34 on E. and
S. 33 on W. faces, with 3 notches on E. & W. faces.

SEC. 7. [7]A _____, _____ ins, diam., which I marked (e.g.)
S. C. T. 5 N. R. 3 W., on N.
S. 36, on E. and
S. 35 on W. faces, with 1 notch on E. and 5 notches on W. faces,

dug pits, 18 x 18 x 12 ins. N., E. & W. of tree, 5½ ft. dist. and

1. Stone with Pits and Mound.
2. Stone with Mound of Stone.
3. Stone with Bearing Trees.
4. Post in Mound.
5. Post with Bearing Trees.
6. Mound without Post or Stone.
7. Tree Corner without Bearing Trees.
8. Tree Corner with Bearing Trees.

raised a mound of earth around tree, for Standard Cor. to Secs. 35 & 36.

SEC. 8. [8]A _____, _____ ins. diam., which I marked (e.g.)

S. C. T. 5 N. R. 3 W., on N.

S. 36, on E. and

S. 35 on W. faces, with 1 notch on E. and 5 notches on W. faces, for Standard Cor. to Secs. 35 & 36; from which

A _____, _____ ins. diam. bears N _____° E. _____ lks dist. marked T. 5 N. R. 3 W. S. 36, B. T.

A _____, _____ ins. diam. bears N _____° W. _____ lks. dist. marked T. 5 N. R. 3 W. S. 35, B. T.

A _____, _____ ins. diam. bears S _____° E. _____ lks. dist. marked T. 4 N. R. 3 W. S. 2, B. T.

SECTION CLOSING CORNERS.

SEC. 1. [1]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Closing Cor. to (e.g.) Secs. 1 & 2, marked C. C., with 1 notch on E. and 5 notches on W. edges, dug pits, 18 x 18 x 12 ins. S., E. & W. of stone, 5½ feet dist., and raised a mound of earth 2 ft. high, 4½ ft. base alongside.

SEC. 2. [2]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Closing Cor. to (e.g.) Secs. 3 & 4, marked C. C., with 3 notches on E. and W. edges, & raised, a mound of stone alongside. Pits impracticable.

SEC. 3. [3]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground, for Closing Cor. to (e.g.) Secs. 1 & 2, marked C. C., with 1 notch on E. and 5 notches on W. edges; from which

A _____, _____ ins. diam. bears S _____° E. _____ lks. dist. marked T. 4 N. R. 3 W. S. 1, B. T.

A _____, _____ ins. diam. bears S _____° W. _____ lks. dist. marked T. 4 N. R. 3 W. S. 2, B. T.

A _____, _____ ins. diam. bears N _____° E. _____ lks. dist. marked T. 5 N. R. 3 W. S. 36, B. T.

SEC. 4. [4]Set a post 4 ft. long, 4 ins. square, with marked stone, (charred stake or quart of charcoal) 12 ins. in the ground for Closing Cor. to (e.g.) Secs. 1 & 2, marked

C. C. T. 4 N. R. 3 W., on S.

S. 1, on E. and

S. 2 on W. faces, with 1 notch on E. and 5 notches on W. faces, dug pits, 18 x 18 x 12 ins., S., E. & W. of post 5½ ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base around post.

SEC. 5. [5]Set a post 4 ft. long, 4 ins. square, 24 ins. in the ground, for Closing Cor. to (e.g.) Secs. 1 & 2, marked

C. C. T. 4 N. R. 3 W., on S.

S. 1, on E. and

S. 2 on W. faces, with 1 notch on E. and 5 notches on W. faces; from which

A _____, _____ ins. diam. bears S _____° E. _____ lks. dist. marked T. 4 N. R. 3, W. S. 1, B. T.

A _____, _____ ins. diam. bears S _____° W. _____ lks. dist. marked T. 4 N. R. 3 W. S. 2, B. T.

A _____, _____ ins. diam. bears N _____° E. _____ lks. dist. marked T. 5 N. R. 3 W. S. 36, B. T.

SEC. 6. [6]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Closing Cor. to (e.g.) Secs. 3 & 4, dug pits, 18 x 18 x 12 ins., S., E. & W. of Cor., 5½

ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base over it. In E. pit drove a stake, 2 ins. square, 2 ft. long, 12 ins. in the ground, marked

C. C. T. 4 N. R. 3 W., on S.

S. 3, on E. and

S. 4 on W. faces, with 3 notches on E. & W. faces.

SEC. 7 [7]A _____, _____ ins. diam., which I marked (e.g.)

C. C. T. 4 N. R. 3 W., on S.

S. 1, on E. and

S. 2 on W. faces, with 1 notch on E. and 5 notches on W. faces, dug pits 18 x 18 x 12 ins. S., E. & W. of tree, 5½ ft. dist., and raised a mound of earth around tree, for closing Cor. to Secs. 1 & 2.

SEC. 8. [8]A _____, _____ ins. diam., which I marked (e.g.)

C. C. T. 4 N. R. 3 W., on S.

S. 1, on E. and

S. 2 on W. faces, with one notch on E. and 5 notches on W. faces, for Closing Cor. to Secs. 1 & 2; from which

A _____, _____ ins. diam. bears S _____° E. _____ lks. dist. marked T. 4 N. R. 3 W. S. 1, B. T.

A _____, _____ ins. diam. bears S _____° W. _____ lks. dist. marked T. 4 N. R. 3 W. S. 2, B. T.

A _____, _____ ins. diam. bears N _____° E. _____ lks. dist. marked T. 5 N. R. 3 W. S. 36, B. T.

SEC. 9. [9]All Section Closing Corners must be connected with the nearest corner on the Standard line.

CORNERS COMMON TO 4 TOWNSHIPS.

SEC. 1. [1]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground for Cor. to (e.g.) Tps. 2 & 3 N. R's 2 & 3 W., marked with 6 notches on each edge, dug pits, 24 x 18 x 12 ins. lengthwise on each line, N., S., E. & W. of stone, 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base alongside.

SEC. 2. [2]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Cor. to (e.g.) Tps. 2 & 3 N. R's 2 & 3 W. marked with 6 notches on each edge, and raised a mound of stone alongside. Pits impracticable.

SEC. 3. [3]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Cor. to (e.g.) Tps. 2 & 3 N. R. 2 & 3 W. marked with 6 notches on each edge; from which

A _____, _____ ins. diam. bears N _____° E. _____ lks. dist. marked T. 3 N. R. 2 W. S. 31, B. T.

A _____, _____ ins. diam. bears S _____° E. _____ lks. dist. marked T. 2 N. R. 2 W. S. 6, B. T.

A _____, _____ ins. diam. bears S _____° W. _____ lks. dist. marked T. 2 N. R. 3 W. S. 1, B. T.

A _____, _____ ins. diam. bears N _____° W. _____ lks. dist. marked T. 3 N. R. 3 W. S. 36, B. T.

SEC. 4. [4]Set a post, 4½ ft. long, 4 ins. square, with marked

1. Stone with Pits and Mound.
2. Stone with Mound of Stone.
3. Stone with Bearing Trees.
4. Post in Mound.
5. Post with Bearing Trees.
6. Mound without Post or Stone.
7. Tree Corner without Bearing Trees.
8. Tree Corner with Bearing Trees.
9. Connection Lines.

stone (charred stake or quart of charcoal) 12 ins. in the ground, for Cor. to (e.g.) Tps. 2 & 3 N. R's 2 & 3 W. marked
T. 3 N. S. 31, on N. E.
R. 2 W. S. 6, on S. E.
T. 2 N. S. 1, on S. W. and
R. 3 W. S. 36 on N. W. faces, with 6 notches on each edge, dug pits,

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24 x 18 x 12 ins., lengthwise on each line, N., S., E. & W. of post, 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base around post.

SEC. 5. [5]Set a post 4½ ft. long, 4 ins. square, 24 ins. in the ground, for Cor. to (e.g.) Tps. 2 & 3 N. R's 2 & 3 W. marked
T. 3 N. S. 31, on N. E.
R. 2 W. S. 6, on S. E.
T. 2 N. S. 1, on S. W. and
R. 3 W. S. 36 on N. W. faces, with 6 notches on each edge; from which
A _____, _____ ins. diam. bears N _____° E. _____ lks. dist. marked T. 3 N. R. 2 W. S. 31, B. T.
A _____, _____ ins. diam. bears S _____° E. _____ lks. dist. marked T. 2 N. R. 2 W. S. 6, B. T.
A _____, _____ ins. diam. bears S _____° W. _____ lks. dist. marked T. 2 N. R. 3 W. S. 1, B. T.
A _____, _____ ins. diam. bears N _____° W. _____ lks. dist. marked T. 3 N. R. 3 W. S. 36, B. T.

SEC. 6. [6]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground for Cor. to (e.g.) Tps. 2 & 3 N. R's 2 & 3 W., dug pits, 24 x 18 x 12 ins., lengthwise on each line, N., S., E. & W. of cor., 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base over it. In S. E. pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked
T. 3 N. S. 31, on N. E.
R. 2 W. S. 6, on S. E.
T. 2 N. S. 1 on S. W. and
R. 3 W. S. 36, on N. W. faces, with 6 notches on each edge.

SEC. 7. [7]A _____, _____ ins. diam., which I marked (e.g.)
T. 3 N. S. 31, on N. E.
R. 2 W. S. 6, on S. E.
T. 2 N. S. 1, on S. W. and
R. 3 W. S. 36 on N. W. faces, with 6 notches on each edge, dug pits, 24 x 18 x 12 ins. lengthwise on each line, N., S., E. & W. of tree, 6 ft. dist., and raised a mound of earth around tree, for Cor. to Tps. 2 & 3 N. R's 2 & 3 W.

SEC. 8. [8]A _____, _____ ins. diam., which I marked (e.g.)
T. 3 N. S. 31, on N. E.
R. 2 W. S. 6, on S. E.
T. 2 N. S. 1, on S. W. and
R. 3 W. S. 36, on N. W. faces, with 6 notches on each edge, for Cor. to Tps. 2 & 3 N. R's 2 & 3 W. from which
A _____ _____ ins. diam. bears N _____° E. _____ lks. dist. marked T. 3 N. R. 2 W. S. 31, B. T.
A _____, _____ ins. diam. bears S. _____° E. _____ lks. dist. marked T. 2 N. R. 2 W. S. 6, B. T.
A _____, _____ ins. diam. bears S. _____° W. _____ lks. dist. marked T. 2 N. R. 3 W. S. 1, B. T.
A _____, _____ ins. diam. bears N _____° W. _____ lks. dist. marked T. 3 N. R. 3 W. S. 36, B. T.

CORNERS COMMON TO 4 SECTIONS.

SEC. 1. [1]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground for Cor. to (e.g.) Secs. 25, 26, 35 & 36, marked with 1 notch on S. & E. edges, dug pits, 18 x 18 x 12 ins. in each Sec., 5½ ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base alongside.

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SEC. 2. [2]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground, for Cor. to (e.g.) Secs. 14, 15, 22 & 23, marked with 3 notches on S. and 2 notches on E. edges, and raised a mound of stone alongside. Pits impracticable.

SEC. 3. [3]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground, for Cor. to (e.g.) Secs. 9, 10, 15 & 16, marked with 4 notches on S. & 3 notches on E. edges, from which
A _____, _____ ins. diam. bears N _____° E. _____ lks. dist. marked T. 2 N. R. 2 W. S. 10, B. T.
A _____, _____ ins. diam. bears S _____° E. _____ lks. dist. marked T. 2 N. R. 2 W. S. 15, B. T.
A _____, _____ ins. diam. bears S _____° W. _____ lks. dist. marked T. 2 N. R. 2 W. S. 16, B. T.
A _____, _____ ins. diam. bears N. _____° W. _____ lks. dist. marked T. 2 N. R. 2 W. S. 9, B. T.

SEC. 4. [4]Set a post 4 ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Cor. to (e.g.) Secs, 15, 16, 21 & 22, marked
T. 2 N. S. 15, on N. E.
R. 2 W. S. 22, on S. E.
S. 21, on S. W. and
S. 16 on N. W. faces, with 3 notches on S. & E. edges, dug pits, 18 x 18 x 12 ins. in each Sec., 5½ ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base around post.

SEC. 5. [5]Set a post 4 ft. long, 4 ins. square, 24 ins. in the ground, for Cor. to (e.g.) Secs. 25, 26, 35 & 36, marked
T. 2 N. S. 25, on N. E.
R. 2 W. S. 36, on S. E.
S. 35, on S. W. and
S. 26, on N. W. faces, with 1 notch on S. & E. edges; from which
A _____, _____ ins. diam. bears N _____° E. _____ lks. dist. marked T. 2 N. R. 2 W. S. 25, B. T.
A _____, _____ ins. diam. bears S _____° E. _____ lks. dist. marked T. 2 N. R. 2 W. S. 36, B. T.
A _____, _____ ins. diam. bears S _____° W. _____ lks. dist. marked T. 2 N. R. 2 W. S. 35, B. T.
A _____, _____ ins. diam. bears N _____° W. _____ lks. dist. marked T. 2 N. R. 2 W. S. 26, B. T.

SEC. 6. [6]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Cor. to (e.g.) Secs. 25, 26, 35 & 36, dug pits, 18 x 18 x 12 ins. in each Sec., 5½ ft. dist.,

1. Stone with Pits and Mound.
2. Stone with Mound of Stone.
3. Stone with Bearing Trees.
4. Post in Mound.
5. Post with Bearing Trees.
6. Mound without Post or Stone.
7. Tree Corner without Bearing Trees.
8. Tree Corner with Bearing Trees.

and raised a mound of earth 2 ft. high, 4½ ft. base over it.

In S. E. pit drove a stake 2 ins. square, 2 ft. long, 12 ins in the ground, marked

T. 2 N. S. 25, on N. E.

R. 2 W. S. 36, on S. E.

S. 35, on S. W. and

S. 26 on N. W. faces, with 1 notch on S. & E. edges.

SEC. 7. [7]A _____, _____ ins. diam., which I marked (e.g.)

T. 2 N. S. 29, on N. E.

R. 2 W. S. 32, on S. E.

S. 31, on S. W. and

S. 30, on N. W. faces, with 1 notch on S. and 5 notches on E. edges, dug pits, 18 x 18 x 12 ins. in each sec. 5½ ft. dist. and raised a mound of earth around tree, for Cor. to Secs. 29, 30, 31 & 32.

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SEC. 8. [8]A _____, _____ ins. diam., which I marked (e.g.)

T. 2 N. S. 5, on N. E.

R. 2 W. S. 8, on S. E.

S. 7, on S. W. and

S. 6 on N. W. faces, with 5 notches on S. & E, edges, for Cor. to Secs. 5, 6, 7 & 8; from which

A _____, _____ ins. diam. bears N _____° E. _____ lks. dist. marked T. 2 N. R. 2 W. S. 5, B. T.

A _____, _____ ins. diam. bears S _____° E. _____ lks. dist. marked T. 2 N. R. 2 W. S. 8, B. T.

A _____, _____ ins. diam. bears S _____° W. _____ lks. dist. marked T. 2 N. R. 2 W. S. 7, B. T.

A _____, _____ ins. diam. bears N _____° W. _____ lks. dist. marked T. 2 N. R. 2 W. S. 6, B. T.

ARTICLE X.

QUARTER SECTION CORNERS.

SEC. 1. [1]Set a _____ stone _____ x _____ x _____ ins., _____ ins, in the ground, for ¼ Sec. Cor., marked ¼ on N. (or W.) face, dug pits,18 x 18 x 12 ins., N. & S., (or E. & W.) of stone 5½ ft. dist., and raised a mound of earth 1½ ft. high, 3½ base alongside.

SEC. 2. [2]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for ¼ Sec. Cor., marked ¼ on N. (or W.) face, and raised a mound of stone alongside. Pits impracticable.

SEC. 3. [3]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for ¼ Sec. Cor. marked ¼ on N. (or W.) face; from which

A _____, _____ ins. diam. bears N _____° E. _____ lks. dist. marked ¼ S. B. T.

A _____, _____ ins. diam. bears S _____° W. _____ lks. dist. marked ¼ S. B. T.

SEC. 4. [4]Set a post 3 ft. long, 3 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for ¼ Sec Cor., marked ¼ S. on N. (or W.) face, dug pits, 18 x 18 x 12 ins., N. & S., (or E. and W.) of post 5½ ft. dist., and raised a mound of earth 1½ ft. high, 3½ ft. base around post.

SEC. 5. [5]Set a post 3 ft. long, 3 ins. square, 24 ins. in the ground, for ¼ Sec. Cor., marked ¼ S. on N. (or W.) face; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks., dist. marked ¼ S. B. T.

A _____, _____ ins. diam., bears S _____° W., _____ lks., dist. marked ¼ S. B. T.

SEC. 6. [6]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for ¼ Sec. Cor., dug pits, 18 x 18 x 12 ins., N. & S., (or E. & W.) of post 5½ ft. dist. and raised a mound of earth 1½ ft. high, 3½ ft. base over it. In E. (or N.) pit drove a stake 2 ft. long, 2 ins. square, 12 ins. in the ground, marked ¼ S. on N. (or W.) face.

SEC 7. [7]A _____, _____ ins. diam., which I marked ¼ S. on N. (or W.) face, for ¼ Sec. Cor., dug pits, 18 x 18 x 12 ins. N. & S. (or E. & W.) of tree, 5½ ft. dist. and raised a mound of earth around tree.

SEC. 8. [8]A _____, _____ ins. diam., which I mark ¼ S. on N. (or W.) face, for ¼ Sec Cor.; from which

A _____, _____ ins. diam. bears N _____° E. _____ lks. dist. marked ¼ S. B. T.

A _____, _____ ins. diam. bears S _____° W. _____ lks. dist. marked ¼ S. B. T.

SEC. 9. [10]On N. and S. lines the marks must be made on W. side, and on E. and W. lines on N. side of the stone, post or tree.

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SEC. 10. [11]On N. & S. lines, the pits must be dug N. & S. of Cor. and on E. & W. lines, E. & W. of Cor.

SEC. 11. [12]On N. & S. lines, the stakes must be driven in N. pit, and on E. & W. lines, E. pit.

STANDARD QUARTER SECTION CORNERS.

All Quarter Section Corners on Standard lines must be established in all respects like other Quarter Section Corners, with the addition of the letters S. C., and if bearing trees are established for such Corners, each tree must be marked S. C. ¼ S. B. T.

MEANDER CORNERS.

SEC. 1. [1]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Meander Cor. to (e.g.) Fractional Secs. 1 & 2, marked M. C., dug a pit 3 ft. square, 1 ft. deep, 8 lks. _____ of stone, and raised a mound of earth 2 ft. high, 4½ ft. base alongside.

SEC. 2. [2]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground for Meander Cor. to (e.g.) Fractional Secs. 35 & 36, marked M. C., and raised a mound of stone 2 ft. high, 4½ ft. base alongside. Pits impracticable.

SEC. 3. [3]Set a _____ stone _____ x _____ x _____

1. Stone with Pits and Mound.
2. Stone with Mound of Stone.
3. Stone with Bearing Trees.
4. Post in Mound.
5. Post with Bearing Trees.
6. Mound without Post or Stone.
7. Tree Corner without Bearing Trees.
8. Tree Corner with Bearing Trees.
9. Connection Lines.
10. Marks.
11. Pits.
12. Stakes in Pits.

ins., _____ ins. in the ground for Meander Cor. to (e.g.) Fractional Secs, 9 & 10, marked M. C.; from which

A _____, _____ ins. diam. bears S _____° E. _____ lks., dist. marked T. 2 N. R. 2 W. S. 10, M. C. B. T.

A _____, _____ ins. diam. bears S _____° W. _____ lks. dist. marked T. 2 N. R. 2 W. S. 9, M. C. B. T.

SEC. 4. [4]Set a post 4 ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Meander Cor. to (e.g.) Fractional Secs. 35 & 36, marked M. C., with

T. 2 N. on N.

R. 2 W. S. 36, on E. and

S. 35 on W. faces, dug a pit, 3 ft. square, 1 ft. deep, 8 lks. _____ of post, and raised a mound of earth 2 ft. high, 4½ ft. base, around post.

SEC. 5. [5]Set a post 4 ft. long, 4 ins. square, 24 ins. in the ground, for Meander Cor. to (e.g.) Fractional Secs. 20 & 21, marked M. C. with

T. 2 N. on S.

R. 2 W. S. 21 on E. and

S. 20 on W. faces; from which

A _____, _____ ins. diam., bears S _____° E. _____ lks., dist. marked T. 2 N. R. 2 W. S. 21, M. C. B. T.

A _____, _____ ins, diam., bears S _____° W. _____ lks., dist. marked T. 2 N. R. 2 W. S. 20, M. C. B. T.

SEC. 6. [6]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Meander Cor. to (e.g.) Fractional Secs. 11 & 12, dug a pit, 3 ft. square, 1 ft. deep, 8 lks. _____ of Cor., and raised a mound of earth 2 ft. high, 4½ ft. base, over it. In pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked M. C. with

T. 2 N. on S.

R. 2 W. S. 12 on E. and

S. 11 on W. faces.

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SEC. 7. [7]A, _____, _____ ins diam., which I marked (e.g.) M. C. with

T. 2 N. on W.

R. 2 W. S. 13 on N. and

S. 24 on S. faces, for Meander Cor. to Fractional Secs. 13 & 24.

SEC. 8. [8]A _____, _____ ins. diam., which I marked (e.g.) M. C. with

T. 2 N. on E.

R. 2 W. S. 6 on N. and

S. 7 on S. faces, for Meander Cor. to Fractional Secs. 6 & 7; from which

A _____, _____ ins. diam. bears N _____° W. _____ lks. dist. marked T. 2 N. R. 2 W. S. 6, M C. B. T.

A _____, _____ ins. diam. bears S _____° W. _____ lks. dist. marked T. 2 N. R. 2 W. S. 7, M. C. B. T.

SEC. 9. [11]When a pit is dug at a Meander Cor. it must be 8 lks. from the Cor., on the side opposite the river or lake meandered.

SEC. 10. [10]The letters "M. C." for Meander Corner must be marked on the side facing the river or lake meandered.

WITNESS CORNERS.

A Witness Corner must bear the same marks that would be placed upon the Corner for which it is a witness, with the addition of the letters W. C., and be established in all respects like such Corner.

If bearing trees are established for a Witness Corner, each tree must be marked W. C., in addition to the usual marks.

MISCELLANEOUS.

SEC. 1. [13]When a rock in place is established for a Corner, its dimensions above ground must be given, and a cross (X) marked at exact Corner point. In other respects form for stone corners will be used.

SEC. 2. [14]Where mounds of earth are raised "alongside" of Corners, on N. and S. lines, they must be placed on the W. and on E. and W. lines on the N. side of Corner. In case the character of the land is such that this cannot be done, the deputy will state in his notes instead of "alongside," "S" (or E.)

SEC. 3. [15]In case where pits are practicable, the deputy prefers raising a mound of stone, or stone covered with earth, as more likely to perpetuate the Corner, he will use the form given for mound of stone, omitting the words "pits impracticable," and adding "covered with earth," when so established.[15]

SEC. 4. [16]Where the requisite number of trees can be found within 300 links of the Corner point, three (3) bearing trees should be established for every Standard or Closing Cor., four (4) for every Cor. common to 4 Townships or Sections, and two (2) for every Quarter Sec. Cor. or Meander Cor. In case the requisite number cannot be found within limits, the deputy must state in his field notes after describing those established, "no other trees within limits," and "dug pits in Secs. _____ & _____," or "raised a mound of stone alongside."

SEC. 5. [17]Stones 18 ins. and less long must be set two-thirds, and over 18 ins. long, three-fourths of their length in the ground. No stones containing less than 504 cubic inches must be used for corners.

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SEC. 6. [18]Particular attention is called to the "Summary of objects and data required to be noted," on pages ____ and ____ of these instructions, and it is expected that the deputy will thoroughly comply with same in his work and field notes.

SEC. 7. [19]No mountains, swampy lands, or lands not classed as surveyable are to be meandered, and all lines approaching such lands must be discontinued at the section or quarter section corner.

SEC. 8. [20]Where by reason of impassable objects the south

4. Post in Mound.
5. Post with Bearing Trees.
6. Mound without Post or Stone.
7. Tree Corner without Bearing Trees.
8. Tree Corner with Bearing Trees.
9. Connection Lines.
10. Marks.
11. Pits.
12. Stakes in Pits.
13. Rock in Place.
14. Mounds of Earth.
15. Mounds of Stone.
16. Bearing Trees.
17. Stones.
18. Objects to be Noted.
19. Lines Discontinued at Legal Corners.
20. Fractional Townships.

boundary of a township cannot be established, an east and west line should be run through the Township, first random, then corrected, from one range line to the other, and as far south as possible, and from such line the section lines will be extended in the usual manner, except over any fraction south of said line, which may be surveyed in the opposite direction from the Section Corners on the auxiliary base thus established.

SEC. 9. [21]When no part of the east or west boundaries can be run, both the north and south boundaries will be established as true lines.

SEC. 10. [22]Allowance for the convergency of Meridians must be made whenever necessary.

SEC. 11. [23]All letters and figures cut in posts or trees must be marked over with red chalk to make them still more plain and durable.

SEC. 12. [24]Township corners common to four townships, and section corners common to four sections, are to be set diagonally in the earth, with the angles in the direction of the lines. All other corners are to be set square, with the sides facing the direction of the lines.

SEC. 13. [25]The sizes of wooden posts, mounds, and pits noted in foregoing descriptions of corners are to be regarded as *minimum,* and whenever practicable to increase their dimensions it is desirable to do so.

SEC. 14. [26]In establishing corners, stones should be used wherever practicable; then, posts; and lastly, mounds, with stake in pit.

SEC. 15. [27]It is expected that the deputy surveyors will carefully read and familiarize themselves with these instructions, and all others contained in this volume, and will instruct their assistants as to their duties before commencing work. Extra copies will be furnished the deputies for the use of their assistants.

MEANDERING.

SEC. 1. Proceeding *down* stream, the bank on the *left* hand is termed the "left bank," and that on the *right* hand the "right bank." These terms are to be universally used to distinguish the two banks of a river or stream.

SEC. 2. Both banks of *navigable* rivers are to be meandered by taking the general courses and distances of their sinuosities, and the same are to be entered in the field book.

At those points where either the township or section lines intersect the banks of a navigable stream, corners are to be established at the time of running these lines. These are called "meander corners"; and in meandering you are to commence at one of those corners, coursing the banks, and measuring the distance of each course from your com-

mencing corner to the next "meander corner." By the same method you are to meander the opposite bank of the same river.

21. Boundaries.
22. Convergency.
23. Red Chalk.
24. Mode of Setting Corners.
25. Size of Posts, etc.
26. Corner Materials.
27. Examine Instructions.

The crossing distance *between* the MEANDER CORNERS on same line is to be ascertained by triangulation, in order that the river may be protracted with entire accuracy. The particulars to be given in the field notes.

Rivers not embraced in the class denominated "navigable" under the statute, but which are well-defined natural arteries of internal communication, will only be meandered *on one bank*. For the sake of uniformity, the surveyor will traverse the *right bank* when not impracticable; but where serious obstacles are met with, rendering it difficult to course along the right bank, he may cross to the left bank and continue the meanders as far as necessary; but all changes from one bank to the other will be made at the point of intersection of some line of the public surveys with the stream being meandered.

The subdividing deputies will be required to establish meander corners on both banks of such meanderable streams at the intersection of all section lines, and the distances across the river will be noted in the field book.

In meandering water-courses, where a distance is more than *ten chains* between stations, even chains only should be taken; but if the distance is *less* than ten chains, and it is found convenient to employ chains and links, the number of links should be a multiple of ten, thereby saving time and labor in testing the closings both in the field and in the surveyor-generals' office.

SEC. 3. You are also to meander, in manner aforesaid, all lakes, bayous, and deep ponds, which may serve as public highways of commerce. Shallow lakes or ponds, readily to be drained or likely to dry up, are not to be meandered. Lakes, bayous, and ponds lying entirely within a section are not to be meandered.

In meandering lakes, bayous, or ponds you are to commence at a meander corner, and proceed as above directed for meandering the banks of navigable streams; and from said corner take the courses and distances of the entire margin of the same, noting the intersections with all meander corners established thereon.

You will notice all streams of water falling into the river, lake, or bayou you are surveying, stating the width of the same at their mouth; also all springs, noting the size thereof and depth, and whether the water be pure or mineral; also the head and mouth of all bayous; and all islands, rapids, and bars are to be noticed, with intersections to their upper and lower points to establish their exact situation. You will also note the elevation of the banks of rivers and streams, the heights of falls and cascades, and the length of rapids.

SEC. 4. Meander lines should not be established at the segregation line between dry and swamp or overflowed land, but at the ordinary low-water mark of the actual margin of the rivers or lakes on which such swamp or overflowed lands border. In cases where such meander lines were formerly established at the segregation line between dry and swamp or overflowed lands, new and proper meander lines may be established under the direction of the surveyor general, and the township and section lines extended over such swamp or overflowed lands and the corners established, as hereinbefore provided, in order that the plats and field-notes of surveys may show the actual facts in the case.

5. The precise relative position of islands, in a township made fractional by the river in which the same are situated,

is to be determined trigonometrically; sighting to a flag or other fixed object on the island,

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from a special and carefully measured base line, connected with the surveyed lines, on or near the river bank, you are to form connection between the meander corners on the river to points corresponding thereto, in direct line, on the bank of the island, and there establish the proper meander corners, and calculate the distance across.

6. In taking the connection of an island with the main land, when there is no meander corner in line, opposite thereto, to sight from, you will measure a special base from the meander corner nearest to such island, and from such base you will triangulate to some fixed point on the shore of the island, ascertain the distance across, and there establish a special meander corner, wherefrom you will commence to meander the island.

7. The field-notes of meanders will be set forth in the field-books showing the dates when the work is performed, as illustrated in the specimen notes annexed. They are to state and describe particularly the meander corner from which they commenced, and each one upon which they close, and are to exhibit the meanders of each fractional section separately; following, and composing a part of such notes, will be given a description of the land, timber, depth of inundation to which the bottom is subject, and the banks, current, and bottom of the stream or body of water you are meandering. The utmost care must be taken to pass no object of topography, or *change therein*, without giving a particular description.

SURVEYING.

Initial points from which the lines of the public surveys are to be extended must be established whenever necessary under such special instructions as may be prescribed in each case by the Commissioner of the General Land Office. The locus of such initial points must be selected with great care and due consideration for their prominence and easy identification, and must be established astronomically.

The initial point having been established, the lines of the public surveys are to be extended therefrom as follows:

BASE LINE.

The base line shall be extended east and west from the initial point by the use of solar instruments or transits, as may be directed by the surveyor-general, in his special written instructions. Where solar instruments are used, the deputy must test said instruments in every 12 miles of line run, by taking the latitude, or by observation on the polar star; and in all cases where he has reason to suppose that said instrument is in error, he must take an observation on the polar star, and if error be found, must make the necessary corrections before proceeding with his survey. The proper corners shall be established at each 40 and 80 chains, and at the intersection of the line with rivers, lakes, or bayous that should be meandered, in accordance with the instructions for the establishment of corners. In order to check errors in measurement, two sets of chainmen, operating independently of each other, must be employed.

Where transits are used, the line will be run by setting off at the point of departure on the principal meridian, a tangent to the parallel of latitude, which will be a line falling at right angles to the said meridian. The survey will be continued on this line for twelve (12) miles, but the corners will be established at the proper points by offsets north-

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erly from said line, at the end of each half mile. In order to offset correctly from the tangent to the parallel, the deputy will be guided by the table of offsets and azimuths contained in this volume. As the azimuth of the tangent is shown, the angle thence to the true meridian at each mile is readily found, thus indicating the direction of the offset line. The computations are made for a distance of 12 miles, at the end of which observations on the polar star must be taken for the projection of a new tangent. The computations are also upon even degrees of latitude; offsets for intervening parallels can be readily determined by interpolation. Where offset distances to quarter-section corners exceed 50 links, their direction to the parallel can be determined in like manner by interpolation for azimuth.

Where said distances are less than 50 links interpolations for determining directions will not be required.

PRINCIPAL MERIDIAN.

The principal meridian shall be extended north and south from the initial point, by the use of solar instruments or transits, as may be directed by the surveyor general in his special written instructions. Where solar instruments are used, the line will be run in the same manner as prescribed for running the base line by solar instruments. Where transits are used, observations upon the polar star must be taken within each 12 miles of line run. In addition to the above general instructions, it is required that in all cases where the establishment of a new principal meridian seems to be necessary to the surveyor-general, he shall submit the matter, together with his reasons therefor, to the Commissioner of the General Land Office, and the survey of such principal meridian shall not be commenced until written authority, together with such special instructions as he may deem necessary, shall have been received from the Commissioner.

STANDARD PARALLELS.

Standard parallels, which are also called correction lines, shall be extended east and west from the principal meridian, at intervals of every 24 miles north and south of the base line, in the same manner as prescribed for running the base line.

AUXILIARY MERIDIANS.

Auxiliary meridians shall be extended north and south from the base line, at intervals of every 24 miles east and west from the principal meridian, in the same manner as prescribed for running the principal meridian.

It is contemplated that these base, principal meridian, standard, and auxiliary meridian lines shall first be ex-

tended over the territory to be surveyed, and that afterwards township and section lines shall be run, where needed, within these tracts of 24 miles square, formed by the extension of these principal lines; and each surveyor general will therefore cause said principal lines to be extended as rapidly as practicable.

EXTERIORS OR TOWNSHIP LINES.

The east and west boundaries of townships are always to be run from south to north on a true meridian line; and the north and south bounda-

ries are to be run from east to west, or from west to east (according to the location of the township to be surveyed with reference to prior surveys), on a *random* or trial line and corrected back on a true line. The distance north or south of the township corner to be closed upon, from the point of intersection of these random lines with the east or west boundary of the township, must be carefully measured and noted. Should it happen, however, that such random line should fall short, or overrun in length, or intersect the east or west boundary more than *three chains'* distance from the township corner thereon, as compared with the corresponding boundary on the south (due allowance being made for convergency), the line, and if necessary the entire exterior boundaries of the township, must be retraced, so as to discover and correct the error. In running random lines temporary corners are to be set at each 40 and 80 chains, and permanent corners established upon the true line as corrected back, in accordance with instructions, throwing the excess or deficiency on the west half mile, as prescribed by law. Permanent corners are to be established in accordance with instructions on the east and west township boundaries at the time they are run. Whenever practicable the township lines within these tracts of 24 miles square must be surveyed in regular order from *south* to *north,* i. e., the exterior boundaries of the township in any one range lying immediately north of the south boundary of such tract of 24 miles square must first be surveyed, and the exteriors of the other three townships in said range extended therefrom, in regular order from *south* to *north,* and it is preferable to first survey the entire range of townships in such tract adjoining the east boundary or adjoining the west boundary, and the other three ranges in regular sequence. In cases, however, where the character of the land is such that this rule cannot be complied with, the following will be observed.

In extending the *south* or *north* boundaries of a township to the *west,* where the *southwest* or *northwest* corners cannot be established in the regular way by running a north and south line, such boundaries will be run *west on a true* line, allowing for convergency on the west half mile; and from the township corner established at the end of such boundary, the west boundary will be run *north* or *south,* as the case may be. In extending *south* or *north* boundaries of a township to the *east,* where the *southeast* or *northeast* corner cannot be established in the regular way, the same rule will be observed, except that such boundaries will be run *east on a true line*, and the *east* boundary run *north* or *south*, as the case may be. One set of chainmen only is required in running township lines.

METHOD OF SUBDIVIDING.

1. The first mile, both of the south and east boundaries of each township you are required to subdivide, is to be carefully traced and measured before you enter upon the subdivision thereof. This will enable you to observe any change that may have taken place in the magnetic variation, as it existed at the time of running the township lines, and will also enable you to compare your chaining with that upon the township lines.

2. Any discrepancy arising either from a change in the magnetic variation or a difference in measurement, is to be carefully noted in the field-notes.

3. After adjusting your compass to a variation which you have thus found will retrace the eastern boundary of the township, you will commence at the corner, to sections 35 and 36, on the south boundary, and

run a line parallel to the range line, forty chains, to the quarter-section corner, which you are to establish between sections 35 and 36; continuing on said course forty chains farther, you will establish the corner to sections 25, 26, 35, and 36.

4. From the section corner last named run a *random* line, without blazing, *due east,* for the corner of sections 25 and 36, on east boundary, and at forty chains from the starting point set a post for *temporary* quarter-section corner. If you intersect exactly at the corner, you will blaze your random line back, and establish it as the *true* line; but if your random line intersects the said east boundary, either north or south of said corner, you will measure the distance of such intersection, from which you will calculate a course that will run a *true* line back to the corner from which your random started. You will establish the permanent quarter-section corner at a point equidistant from the two terminations of the *true* line.

5. From the corner of sections 25, 26, 35, and 36, run due north between sections 25 and 26, setting the quarter-section post as before, at forty chains, and at eighty chains establishing the corner of sections 23, 24, 25, and 26. Then run a random *due east* for the corner of sections 24 and 25 on east boundary; setting temporary quarter-section post at forty chains; correcting back, and establishing *permanent* quarter-section corner at the equidistant point on the *true* line, in the manner directed on the line between sections 25 and 36.

6. In this manner you will proceed with the survey of each successive section in the first tier, until you arrive at the north boundary of the township, which you will reach in running up a random line between sections 1 and 2. If this random line should not intersect at the corner established for sections 1, 2, 35, and 36, upon the township line, you will note the distance that you fall east or west of the same, from which distance you will calculate a course that will run a true line south to the corner from which your random started. If the north boundary of a township is a base or standard line, the line between sections 1 and 2 is to be run north as a *true* line, and the closing corner established at the point of intersection with such base or standard line; and in such case the distance from said closing corner to the nearest section or quarter-

section corner on such base or standard line must be carefully measured and noted as a *connection line.*

7. In like manner proceed with the survey of each successive tier of sections, until you arrive at the fifth tier; and from each section corner which you establish upon this tier you are to run random lines to the corresponding corners established upon the range line forming the western boundary of the township; setting, as you proceed, each *temporary* quarter-section corner at forty chains from the interior section corner, so as to throw the excess or deficiency of measurement on the extreme tier of quarter sections contiguous to the township boundary; and on returning establish the *true* line, and establish thereon the *permanent* quarter-section corner.

8. It is not required that the deputy shall complete the survey of the first tier of sections from south to north, before commenting the survey of the second or any subsequent tier, but the corner on which the random line closes must have been previously established by running the line north on which it is established, except as follows: Where it is impracticable to establish such section corner in the regular manner it may be established by running the east and west line *east* or *west*, as the case may be, on a *true line,* setting the quarter-section corner at 40 chains and the section corner at 80 chains.

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9. Quarter-section corners, both upon north and south and upon east and west lines, are to be established at a point *equidistant* from the corresponding section corners, except upon the lines closing on the north and west boundaries of the township, and in those situations the quarter-section corners will always be established at precisely *forty chains* to the north or west (as the case may be) of the respective section corners from which those lines respectively *start*, by which procedure the excess or deficiency in the measurements will be thrown, according to law, on the extreme tier of quarter-sections.

PRESCRIBED LIMITS FOR CLOSINGS AND LENGTH OF LINES IN CERTAIN CASES.

1. Every north-and-south section line, except those terminating in the north boundary of the township, must be *eighty chains* in length.

2. The east-and-west *section lines,* except those terminating in the west boundary of the township, are to be within *eighty links* of the actual distance established on the south boundary line of the township for the width of said tier of sections, and must close within eighty links north or south of the section corner.

3. The north boundary and south boundary of any one section, except in the extreme western tier, are to be within *eighty links* of equal length.

4. The meanders within each fractional section, or between any two meander posts, or of an island in the interior of a section, must close within one chain and fifty links.

5. In running *random* township exteriors, if such random lines fall short or overrun in length, or intersect the eastern or western boundary, as the case may be, of the township, at more than *three chains* north or south of the true corner, the lines must be retraced, even if found necessary to remeasure the meridional boundaries of the township. One set of chainmen, only, is required in subdividing.

SUBDIVISION OF SECTIONS.

Under the provisions of the act of Congress approved February 11, 1805, the course to be pursued in the subdivision of sections is to run straight lines from the established quarter-section corners—United States surveys—to the opposite corresponding corners, and the point of intersection of the lines so run will be the corner common to the several quarter-sections, or, in other words, the legal center of the section.

In the subdivision of fractional quarter sections where no opposite corresponding sections have been or can be fixed, the subdivision lines should be ascertained by running from the established corners due north, south, east, or west lines, as the case may be, to the water-course, Indian boundary line, or other external boundary of such fractional section.

The law presupposes the section lines surveyed and marked in the field by the United States deputy surveyors to be due north and south or east and west lines, but in actual experience this is not always the case; hence, in order to carry out the spirit of the law, it will be necessary, in running the subdivisional lines through fractional sections, to adopt mean courses where the section lines are not due lines, or to run the subdivision line parallel to the section line when there is no opposite section line.

Upon the lines closing on the north and west boundaries of a township, the quarter-section corners are established by the United States deputy surveyors at precisely forty chains to the north or west of the

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last interior section corners, and the excess or deficiency in the measurement is thrown on the outer tier of lots, as per act of Congress approved May 10, 1800.

In the subdivision of quarter-sections the quarter-quarter corners are to be placed at points equidistant between the section and quarter-section corners and between the quarter corners and the common center of the section, *except* on the last half mile of the lines closing on the north or west boundaries of a township, where they should be placed at twenty chains, proportionate measurement, to the north or west of the quarter-section corner.

The subdivisional lines of fractional quarter sections should be run from points on the section lines intermediate between the section and quarter-section corners due north, south, east, or west, to the lake, water-course, or reservation which renders such tracts fractional.

When there are double sets of section corners on township and range lines, the quarter corners for the sections south of the township lines and east of the range lines are not established in the field by the United States surveyors, but in subdividing such sections said quarter corners should be so placed as to suit the *calculations of the areas of the quarter-sections adjoining the township boundaries* as expressed upon the official plat, adopting proportionate measurements were the present measurements of the north or west boundaries of the sections differ from the original measurements.

RE-ESTABLISHMENT OF LOST CORNERS.

The original corners, when they can be found, must stand as the true corners they were intended to represent, even though not exactly whe restrict professional care might have placed them in the first instance.

Missing corners should be re-established in the identical localities they originally occupied. When the point cannot be determined by the existing landmarks in the field, resort must be had to the field notes of the original survey. The law provides that the lengths of the lines as stated in the field notes shall be considered as the true lengths thereof, and the distances between corners set down in the field notes constitute proper data from which to determine the true locality of a missing corner; hence the rule that all such should be restored at distances proportionate to the original measurements between existing original corners. That is, if the measuremnt between two existing corners differs from that stated in the field notes, the excess or deficiency should be distributed proportionately among the intervening section lines between the said existing corners standing in their original places. Missing corners on standard, township, and range lines should be restored by proportionate measurement between the nearest existing original corners on those lines. Missing section corners in the interior of townships should be re-established at proportionate distances between the nearest existing original corners *north* and *south* of the missing corners.

As has been observed, no existing original corner can be disturbed, and it will be plain than any excess or deficiency in measurements between existing corners cannot in any degree affect the distances beyond said existing corners, but must be added or subtracted proportionately to or from the intervals embraced between the corners which are still standing.

RETRACING TOWNSHIP LINES.

If, in subdividing a township, it is found that the exterior boundaries have been improperly run, measured, or marked, or the corners estab-

lished thereon have been obliterated, the deputy will resurvey so much of said exterior boundaries as may be necessary, and establish new corners upon same wherever necessary. Where no subdivisions have been made on either side of a township boundary, it will be corrected, if necessary, in point of alignment as well as measurement, by establishing the section corners at lawful distances from the south or east boundaries of the township (as the case may be), and upon a right line extending between the township corners; and in such case, the old corners on said township boundaries will be destroyed.

Where subdivisional lines have been closed upon a township boundary in advance of the preliminary survey of the same, its alignment will not be changed. If it is found necessary to establish new corners on such boundary they will receive only the marks referring to the sections in the township being subdivided, and the marks on the old corners on such boundary, which refer to such sections, will be obliterated.

In all cases such necessary corrections will be made as will place the section corners at the aforesaid lawful distances from the south or east boundary, in order that a legal subdivision of the township may be made, and where new corners are thus necessarily established, the distance, be it one hundred links or more, and direction between new and old corners must be carefully noted.

New corners on township boundaries must be established by a survey of such lines, and in *no case* will such corners be established from *data* acquired in running lines closing on such boundaries. One set of chainmen, only, is required in retracing township lines.

If, in the subdivision of part of a township, the lands to be surveyed cannot be reached by lines extending from the south boundary of the township, a line corresponding to the south boundary of the same shall be extended from some section corner on the east boundary of the township to the west boundary thereof, in order that it may constitute the south boundary of the surveyable area; from which subdivisional meridian lines will be projected northward, and the surveys carried forward in the same manner as for the subdivision of a full township, in order that regular and fractional areas shall occupy their true and legal positions.

Fragmentary portions of surveyable lands lying south of the provisional base last described may be included in the survey by extending lines *south* from the same in harmony with the general system.

When the proper point for the establishment of a section corner is inaccessible, and a witness monument can be erected upon each of the two lines which approach the same at distances not exceeding twenty chains therefrom, the quarter-sections depending thereon will be disposed of in the same manner as if the corner had been regularly established.

The witness monument must be marked as conspicuously as a section corner, and bearing trees used wherever possible.

The deputy will be required to furnish good evidence that the section corner is actually inaccessible.

When township or subdivision lines intersect the boundaries of confirmed private land claims, the latter must be retraced so far as may be necessary to establish the corners to the fractional sections at their proper places, and such corners must be established, in all respects, like meander corners, except that instead of the letters "M. C." the letters used to designate such private land claim must be marked on corners. In retracing the boundary of such claim the deputy must set stakes thereon, at each forty chains, where the ground is level, and on broken

ground, at every spur, ridge, or other prominent point, and also at each angle formed by a change in the direction of such boundary.

FIELD NOTES.

The deputy surveyor will provide himself with proper blank books for his field notes, or same will be furnished to him by the surveyor general, and in such books he must make a faithful, distinct, and minute record of everything officially done and observed by himself and his assistants, pursuant to

instructions, in relation to running, measuring and marking lines, establishing corners, &c., and present, as far as possible, a full and complete topographical description of the country surveyed.

From the *data* thus recorded at the time when the work is done on the ground, the deputy must prepare *true* field notes of the surveys executed by him, in the manner hereinafter prescribed, and return same to the surveyor general, together with the required sketches, at the earliest practicable date after the completion of his work in the field.

The field notes of the survey of base, meridian, standard, exterior, and subdivision lines are each to be written in separate books.

The first, or title, page of the field-note book is to describe the subject-matter of the same, the locus of the survey, by whom surveyed, date of contract, and the dates of commencement and completion of the work. The second page is to contain the names and duties of the assistants, and the index is to be placed on same or following page. Whenever a new assistant is employed, or the duties of any one of them changed, such facts are to be stated in an appropriate entry immediately preceding the notes taken under such changed arrangements.

The exhibition of every mile of surveying, whether on township or subdivisional lines, and of meanders in each section, must be *complete in itself*, and be separated by a black line drawn across the paper.

The variation of the needle must always occupy a *separate line* preceding the notes of measurements on line.

The description of the surface, soil, minerals, timber, undergrowth, &c., on *each mile* of line, is to follow the notes of survey of such line, and not be mixed up with them.

The date of each day's work must follow immediately after the notes thereof.

No abbreviations of words are allowable, except of such words as are constantly occurring, such as *"sec."* for *"section"; "in. diam."* for *"inches diameter"; "chs."* for *"chains"; "lks."* for *"links"; "dist."* for *"distant"; "¼ sec. cor."* for *"quarter-section corner"; "va."* for *"variation,"* &c.; for 14 inches long, 12 inches wide, and 3 inches thick, in describing a corner stone, use 14 x 12 x 3, being particular to always observe the same order of length, width, and thickness. Proper names must never be abbreviated, however often their recurrence.

When the lines of survey cross hills or ravines, the height or depth of same, in feet, must be noted as nearly as practicable.

The corners established in previous surveys, from which the lines start, or upon which they close, must be fully described in the field notes. A full description of such corners will in all cases be furnished the deputy from the surveyor general's office at the date authority is given for commencing work.

In all cases where a corner is re-established the field notes must describe fully the manner in which it is done.

Field notes of the survey of base, standard, and meridian lines must describe all corners established thereon, how established, the crossings

of streams, ravines, hills, and mountains; character of soil, timber, minerals, &c.; and after the description of each township corner established in running such lines, the deputy will note particularly in the "general description" the townships on each side of the lines run.

Field notes of the survey of exterior boundaries of townships must describe the corners and topography, as above required, and the "general description" at the end of such notes must describe the townships as fully as may be, and also state whether or not they should be subdivided. The topography on the *true line* of exterior boundaries must be given, and not that on the random line.

Field notes of the subdivisional survey of townships must describe the corners and topography as above required, and the "general description" at the end of such notes must state minutely the character of the land, soil, timber, &c., found in such townships.

A blank line must be left at the bottom of each page of the field notes, and the notes must be written in a plain, legible hand, and in clear and precise language, so that the figures, letters, words, and meaning will always be unmistakable, and erasures and interlineations avoided, as far as possible.

With the notes of the survey of principal lines forming a tract of 24 miles square the deputy will submit a plat of the lines run, on a scale of one-half inch to the mile, and with the notes of survey of the exterior lines of townships, a plat of the lines run, on the scale of two inches to the mile, on which are to be noted all the objects of topography on line necessary to illustrate the notes, viz, the distance on line at the crossings of streams, so far as such can be noted on the paper, and the direction of each by an arrow head pointing down stream; also the intersection of line by prairies, marshes, swamps, ravines, ponds, lakes, hills, mountains, and all other matters indicated by the notes, to the fullest extent practicable.

With the instructions for making subdivisional surveys of townships into sections, the deputy will be furnished by the surveyor general with a diagram of the *exterior* lines previously established of the townships to be subdivided (on the above-named scale), upon which are carefully to be laid down the measurements of each of the lines on such boundaries whereon he is to close, and the magnetic variation of each mile. And on such diagram the deputy who subdivides will make appropriate sketches of the various objects of topography as they occur on his lines, so as to exhibit not only the points on line at which the same occur, but also the direction and position of each between the lines, or within each section, as far as practicable, so that every object of topography may be properly completed or connected in the showing.

SUMMARY OF OBJECTS AND DATA REQUIRED TO BE NOTED.

1. The precise length of every line run, noting all necessary offsets therefrom, with the reason and mode thereof.
2. The kind and diameter of all *"bearing trees,"* with the course and distance of the same from their respective corners; and the precise relative position of WITNESS CORNERS to the *true corners*.
3. The kind of materials of which corners are constructed.
4. *Trees on line.* The name, diameter, and distance on line to all trees which it intersects.
5. Intersections by line of *land objects*. The distance at

which the line first intersects and then leaves every *settler's claim* and *improvement;* prairie, river, creek, or other "bottom"; or swamp, marsh, grove, and

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wind fall, with the course of the same at both points of intersection; also the distances at which you begin to ascend, arrive at the top, begin to descend, and reach the foot of all remarkable hills and ridges, with their courses, and *estimated* height, in feet, above the level land of the surrounding country, or above the bottom lands, ravines, or waters near which they are situated.

6. Intersections by line of *water objects*. All rivers, creeks, and smaller streams of water which the line crosses; the distances on line at the points of intersection, and their *widths on line*. In cases of *navigable* streams, their width will be ascertained between the *meander corners,* as set forth under the proper head.

7. The land's *surface*—whether level, rolling, broken, or hilly.

8. The *soil*—whether first, second, third, or fourth rate.

9. *Timber*—the several kinds of timber and undergrowth, in the order in which they predominate.

10. *Bottom lands*—to be described as wet or dry, and if subject to inundation, state to what depth.

11. *Springs of water*—whether fresh, saline, or mineral, with the course of the stream flowing from them.

12. *Lakes and ponds*—describing their banks and giving their height, and also depth of water, and whether it be pure or stagnant.

13. *Improvements*. Towns and villages; houses or cabins; fields, or other improvements; sugar-tree groves, sugar camps, mill seats, forges, and factories.

14. *Coal* banks or beds; *peat* or turf grounds; *minerals* and ores; with particular description of the same as to quality and extent, and all *diggings* therefor; also *salt* springs and licks. All reliable information you can obtain respecting these objects, whether they be on your immediate line or not, is to appear on the general description to be given at the end of the notes.

15. *Roads and trails*, with their directions, whence and whither.

16. Rapids, cataracts, cascades, or falls of water, with the estimated height of their fall in feet.

17. Precipices, caves, sink holes, ravines, stone quarries, ledges of rocks, with the kind of stone they afford.

18. *Natural curiosities,* interesting fossils, petrifications, organic remains, &c.; also all ancient works of art, such as mounds, fortifications, embankments, ditches, or objects of like nature.

19. The *variation* of the needle must be noted at all points or places on the lines where there is found any material *change* of variation, and the position of such points must be perfectly identified in the notes.

20. Besides the ordinary notes taken on line (and which must always be written down on the spot, leaving nothing to be supplied by memory), the deputy will subjoin, at the conclusion of his book, such further description or information touching any matter or thing connected with the township (or other survey) which he may be able to afford, and may deem useful or necessary to be known—with a *general description* of the township in the *aggregate*, as respects the face of the country, its soil and geological features, timber, minerals, waters, &c.

Following the "general descripton" of the township is to be "A list of the names of the individuals employed to assist in running, measuring, and marking the lines and corners described in the foregoing field notes of township No. _____ of the BASE LINE of range No. _____ of the _____ MERIDIAN, showing the respective capacities in which they acted."

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AFFIDAVITS TO FIELD NOTES.

The following are the forms of official oaths to be taken by deputy surveyors and their assistants. The original oaths are to be affixed to the *true* field notes returned to the surveyor-general by the deputy surveyor; the preliminary oaths being placed immediately after the index of the first book, and the final oaths at the end of the last book of field notes of the surveys to which they refer:

PRELIMINARY OATHS OF ASSISTANTS.

I, _____ _____, do solemnly swear that I will well and truly perform the duties of compassman, according to instructions given me, and to the best of my skill and ability, in the survey of the _____ _____.

_____ _____, *Compassman.*

Subscribed and sworn to before me this _____ day of _____, 18__.

_____ _____,
_____.

We, _____ _____ and _____ _____, do solemnly swear that we will well and faithfully execute the duties of chain carriers; that we will level the chain upon even and uneven ground and plumb the tally pins, either by sticking or dropping the same; that we will report the true distance to all notable objects, and the true length of all lines that we assist in measuring, to the best of our skill and ability, and in accordance with instructions given us, in the survey of the _____ _____.

_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*

Subscribed and sworn to before me this _____ day of _____, 18__.

_____ _____,
_____.

We, _____ _____ and _____ _____, do solemnly swear that we will well and truly perform the duties of axemen, in the establishment of corners and other duties, according to instructions given us, and to the best of our skill and ability, in the survey of _____ _____.

_____ _____, *Axeman.*
_____ _____, *Axeman.*

Subscribed and sworn to before me this _____ day of _____, 18__.

_____ _____,
_____.

FINAL OATHS FOR SURVEYS.

List of names.

A list of the names of the individuals employed by _____ _____, United States deputy surveyor, to assist in running, measuring, and marking the lines and corners described in the foregoing field notes of the survey of _____ _____, showing the respective capacities in which they acted.

_____ _____, *Compassman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Axeman.*
_____ _____, *Axeman.*
_____ _____, *Flagman.*

FINAL OATHS OF ASSISTANTS.

We hereby certify that we assisted _____ _____, United States deputy surveyor, in surveying all those parts or portions of the _____ of the _____ base and _____ meridian, _____ of _____, as are represented in the foregoing field notes as having been surveyed by him and under his direction; and that said survey has been in all respects, to the best of our knowledge and belief, well and faithfully surveyed, and

the corner monuments established according to the instructions furnished by the United States surveyor-general for _____.

_____ _____, *Compassman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Axeman.*
_____ _____, *Axeman.*
_____ _____, *Flagman.*

Subscribed and sworn to before me this _____ day of _____, 18__.

_____ _____,
_____.

FINAL OATH OF UNITED STATES DEPUTY SURVEYOR.

I, _____ _____, United States deputy surveyor, do solemnly swear that in pursuance of instructions received from _____ _____, United States surveyor general for _____, bearing date of the _____ day of _____, 18__, I have well, faithfully, and truly, in my own proper person, and in strict conformity with the instructions furnished by the United States, surveyed all those parts or portions of _____ of the _____ base and _____ meridian in the _____ of _____, as are represented in the foregoing field notes as having been surveyed by me and under my directions; and I do further solemnly swear that all the corners of said survey have been established and perpetuated in strict accordance with the surveying manual, printed instructions, the special written instructions of the United States surveyor general for _____, and in the specific manner described in the field notes, and that the foregoing are the *true* field notes of such survey; and, should any fraud be detected, I will suffer the penalty of perjury, under the provisions of an act of Congress, approved August 8, 1816.

_____ _____,
United States Deputy Surveyor.

Subscribed and sworn to before me this _____ day of _____, 18__.

_____ _____,
_____.

The final oath of the deputy surveyor must, in all cases, be taken before some officer duly authorized to administer oaths. It is preferable that all oaths—both preliminary and final—of assistants should also be taken before such officer. In cases, however, where great delay or inconvenience would result from a strict compliance with this rule, the deputy surveyor is authorized to administer the necessary oaths to his assistants, but in each case where this is done he must submit a full written report to the proper surveyor general of the circumstances of such case.

To enable the deputy surveyor to fully understand and appreciate the responsibility under which he is acting, his attention is invited to the provisions of the second section of the act of Congress, approved August 8, 1846, entitled "An act to equalize the compensation of the surveyors-general of the public lands of the United States, and for other purposes," and which is as follows:

"SEC. 2. That the surveyors-general of the public lands of the United States, in addition to the oath now authorized by law to be administered to deputies on their appointment to office, shall require each of their deputies, on the return of his surveys, to take and subscribe an oath or affirmation that those surveys have been faithfully and correctly executed according to law and the instructions of the surveyor-general; and on satisfactory evidence being presented to any court of competent jurisdiction that such surveys, or any part thereof, had not been thus executed, the deputy making such false oath or affirmation shall be deemed guilty of perjury, and shall suffer all the pains and penalties attached to that offense; and the district attorney of the United States for the time being, in whose district any such false, erroneous, or fraudu-

lent surveys shall have been executed, shall, upon the application of the proper surveyor-general, immediately institute suit upon the bond of such deputy; and the institution of such suit shall act as a lien upon any property owned or held

by such deputy, or his sureties, at the time such suit was instituted."

SPECIMEN FIELD NOTES AND PLATS.

Diagram A illustrates the method of laying off tracts of land 24 miles square, as nearly as practicable, by the survey of principal lines, and the survey of exteriors or township lines within such tracts, north of the base line and east of the principal meridian. The same general principles will apply equally to the survey of such tracts differently located with reference to the initial point. The topography noted on said diagram is on those portions of the lines of surveys for which specimen field notes are given.

Diagram B illustrates the method of laying off a township into sections and quarter sections. In the subdivision of townships lying *south* of and *contiguous* to the base line, or to any standard parallel, the lines between the northern tier of sections will be run north as *true* lines; quarter-section corners will be established at 40 chains, closing section corners will be established at the points of intersection of such lines with the base or standard lines (as the case may be), and the *course* and *distance* from such corners to the nearest corner upon the line closed upon are to be accurately ascertained and set down in the field notes.

Diagram C illustrates the mode of establishing stone, post, and mound corners for townships, sections, and quarter sections.

Specimen field notes Nos. 1, 2, 3, 4, and 5 illustrate, respectively, the mode and order of surveying standard lines, meridian lines, exteriors or township lines, resurveying exteriors or township lines, and subdividing a township into sections and quarter sections. The attention of the deputy is particularly directed to these specimens, as indicating only the method in which his work is to be conducted, but also the order, manner, language, &c., in which his field notes are required to be returned to the surveyor general's office; and such specimens are to be deemed part of these instructions, and any *departure* from their details, without special authority, in cases where the circumstances are analogous in practice, *will be regarded as a violation of his contract and oath.*

The subdivisions of fractional sections into 40-acre lots (as near as may be) are to be so laid down on the official township plat in dotted black lines as to admit of giving to each a specific designation, if possible, according to its relative position in the fractional section, as per examples afforded by Diagram B, as well as by a number, in all cases where the lot cannot properly be designated as a quarter-quarter. Those fractional subdivision lots which are not susceptible of being described according to relative local position, are to be numbered in regular series; those bordering on the north boundary of a township to be numbered progressively from east to west, and those bordering on the west boundary of a township to be numbered progressively from north to south, in each section. As section 6 borders on both the north and west boundaries of the township, the fractional lots in same will be numbered as follows: Commencing with No. 1 in the northeast, thence progressively west to No. 4 in the northwest, and south to No. 7 in the southwest corner of the section.

In numbering fractional lots, other than those above specified (wherever practicable and as a general rule), the series should commence with

No. 1 in the northeastern or the most easterly fractional lot, and continue from east to west, and west to east, alternately, to the end of the series, as shown in Diagram B; but such general rule is departed from under circumstances given as examples in said diagram.

Interior lots are to be, as nearly as possible, 20 chains long by 20 chains wide; and the excess or deficiency of measurement is always to be thrown on the lots bordering on the northern and western boundaries of the township, or those made fractional by meander lines.

The official township plat to be returned to the General Land Office is to show on its face, on the right-hand margin, the meanders of navigable streams, islands, and lakes. Such details are wanted in the adjustment of the surveying accounts, but may be omitted in the copy of the township plat to be furnished to the district land office by the surveyor general. A suitable margin for *binding* is to be preserved on the left-hand side of each plat. Each plat is to be certified, with table annexed, according to the forms subjoined to "Diagram B," and is to show the areas of public land, of private surveys, and of water, with the aggregate area as shown on the diagram.

Each township plat is to be prepared in *triplicate*: one for the General Land Office, one for the United States district land office, and the third to be retained as the record in the office of the surveyor general.

The plat for the local land office must not be forwarded until notice is received by the surveyor-general from the Commissioner of the General Land Office that the survey represented on said plat has been approved.

The plats must be prepared as nearly as possible in accordance with the specimen plat designated as "Diagram B." The use of all fluids, except a preparation of India ink of good quality, must be avoided by the draughtsman in delineations relating to the public surveys. All lines, figures, &c., must be sharply defined. All lettering on the plats must be clear and sharp in outline and design, and ornamentation of any kind is prohibited. These requirements are necessary in order that everything shown upon original plats may be fairly reproduced in making photolithographic copies of the same.

All towns, settlements, permanent buildings, private claims, reservations, water courses, ditches, lakes, islands, mountains, buttes, canons, roads, railroads, telegraph lines, canals, &c., will be shown upon the plats and designated by proper names where such are known.

The mean magnetic declinations determined at the date of the survey of the exterior and subdivisional lines will be entered upon each plat in the manner shown in Diagram B. This will be ascertained by taking the mean of the greatest and least magnetic declination found at the dates of surveys, excluding such changes as are clearly attributable to local attraction.

All plats are to be drawn to a uniform scale of 40 chains to 1 inch, United States standard.

Surveyors general will require that the specimen plat shall be closely followed in order that uniformity of appearance and expression of drawings representing the public land surveys may be attained.

The true field books, each bearing the *written approval* of

the surveyor-general, are to be substantially bound into volumes of suitable size, and retained in the surveyor-general's office, and certified *transcripts* of such field books (to be of *foolscap* size) are to be prepared and forwarded, from time to time, to the General Land Office.

All transcripts of surveys must be written in a bold, legible hand, with durable black ink, and such transcripts of any series of surveys

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included in one account forwarded to the General Land Office must be firmly fastened together at the surveyor-general's office prior to transmittal.

With the copy of each township plat furnished to a district land office, the surveyor-general is required by law to furnish *descriptive notes* as to the character and quality of the soil and timber found on and in the vicinity of each surveyed line, and giving a description of each corner.

Printed blank forms for such notes will be furnished by the General Land Office. The forms provide eighteen spaces for *meander corners,* which, in most cases, will be sufficient; but when the number shall exceed eighteen, the residue will have to be inserted on the face of the township plat, to be furnished to the register of the district land office, or on a supplemental blank form.

There is shown a series of meander corners on Diagram B, viz, from No. 1 to No. 12 on the river and island, and No. 1 to No. 5 on Lin's Lake.

THE MAGNETIC DECLINATION OR VARIATION OF THE NEEDLE.

The magnetic declination at any place is the angle which the compass needle, when it is correctly constructed and freely suspended, makes with the true meridian. The true meridian is fixed, but the declination varies because the direction in which the needle points is in a continuous state of change. Therefore, whenever a measure of the declination of the needle is taken, the exact time (year, day of month, and hour of the observations) should be recorded, as well as the geographical position of the place, or its latitude and longitude expressed to the nearest minutes of arc.

The declination is called "West" when the north end of the needle points to the west of the true meridian, and it is called "East" when the north end of the needle points east of the true meridian. In order to give an idea of the amount of the declination at present observable within the limits of the United States we instance the following places at or near which it reaches extreme value, which are given to the nearest whole degree.

At Eastport, Me., the declination is 18° west.

At the mouth of the Rio Grande, Texas, 8° east.

At San Diego, Cal., 14° east.

At Sitka, Alaska, 29° east.

At Fort Yukon, Alaska, 36° east.

The accuracy with which the declination may be determined depends chiefly upon the instrumental means, but also, and in a great measure, upon the care taken in the use of the instruments and the selection of the proper methods and times for observing.

The instruments ordinarily at the disposal of the surveyor are sufficiently described, but for a description and illustration of more refined ones, as used by scientists, we refer to the instructions for magnetical observations published as Appendix No. 16, Coast Survey Report for 1875.

Omitting any detailed notice of the irregular variations to which the magnetic needle is subject, it becomes important for the purposes of the surveyor to refer particularly to the changes which have a special bearing upon his observations. These are the *daily variation* and the *secular variation.*

The daily variation.—It has been found that at about the time of sunrise the north end of the needle has a slow motion towards the east which soon ceases. The needle is then said to be at its eastern elongation; its

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north end then begins a retrograde motion towards the west, and at about one o'clock in the afternoon reaches the point at which it is said to be at its western elongation, after which it again turns back towards the east.

The times at which the needle reaches its eastern and western elongations vary with the seasons of the year (with the sun's declination), happening a little earlier in summer than in winter.

The angular range between the eastern and western elongations varies also with the seasons of the year.

The average position of the needle for the day is called the *mean magnetic meridian.*

At about six o'clock in the evening (and for about an hour before and after), throughout the year, the position of the needle coincides very nearly with the mean magnetic meridian, and this, therefore, is the time most favorable for making observations to obtain at once the mean declination.

For reducing the direction of the needle observed at other hours to the mean magnetic meridian the following table is furnished. It gives to the nearest minute the variations of the needle from its average position during the day, for each hour in the day for the four seasons of the year.

Table for reducing the observed declination to the mean declination of the day.

	The needle points east of the mean magnetic meridian.							The needle points west of the mean magnetic meridian.					
	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	Noon.	P.M.	P.M.	P.M.	P.M.	P.M.	P.M.
Hour	h. 6	h. 7	h. 8	h. 9	h. 10	h. 11	Noon.	h. 1	h. 2	h. 3	h. 4	h. 5	h. 6
	′	′	′	′	′	′	′	′	′	′	′	′	′
Spring	3	4	4	3	1	1	4	5	5	4	3	2	1
Summer...	4	5	5	4	1	2	4	6	5	4	3	2	1
Autumn...	2	3	3	2	0	2	3	4	3	2	1	1	0
Winter....	1	1	2	2	1	0	2	3	3	2	1	1	0

The secular variation of the magnetic declination is a subject of the greatest importance to surveyors. It manifests itself by a gradual change in one direction, which at first increases slowly, then more rapidly, diminishing again afterward until the needle becomes stationary and subsequently returns by similar changes to its former position, the whole period extending over nearly two and a half centuries. Thus it

will be seen by a table given below that at Philadelphia the declination was 8¾° west in 1700, whence it diminished until in 1800 it reached a minimum 2°.1 (2°6′), and will increase again to 6°.8 in 1880. At present all along the Atlantic and Gulf coasts the effect of the secular variation is to *increase west* declinations or to *decrease east* declinations by from 2′ to 5′, but on the Pacific coast the effect is opposite in direction, viz, *increasing* east declinations by from 1′ to 3′.

In Alaska, however, we have indications of a decrease of east declinations.

The following table of computed declinations at various places, taken from the Coast Survey Report for 1874, exhibits the effect of the secular variation for a number of places, and will be found especially useful where old lines have to be retraced.

The table should not be extended in time either way without the support of additional observations.

[Pages 51 and 52 are deleted. They contain a "Table of Decimal Values of the Magnetic Declination."]

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It will be observed that the amount of change is by no means the same even in places not far remote from each other, as New York and Philadelphia.

In grouping together a table of the present rate of change much allowance must therefore be made for possible local peculiarities that have not been ascertained.

The following statement of the present (1878) annual change in the magnetic declination, due to the secular variation, may serve to give a general idea of the *approximate* amount of change along our immediate sea-coast. For the interior States the information is very scanty, and therefore less trustworthy, or altogether wanting.

The annual change is expressed in minutes of arc, a + sign indicating increase of westerly or decrease of easterly declination.

Locality.	Annual change.
Maine, coast of	+2
Maine, interior	+3
New Hampshire	+3½
Vermont	+5½
Massachusetts, eastern part	+2¾
Massachusetts, western part	+3 to 4
Rhode Island and Connecticut	+3¼
New York, Long Island	+3
New York, northern and western part	+4½
New Jersey	+3
Pennsylvania	+3¾
Ohio	+2½
Tennessee, eastern part	+2½
Tennessee, western part	+2
Missouri	+2
Delaware, Maryland, and Virginia	+3
West Virginia	+3½
North Carolina, South Carolina, and Georgia	+3½
Florida, northern part	+3½
Florida, southern part	+3
Alabama and Mississippi, Gulf coast of	+3
Louisiana, eastern part	+2½
Louisiana, western coast	+2
Texas, coast of	+1
Texas, southwestern part	+0 (probably.)
New Mexico and Southwestern Arizona	+0 (probably.)
California, coast of	−1⅛
Oregon, coast of	−2 to 2½
Washington Territory, coast of	−2½ to 3

The negative sign indicates an increase of easterly direction.

METHOD OF ASCERTAINING THE TRUE MERIDIAN AND THEREBY THE MAGNETIC DECLINATION OR VARIATION OF THE COMPASS.

The following chapter, on the subject of the declination of the magnetic needle, is extracted from the revised edition of the work on surveying by Dr. Charles Davies, a graduate of the Military Academy at West Point. The work itself will be a valuable acquisition to the deputy surveyor, and his attention is particularly invited to the following chapter, which sets forth the usual easy modes by which the true meridian and magnetic declination may be approximately ascertained; his attention is also called to more complete statements on the subject given in the work "A treatise on land-surveying, &c.," by Dr. W. M. Gillespie, professor of engineering, Union College, in chapter treating of the declination of the magnetic needle. For more refined methods, he may consult Coast Survey Report for 1875, Appendix No. 16.

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METHOD OF ASCERTAINING THE TRUE MERIDIAN.

The best practical method of determining the true meridian of a place is by observing the north star. If this star were precisely at the point in which the axis of the earth, prolonged, pierces the heavens, then the intersection of the vertical plane passing through it and the place, with the surface of the earth, would be the true meridian. But the star being at a distance from the pole equal to 1°30′ nearly, it performs a revolution about the pole in a circle, the polar distance of which is 1°30′; the time of revolution is 23 hours and 56 minutes.

To the eye of an observer this star is continually in motion, and is due north but twice in 23 hours and 56 minutes; and is then said to be on the meridian. Now, when it departs from the meridian, it apparently moves east or west for 5 hours and 59 minutes, and then returns to the meridian again.

When at its greatest distance from the meridian, east or west, it is said to be at its *eastern or western elongation.*

The following tables show the times of its eastern and western elongations:

Time of elongation of Polaris (a Ursa Min.), April 1, 1883, to April 1, 1884, computed for north latitude 38°, and which will serve for all latitudes from 26° to 50° north, and for all dates from April, 1878, to April, 1888, with an error of less than five minutes.

[The times are reckoned from noon (astronomical time).]

EASTERN ELONGATIONS.

Day.	April.	May.	June.	July.	August.	September.
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
1.....	18 37	16 39	14 37	12 39	10 37	8 36
7.....	18 14	16 16	14 14	12 16	10 14	8 12
13.....	17 50	15 52	13 50	11 52	9 50	7 48
19.....	17 26	15 28	13 26	11 29	9 27	7 25
25.....	17 03	15 05	13 03	11 05	9 03	7 01

WESTERN ELONGATIONS.

Day.	October.	November.	December.	January.	February.	March.
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
1.....	18 27	16 25	14 28	12 26	10 24	8 30
7.....	18 04	16 02	14 04	12 02	10 00	8 06
13.....	17 40	15 38	13 40	11 39	9 37	7 43
19.....	17 17	15 15	13 17	11 15	9 13	7 19
25.....	16 53	14 51	12 53	10 51	8 49	6 55

The eastern elongations are put down from the beginning of April to the end of September, and the western from the beginning of October to the end of March. The time is computed from noon. The western elongations in the first case, and the eastern in the second, occurring in the day-time, cannot be used. Some of those put down are also invisible, occurring in the evening before it is dark, or after daylight in the morning.

-55-

In such case, if it be necessary to determine the meridian at that particular season of the year, let 5 hours 59 minutes be added to or subtracted from the time of greatest eastern or western elongation, and the observation be made at night when the star is on the meridian.

The following table exhibits the angle which the meridian plane makes with the vertical plane passing through the pole-star when at its greatest eastern or western elongation; such angle is called the *azimuth.*

The mean angle only is put down, being calculated for the first of July of each year.

Azimuth of Polaris (a Ursa Min.) at elongation, 1878 to 1888.

(Latitude 2°6 to 50° north.)

	26°	28°	30°	32°	34°	36°	38°	40°	42°	44°	46°	48°	50°
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1878.....	1 29½	1 31¼	1 33	1 35	1 37¼	1 39½	1 42¼	1 45¼	1 48½	1 52	1 56	2 00½	2 05¼
1879.....	29¼	30¾	32¾	34½	36¾	39¼	41¾	44¾	48	51½	55½	2 00	04¾
1880.....	29	30½	32¼	34¼	36½	38¾	41½	44¼	47½	51	55	1 59½	04¼
1881.....	28½	30¼	32	33¾	36	38½	41	44	47	50¾	54½	59	03¾
1882.....	28¼	29¾	31½	33½	35¾	38	40½	43½	46¾	50¼	54¼	58½	03¼
1883.....	28	28½	31¼	33	35¼	37½	40¼	43q	46¼	49¾	53¼	58	02¾
1884.....	27⅛	29	30¾	32¾	35	37¼	39¾	42¾	45¾	49¼	53¼	57½	02¼
1885.....	27¼	28¾	30½	32¼	34½	36¾	39¼	42¼	45½	49	52¾	57	02
1886.....	26¾	28¼	30	32	34	36½	39	41¾	45	48½	52¼	56½	01½
1887.....	26½	28	29¾	31½	33¾	36	38½	41½	44½	48	51¾	56¼	01
1888.....	26	27¾	29¼	31¼	33¼	35¾	38¼	41	44	47½	51½	55¾	00½

TO FIND THE TRUE MERIDIAN WITH THE THEODOLITE.

Take a board, of about one foot square, paste white paper upon it, and perforate it through the center; the diameter of the hole being somewhat larger than the diameter of the telescope of the theodolite. Let this board be so fixed to a vertical staff as to slide up and down freely; and let a small piece of board, about three inches square, be nailed to the lower edge of it, for the purpose of holding a candle.

About twenty-five minutes before the time of the greatest eastern or western elongation of the pole-star, as shown by the tables of elongations, let the theodolite be placed at a convenient point and leveled. Let the board be placed about one foot in front of the theodolite, a lamp or candle placed on the shelf at its lower edge; and let the board be slipped up or down, until the pole-star can be seen through the hole. The light reflected from the paper will show the cross hairs in the telescope of the theodolite.

Then, let the vertical spider's line be brought exactly upon the pole-star, and if it is an eastern elongation that is to be observed, and the star has not yet reached the most easterly point, it will move from the line toward the east, and the reverse when the elongation is west.

At the time the star attains its greatest elongation, it will appear to coincide with the vertical spider's line for some time, and then leave it, in the direction contrary to its former motion.

As the star moves toward the point of greatest elongation, the telescope must be continually directed to it, by means of the tangent screw of the vernier plate; and when the star has attained its greatest elongation, great care should be taken that the instrument be not afterward moved.

Now, if it be not convenient to leave the instrument in its place until daylight, let a staff, with a candle or small lamp upon its upper extremity, be arranged at thirty or forty yards from the theodolite, and in the

-56-

same vertical plane with the axis of the telescope. This is easily effected, by revolving the vertical limb about its horizontal axis without moving the vernier plate, and aligning the staff to coincide with the vertical hair. Then mark the

point directly under the theodolite; the line passing through this point and the staff, makes an angle with the true meridian equal to the azimuth of the pole star.

From the table of azimuths, take the azimuth corresponding to the year and nearest latitude. If the observed elongation was east, the true meridian lies on the west of the line which has been found, and makes with it an angle equal to the azimuth. If the elongation was west, the true meridian lies on the east of the line; and, in either case, laying off the azimuth angle with the theodolite, gives the true meridian.

TO FIND THE TRUE MERIDIAN WITH THE COMPASS.

1. Drive two posts firmly into the ground, in a line nearly east and west; the uppermost ends, after the posts are driven, being about three feet above the surface, and the posts about four feet apart; then lay a plank, or piece of timber three or four inches in width, and smooth on the upper side, upon the posts, and let it be pinned or nailed, to hold it firmly.

2. Prepare a piece of board four or five inches square, and smooth on the under side. Let one of the compass sights be placed at right angles to the upper surface of the board, and let a nail be driven through the board, so that it can be tacked to the timber resting on the posts.

3. At about twelve feet from the stakes, and in the direction of the pole star, let a plumb be suspended from the top of an inclined stake or pole. The top of the pole should be of such a height that the pole star will appear about six inches below it; and the plumb should be swung in a vessel of water to prevent it from vibrating.

This being done, about twenty minutes before the time of elongation place the board to which the compass sight is fastened on the horizontal plank, and slide it east or west until the aperture of the compass sight, the plumb line, and the star are brought into the same range. Then if the star depart from the plumb line move the compass sight east or west along the timber, as the case may be, until the star shall attain its greatest elongation, when it will continue behind the plumb line for several minutes, and will then recede from it in the direction contrary to its motion before it became stationary. Let the compass sight be now fastened to the horizontal plank. During this observation it will be necessary to have the plumb line lighted; this may be done by an assistant holding a candle near it.

Let now a staff, with a candle or lamp upon it, be placed at a distance of thirty or forty yards from the plumb line, and in the same direction with it and the compass sight. The line so determined makes, with the true meridian, an angle equal to the azimuth of the pole star; and from this line the variation of the needle is readily determined, even without tracing the true meridian on the ground.

Place the compass upon this line, turn the sights in the direction of it, and note the angle shown by the needle. Now, if the elongation at the time of observation was west, and the north end of the needle is on the west side of the line, the azimuth, plus the angle shown by the needle, is the true variation. But should the north end of the needle be found on the east side ofthe line, the elongation being west, the difference between the azimuth and the angle would show the variation, and the reverse when the elongation is east.

-57-

1. Elongation west, azimuth			2°04′
North end of the needle on the west, angle	4°06′		
Variation	6°10′	west.	
2. Elongation west, azimuth			4°59′
North end of the needle on the east, angle	4°50′		
Variation	2°51′	east.	
3. Elongation east, azimuth			2°05′
North end of the needle on the west, angle	8°30′		
Variation	6°25′	west.	
4. Elongation east, azimuth			1°57′
North end of the needle on the east, angle	8°40′		
Variation	10°37′	east.	

The variation at West Point in September, 1835, was 6° 32′ west.

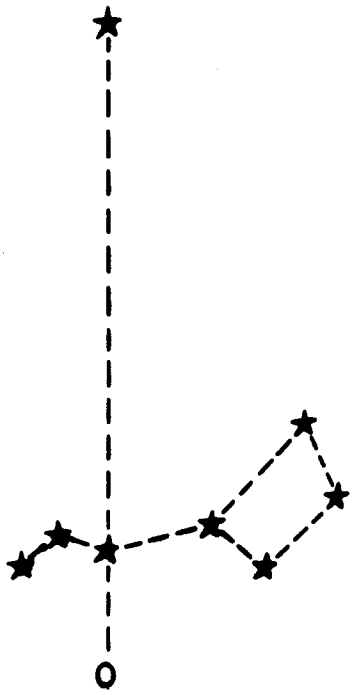
The variation of the needle should always be noted on every survey made with the compass, and then if the land be surveyed at a future time the old lines can always be rerun.

It has been found by observation that heat and cold sensibly affect the magnetic needle, and that the same needle will at the same place indicate different lines at different hours of the day.

If the magnetic meridian be observed early in the morning, and again at different hours of the day, it will be found that the needle will continue to recede from the meridian as the day advances, until about the time of the highest temperature, when it will begin to return, and at evening will make the same line as in the morning. This change is called the *diurnal variation,* and varies, during the summer season, from one-fourth to one-fifth of a degree.

A very near approximation to a true meridian, and consequently to the variation, may be had, by remembering that the pole star very nearly reaches the true meridian when it is in the same vertical plane with the star Alioth in the tail of the Great Bear, which lies nearest the four stars forming the quadrilateral.

The vertical position can be ascertained by means of a plumb line. To see the spider's lines in the field of the telescope at the same time with the star, a faint light should be placed near the object glass. When the plumb line, the star Alioth, and the north star fall on the vertical spider's line, the horizontal limb is firmly clamped and the telescope brought down to the horizon; a light, seen through a small aperture in a board, and held at some distance by an assistant, is then moved according to signals, until it is covered by the intersection of the spider's lines. A picket driven into the ground, under the light, serves to mark the meridian line for reference by day, when the angle formed by it and the magnetic meridian may be measured.



[Pages 58 and 59 are deleted. They contain a table of latitudes and departures, and a table of offsets from the tangent to the parallel.]

DIAGRAM A

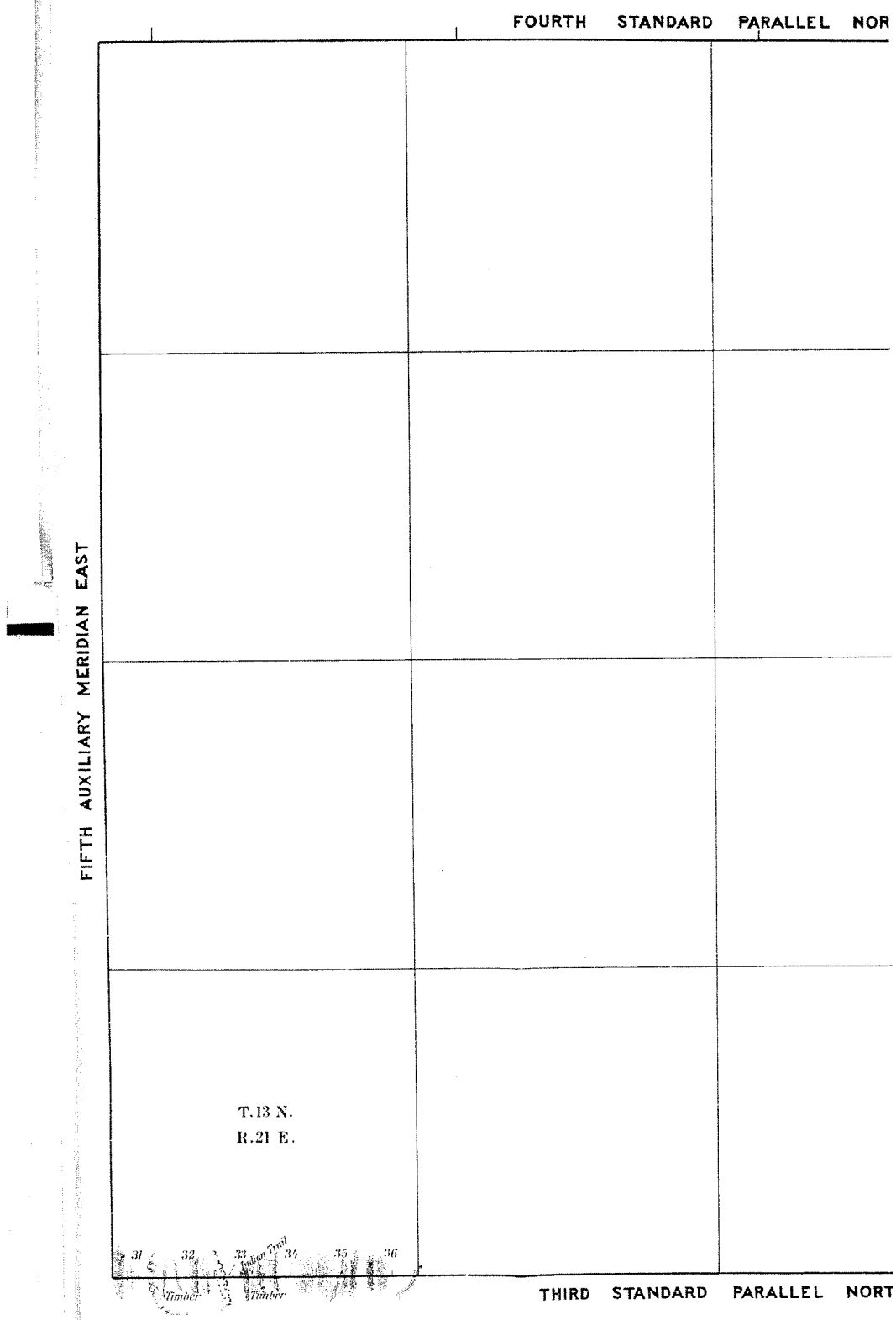

FOURTH STANDARD PARALLEL NOR
FIFTH AUXILIARY MERIDIAN EAST
T.13 N.
R.21 E.
31
32
33
Indian Trail
34
35
36
Timber
Timber
THIRD STANDARD PARALLEL NORT

DIAGRAM A

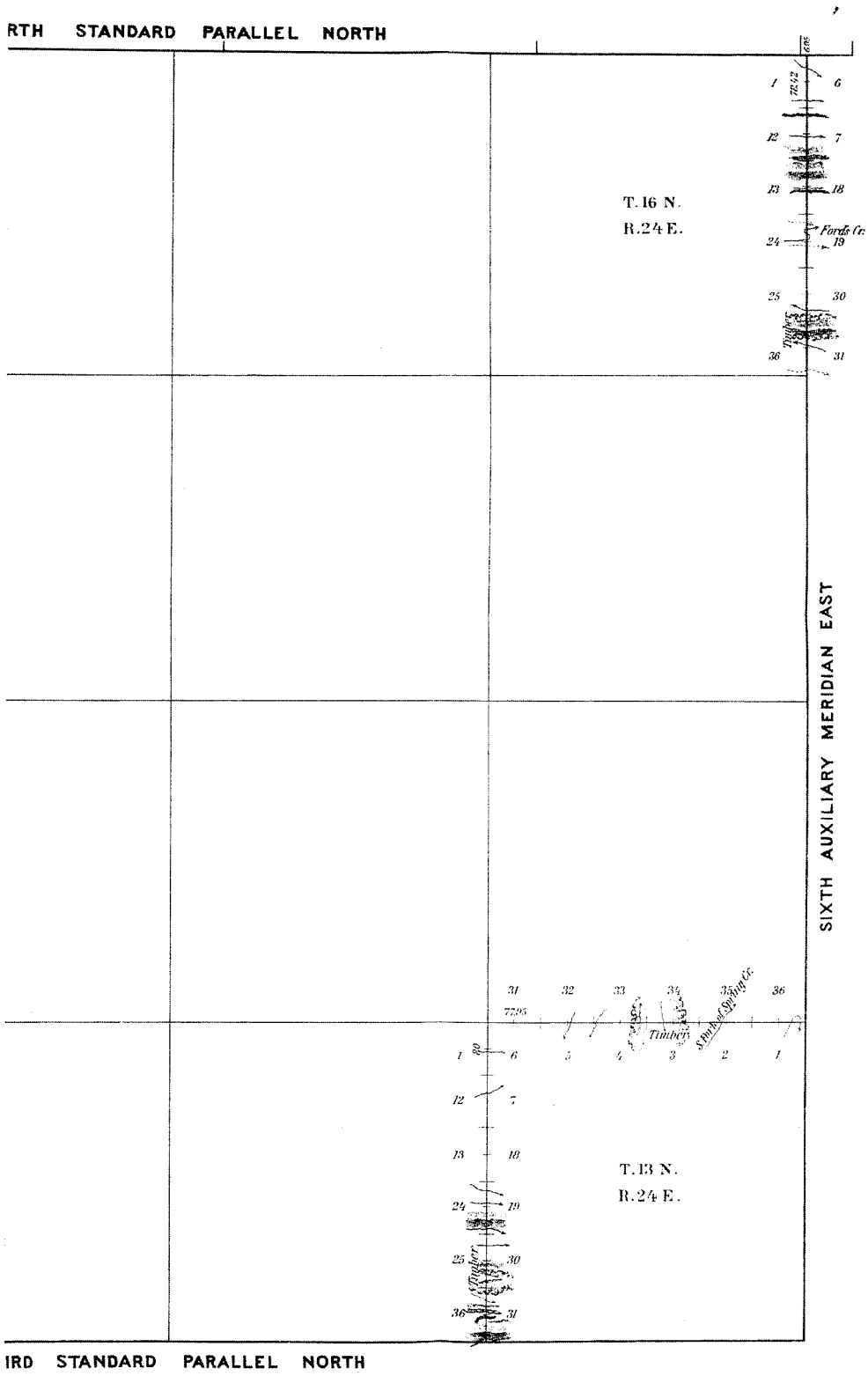
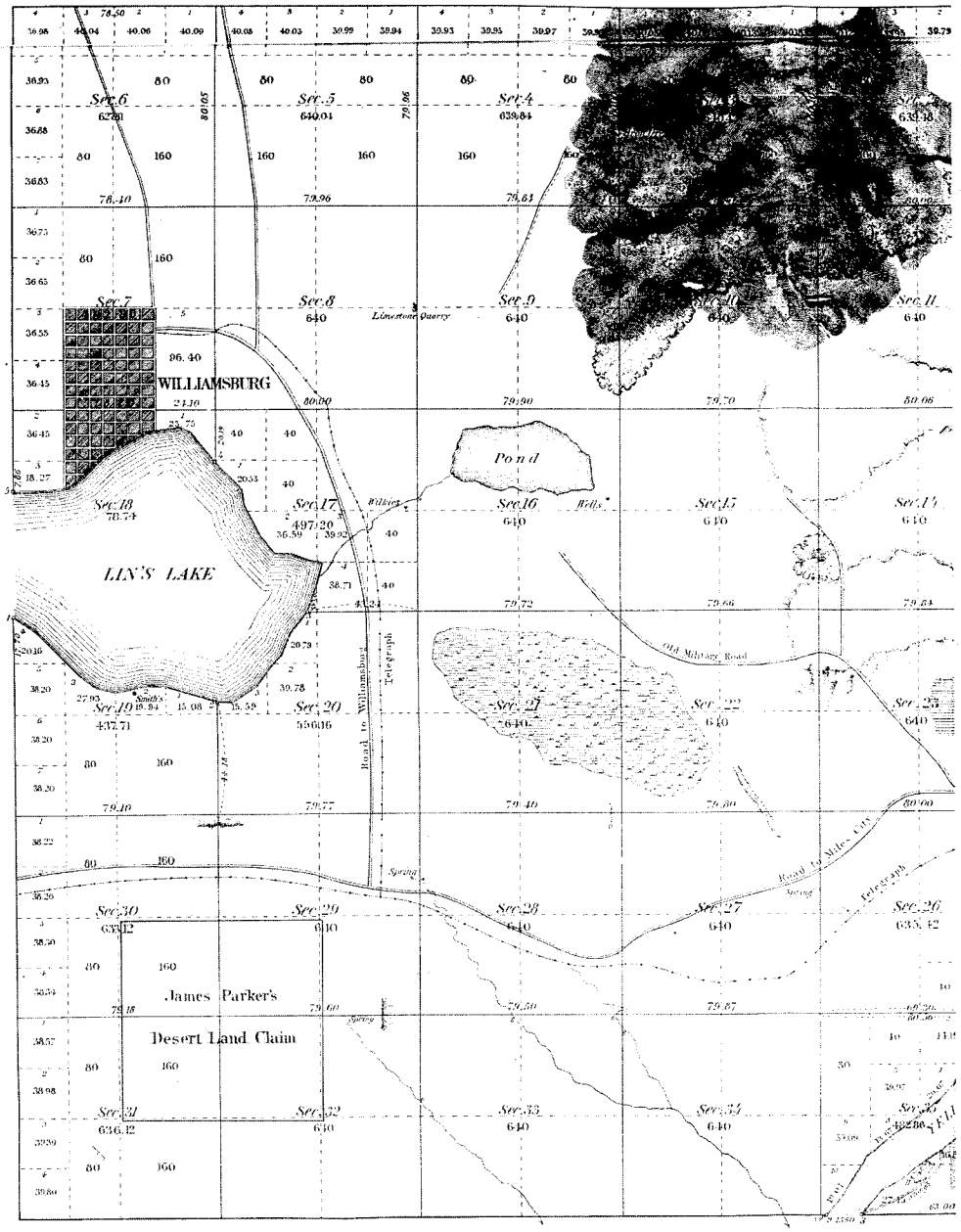

RTH STANDARD PARALLEL NORTH
T. 16 N.
R. 24 E.
Fords Cr.
Timber
SIXTH AUXILIARY MERIDIAN EAST
Timber
T. 13 N.
R. 24 E.
Timber
IRD STANDARD PARALLEL NORTH

DIAGRAM B

TOWNSHIP Nº 6 NORTH RANGE Nº 34 EAST OF THE PRI

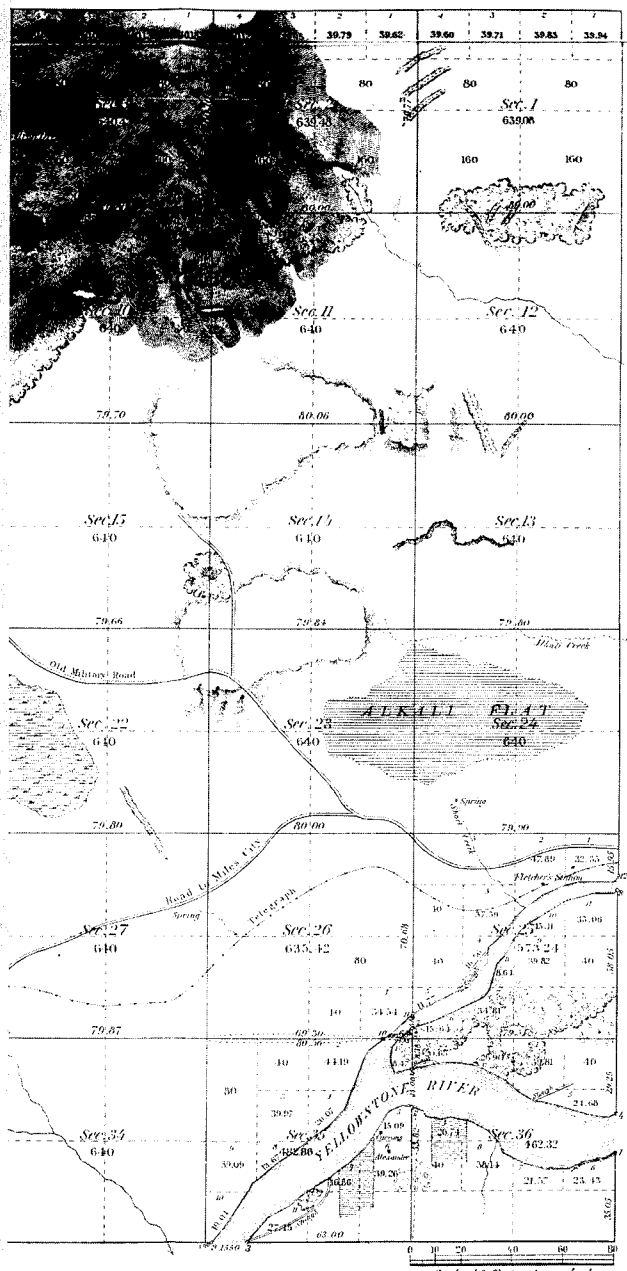


Area of Public Land 21462.71 Acres, — of Water Surface 1310.96 Acres, — of Town Site 207.10 Acres, — Total number of Acres = 22980.7

Surveys Designated	*By Whom Surveyed*	*Date of Contract*	*Amount of Surveys*			*When Surveyed*	*Mean Declinatio*
			Mls	*Chs*	*Lks*		
Township Lines							
Subdivisions	*Walter W. de Lacy*	*March 22nd 1879*	*57*	*26*	*99*	*Aug. 6th to 16th 1880*	*18° 37' 30"*
Meanders	"	"	*11*	*46*	*09*	"	

DIAGRAM B

34 EAST OF THE PRINCIPAL MERIDIAN MONTANA



Meanders of Yellowstone River

Bearing	Chains	Links
Right Bank		
Sec. 36		
1 S. 65¾° W.	4	00
S. 73¾° W.	7	50
S. 63¾° W.	2	00
S. 89½° W.	8	50
N. 72½° W.	10	00
N. 60° W.	7	00
N. 33½° W.	1	70
N. 50° W.	7	80
N. 60° W.	4	80
N. 72½° W.	3	50
N. 70° W.	3	80
S. 77½° W.	3	50
N. 80½° W.	5	00
N. 71° W.	2	50
N. 25½° W.	2	50
N. 71½° W.	3	50
2 N. 76° W.	1	50
Sec. 35		
2 S. 86½° W.	2	50
S. 74½° W.	3	50
S. 65° W.	2	50
S. 34½° W.	11	00
S. 28½° W.	5	00
S. 16½° W.	9	00
S. 34½° W.	5	00
S. 44½° W.	7	00
S. 65° W.	2	00
S. 55½° W.	8	70
S. 55° W.	2	00
S. 48½° W.	5	00
S. 56½° W.	8	70
3 S. 50½° W.	16	12
Island in Secs. 25, 26, 35 & 36		
Sec. 36		
4 S. 70½° W.	2	50
S. 86° W.	3	00
N. 81° W.	8	50
N. 68½° W.	7	00
N. 73½° W.	7	50
N. 82° W.	3	50
N. 61½° W.	1	50
N. 60½° W.	3	50
N. 55½° W.	2	50
N. 61½° W.	2	00
N. 57½° W.	4	00
N. 62½° W.	8	50
N. 71½° W.	4	00
N. 77½° W.	5	80
N. 88½° W.	2	50
N. 80½° W.	2	00
5 N. 88½° W.	3	75
Sec. 35		
5 N. 70° W.	6	70
N. 15½° W.	3	00
N. 7½° W.	3	50
N. 17½° E.	3	20
6 N. 50° E.	2	20
Sec. 26		
6 bis N. 52½° E.	6	05
Sec. 25		
7 N. 64° E.	2	50
N. 69½° E.	8	50
N. 63° E.	9	50
N. 65½° E.	9	70
N. 59° E.	4	50
N. 53° E.	2	50
N. 15½° E.	9	00
N. 46½° E.	4	00
N. 27½° E.	7	50
N. 34½° E.	4	70
N. 45½° E.	4	60
Sec. 23 Cont^d		
N. 61½° E.	17	00
N. 74½° E.	11	00
N. 82½° E.	6	50
8 N. 34½° E.	0	60
Left Bank		
Sec. 35		
9 N. 57° E.	2	80
N. 37½° E.	6	50
N. 31° E.	3	50
N. 31½° E.	6	50
N. 38½° E.	7	10
N. 37° E.	2	70
N. 33½° E.	5	00
N. 57½° E.	1	90
N. 51½° E.	6	00
N. 34½° E.	12	00
N. 32½° E.	6	00
N. 47½° E.	3	90
N. 50½° E.	8	50
N. 20½° E.	7	60
N. 31° E.	3	70
N. 13½° E.	0	70
N. 33½° E.	3	60
10 N. 50½° E.	6	50
Sec. 26		
10 N. 59° E.	4	60
N. 43½° E.	7	80
11 N. 19° E.	2	05
Sec. 25		
11 N. 65½° E.	7	50
N. 63½° E.	5	50
N. 61½° E.	17	00
N. 40½° E.	3	60
N. 35° E.	2	70
N. 27½° E.	2	50
N. 19° E.	2	70
N. 49½° E.	9	00
N. 35° E.	1	70
N. 41° E.	4	60
N. 50½° E.	5	00
N. 49½° E.	3	00
N. 45° E.	3	00
N. 50½° E.	2	60
N. 62½° E.	11	50
N. 72° E.	3	70
S. 67½° E.	13	00
12 N. 67½° E.	0	80
Lin's Lake		
Sec. 19		
1 N. 59° E.	8	80
S. 46½° E.	3	50
S. 44° E.	2	50
S. 43½° E.	5	70
S. 43° E.	4	50
S. 46½° E.	5	50
S. 52½° E.	3	80
S. 55½° E.	1	50
S. 70½° E.	5	50
S. 75½° E.	3	00
S. 80° E.	4	00
S. 78° E.	9	00
S. 88½° E.	6	50
S. 72½° E.	6	70
2 S. 71½° E.	10	00
Sec. 20		
2 S. 82° E.	6	20
N. 65½° E.	11	50
N. 52½° E.	9	50
N. 48½° E.	6	50
N. 31½° E.	5	00
N. 24½° E.	3	90
N. 22½° E.	2	10
N. 33° E.	2	50
N. 32½° E.	3	50
Sec. 20 Cont^d		
3 N. 51½° E.	3	50
Sec. 17		
3 N. 20° E.	11	00
N. 85° W.	10	10
N. 83½° W.	2	00
N. 76° W.	2	50
N. 69½° W.	7	00
N. 80½° W.	6	10
N. 83½° W.	8	00
N. 20½° W.	14	00
N. 13½° W.	6	80
N. 39° W.	2	50
N. 47½° W.	6	00
N. 49½° W.	5	00
N. 53½° W.	3	50
4 N. 49½° W.	0	20
Sec. 18		
4 N. 38½° W.	13	00
N. 63½° W.	5	00
N. 81° W.	13	00
S. 61½° W.	19	00
N. 43° W.	13	00
N. 55° W.	4	00
N. 74½° W.	4	70
N. 85½° W.	5	60
5 N. 88½° W.	12	47
Total Meanders		
11 Mi. 46 Ch. 09 Lks.		

Site 207.10 Acres. Total number of Acres = 22950.77

Surveys	When Surveyed	Mean Declination
Lks		
99	Aug. 6th to 16th 1880	16° 37' 30"
09	"	

The above Map of Township No 6 North, of Range No 34 East of the Principal Meridian Montana, is strictly conformable to the field notes of the survey thereof on file in this Office which have been examined and approved.

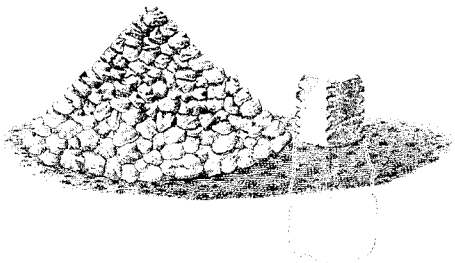
Surveyor Generals Office

Surv. Genl

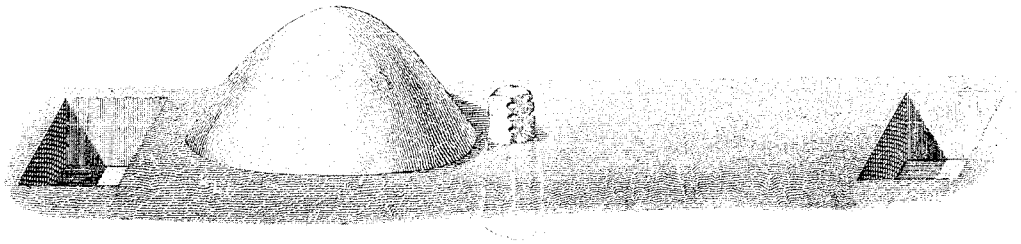
Sheet N°1

DIAGRAM C

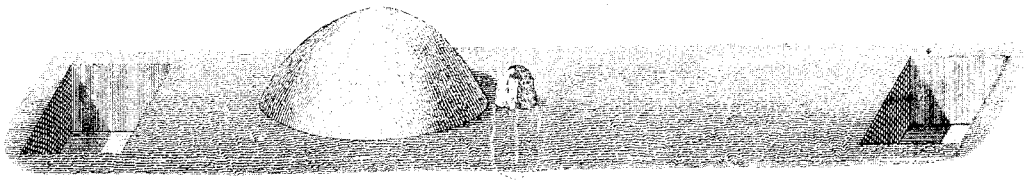
Illustrating mode of establishing Stone, Post and Mound Corners



Township Corner Stone with mound of Stone



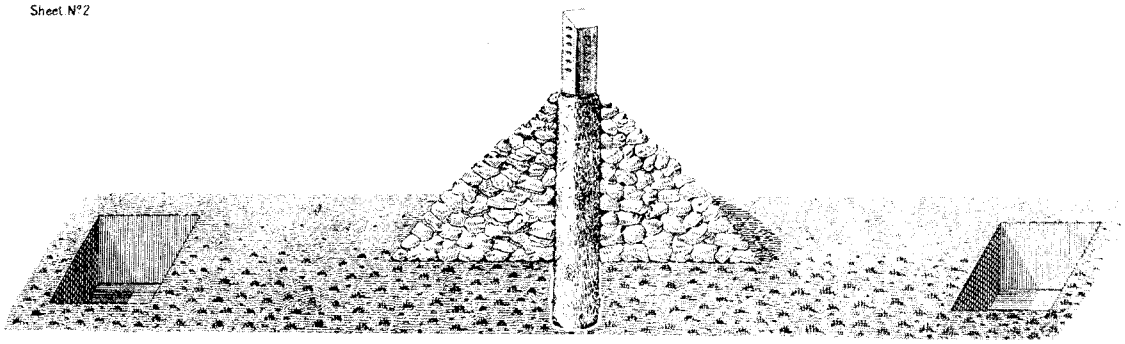
Section Corner Stone with pits and mound of earth



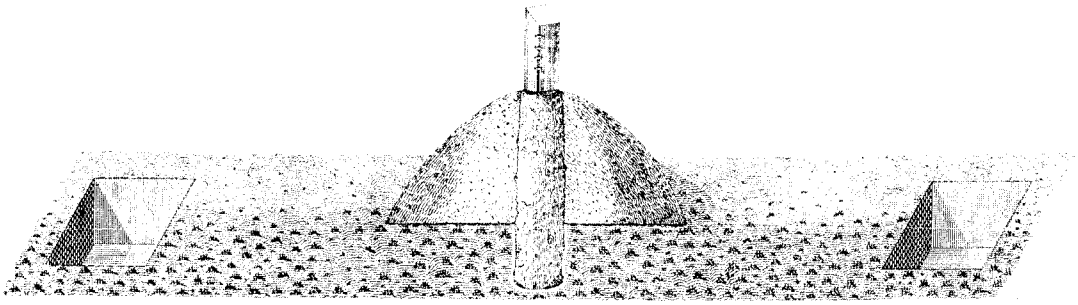
Quarter Section Corner with mound of earth

DIAGRAM C

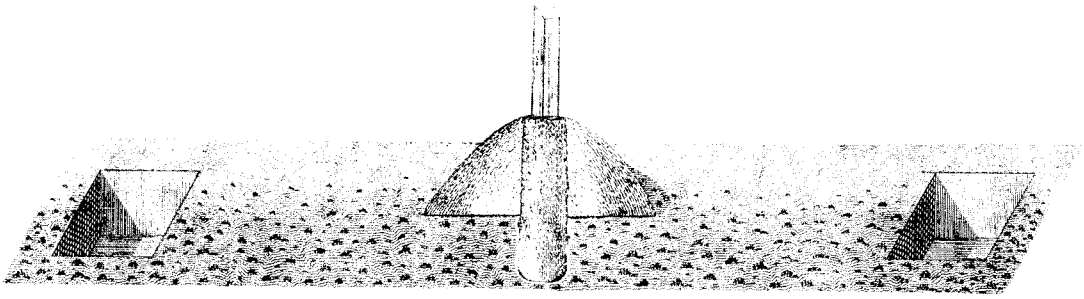
Sheet N°2



Township Corner Post on Standard Line with mound of stone



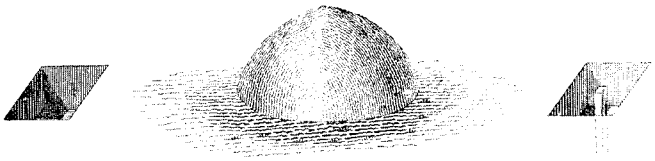
Section Corner Post with mound of earth



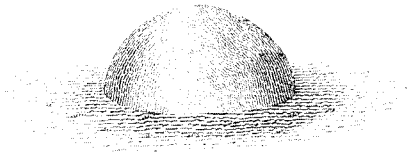
Quarter Section Corner Post with mound of earth

Sheet N°3

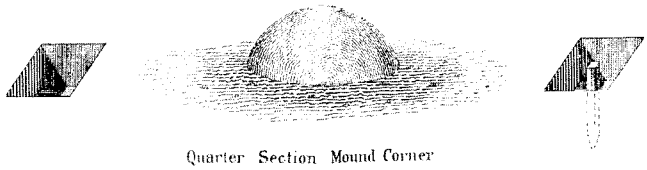
DIAGRAM C



Mound Corner on Standard Line



Mound Corner Common to 4 Sections



Quarter Section Mound Corner

(This Circular pamphlet is copied from an original now in the possession of the National Archives.)

RESTORATION OF LOST AND OBLITERATED CORNERS.

GENERAL LAND OFFICE,
MARCH 13, 1883.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1883.

[Revised in 1885, only change was the date on the cover.]

RESTORATION OF LOST AND OBLITERATED CORNERS.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., March 13, 1883.

The increasing number of letters from county and local surveyors received at this office, making inquiry as to the proper method of restoring to their original position lost or obliterated corners marking the survey of the public lands of the United States, or such as have been willfully or accidentally moved from their original position, have rendered the preparation of the following general rules necessary, particularly as in a very large number of cases the immediate facts necessary to a thorough and intelligent understanding are omitted. Moreover, surveys having been made under the authority of different acts of Congress, different results have been obtained, and no special law has been enacted by that authority covering and regulating the subject of the above-named inquiries. Hence the general rules here given must be considered merely as an expression of the opinion of this office on the subject, based, however, upon the spirit of the several acts of Congress authorizing the surveys, as construed by this office. When cases arise which are not covered by these rules, and the advice of this office is desired, the letter of inquiry should always contain a description of the particular corner with reference to the township, range, and section of the public surveys, to enable this office to consult the record.

To restore extinct boundaries of the public lands correctly, the surveyor must have some knowledge of the manner in which townships were subdivided by the several methods authorized by Congress. Without this knowledge he may be greatly embarrassed in the field, and is liable to make mistakes invalidating his work, and leading eventually to serious litigation. It is believed that the following synopsis of the several acts of Congress regulating the surveys of the public lands will be of service to county surveyors and others, and will help to explain many of the difficulties encountered by them in the settlement of such questions.

The differences resulting from Congressional legislation at different periods resulted in *two* sets of corners being established on *township lines* at one time; at another time *three* sets of corners were established on *range lines,* while the system now in operation makes but *one* set of corners on *township boundaries*, except on standard lines, i. e., base and correction lines, and in some exceptional cases.

The following brief explanation of the modes which have been practiced will be of service to all who may be called upon to restore obliterated boundaries of the public land surveys:

Where two sets of corners were established on township boundaries one set was planted at the time the exteriors were run, those on the

-3-

-4-

north boundary belonging to the sections and quarter sections north of said line, and those on the west boundary belonging to the sections and quarter sections west of that line. The other set of corners was established when the township was subdivided. This method, as stated, resulted in the establishment of two sets of corners on all four sides of the townships.

Where three sets of corners were established on the range lines, the subdivisional surveys were made in the above manner, except that the east and west section lines, instead of being closed upon the corners previously established on the east boundary of the township, were run due east from the last interior section corner, and new corners were erected at the points of intersection with the range line.

The method now in practice requires section lines to be initiated from the corners on the south boundary of the township, and to close on existing corners on the east, north, and west boundaries of the township, except when the north boundary is a base line or standard parallel.

SYNOPSIS OF ACTS OF CONGRESS.

The first enactment in regard to the surveying of the public lands was an ordinance passed by the Congress of the Confederation, May 20, 1785, prescribing the mode for the survey of the "Western Territory," and which provided that said territory should be divided into "townships of six miles square, by lines running due north and south, and others crossing them at right angles" as near as might be.[1]

It further provided that the first line running north and south should begin on the Ohio River, at a point due north from the western terminus of a line run as the south boundary of the State of Pennsylvania, and the first line running east and west should begin at the same point, and extend through the whole territory. In these initial surveys only the exterior lines of the townships were surveyed, but the plats were marked by subdivisions into sections of one mile square, numbered from 1 to 36, commencing with No. 1 in the southeast corner of the township, and running from south to north in each tier to No. 36 in the northwest corner of the township; mile corners were established on the township lines. The region embraced by the surveys under this law forms a part of the present State of Ohio, and is generally known as "the Seven Ranges."

The Federal Congress passed a law, approved May 18, 1796, in regard to surveying the public domain, and applied to "the territory northwest of the Ohio River, and above the mouth of the Kentucky River."[2]

Section 2, of said act, provided for dividing such lands as had not been already surveyed or disposed of, "by north and south lines run according to the true meridian, and by others crossing them at right angles, so as to form townships of 6 miles square," &c. It also provided that "one half of said townships, taking them alternately, should be subdivided into sections containing, as nearly as may be, 640 acres each, by running parallel lines through the same each way at the end of every two miles, and marking a corner on each of said lines at the end of every mile." The act also provided that "the

1. Ordinance of the Congress of the Confederation, of May 20, 1785. U. S. Land Laws, p. 349. Edition 1828.

2. Act of May 18, 1796. U. S. Statutes at Large, vol. 1, p 465. Section 2395, U. S. Revised Statutes.

sections shall be numbered, respectively, beginning with the number one in the northeast section, and proceeding west and east alternately through the township, with progressive numbers till the thirty-sixth be completed." This method of numbering sections is still in use.

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An act amendatory of the foregoing, approved May 10, 1800, required the "townships west of the Muskingum, which are directed to be sold in 1 quarter townships, be subdivided into half sections of 320 acres each, as nearly as may be, by running parallel lines through the same from east to west, and from north to south, at the distance of one mile from each other, and marking corners, at the distance of each half mile on the lines running east and west, and at the distance of each mile on those running from south to north. And the interior lines of townships intersected by the Muskingum, and of all townships lying east of that river, wich have not been heretofore actually subdivided into sections, shall also be run and marked. And in all cases where the exterior lines of the townships thus to be subdivided into sections or half sections shall exceed, or shall not extend six miles, the excess or deficiency shall be specially noted, and added to or deducted from the western or northern ranges of sections or half sections in such townships, according as the error may be in running the lines from east to west or from south to north." Said act also provided that the northern and western tier of sections should be sold as containing only the quantity expressed on the plats, and all others as containing the complete legal quantity.[3]

The act approved June 1, 1796, "regulating the grants of land appropriated for military services," &c., provided for dividing the "Virginia Military Tract," in the State of Ohio, into townships 5 miles square, each to be subdivided into quarter townships containing 4,000 acres.[4]

Section 6 of the act approved March 1, 1800, amendatory of the foregoing act, enacted that the Secretary of the Treasury was authorized to subdivide the quarter townships into lots of 100 acres, bounded as nearly as practicable by parallel lines 160 perches in length by 100 perches in width. These subdivisions into lots, however, were made upon the plats in the office of the Secretary of the Treasury, and the actual survey was only made at a subsequent time when a sufficient number of such lots had been located to warrant the survey. It thus happened, in some instances, that when the survey came to be made the plat and survey could not be made to agree, and that fractional lots on plats were entirely crowded out. A knowledge of this fact may explain some of the difficulties met with in the district thus subdivided.[5]

The act of Congress approved February 11, 1805, directs the subdivision of the public lands into quarter quarter sections, and provides that all corners marked in the field shall be established as the proper corners of the sections or quarter sections which they were intended to designate, and that corners of half and quarter sections not marked shall be placed as nearly as possible "equidistant from those two corners which stand on the same line." This act further provides that "the boundary lines actually run and marked" (in the field) "shall be established as the proper boundary lines of the sections or subdivisions for which they were intended; and the length of such lines as returned by the surveyors shall be held and considered as the true length thereof, and the boundary lines which shall not have been actually run and marked as aforesaid shall be ascertained by running straight lines from the established corners to the opposite corresponding corners, but in those fractional townships where no such opposite or corresponding corners have been or can be fixed, the said boundary line shall be ascertained by running from the established corners due north and south, or east and

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west, as the case may be, to the external boundary of such fractional township."[6]

The act of Congress approved April 24, 1820, provides for the sale of public lands in half quarter sections, and requires "that in every case of the division of a quarter section the line for the division thereof shall run north and south, and fractional sections, containing 160 acres and upwards, shall in like manner, as nearly as practicable, be subdivided into half quarter sections, under such rules and regulations as may be prescribed by the Secretary of the Treasury; but fractional sections, containing less than 160 acres, shall not be divided."[7]

The act of Congress approved May 24, 1824, provides "that whenever, in the opinion of the President of the United States, a departure from the ordinary mode of surveying land on any river, lake, bayou, or water course would promote the public interest, he may direct the surveyor general in whose district such land is situated, and where the change is intended to be made, under rules and regulations as the President may prescribe, to cause the lands thus situated to be surveyed in tracts of two acres in width, fronting on any river, bayou, lake, or water course, and running back the depth of forty acres."[8]

The act of Congress approved April 5, 1832, directed the subdivision of the public lands into quarter quarters; that in every case of the division of a half quarter section the dividing line should run east and west, and that fractional sections should be subdivided, under rules and regulations prescribed by the Secretary of the Treasury. Under the latter provision the Secretary directed that fractional sections containing less than 160 acres, or the residuary portion of a fractional section, after the subdivision into as many quarter quarter sections as it is susceptible of, may be subdivided into lots, each containing the quantity of a quarter quarter section as nearly as practicable, by so laying down the line of subdivision that they shall be 20 chains wide, which distances are to

3. Act of May 10, 1800. U. S. Statutes at Large, vol. 2, p. 73. Section 2395, U. S. Revised Statutes.

4. Act of June 1, 1796. U. S. Statutes at Large, vol. 1, p. 490.

5. Act of March 1, 1800. U. S. Statutes at Large, vol. 2, p. 14.

6. Act of February 11, 1805. U. S. Statutes at Large, vol. 2, p 313. Section 2396, U. S. Revised Statutes.

7. Act of April 24, 1820. U. S. Statutes at Large, vol. 3, p. 566. Section 2397, U. S. Revised Statutes.

8. Act of May 24, 1824. U. S. Statutes at Large, vol. 4, p. 34.

be marked on the plat of subdivision, as are also the areas of the quarter quarters and residuary fractions.[9]

These two acts last mentioned provided that the corners and contents of half quarters and quarter quarter sections should be ascertained as nearly as possible in the manner and on the principles prescribed in the act of Congress approved February 11, 1805.

From the foregoing synopsis of Congressional legislation it is evident—

1st. That the boundaries of the public lands established and returned by the duly appointed Government surveyors, when approved by the surveyors general and accepted by the Government, are *unchangeable.*

2d. That the original township, section, and quarter section corners established by the Government surveyors must stand as the true corners which they were intended to represent, whether the corners be in place or not.

3d. That quarter quarter corners not established by the Government surveyors must be planted equidistant and on line between the quarter section and section corner.

4th. That all subdivisional lines of a section must be straight lines, running from the proper corner in one exterior line to its opposite corresponding corner in the opposite exterior line.

5th. That in fractional sections where no opposite corresponding corner has been or can be established, any required subdivision line of such section must be run from the proper original corner in the boundary

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line due east and west, or north and south, as the case may be, to the water course, Indian reservation, or other exterior boundary of such section.

From the foregoing it will be plain that extinct corners of the Government surveys must be restored to their original locations, whenever it is possible to do so; and hence resort should always be first had to the marks of the survey in the field. The locus of the missing corner should be first identified on the ground by the aid of the mound, pits, line trees, bearing trees, &c, described in the field notes of the original survey.

The identification of mounds, pits, and witness trees, or other objects noted in the field notes of survey, afford the best means of relocating the missing corner in its original position. If this cannot be done, clear and unquestioned testimony as to the locality it originally occupied should be taken, if such can be at all obtained. In any event, whether the locus of the corner be fixed by the one means or the other, such locus should always be tested and proven by measurements to *known* corners. No definite rule can be laid down as to what shall be sufficient evidence in such cases, and much must be left to the skill, fidelity, and good judgment of the surveyor in the performance of his work.

Where retracements of lines have to be made for the purpose of either testing the relocation of a missing corner, or by direct measurement between known corners intersecting at the point sought to be re-established, it will almost invariably happen that a difference of measurement is developed between the original measurement, as stated in the field notes, and the new measurement made for the purpose of re-establishment or proof. When these differences occur, the surveyor must in all cases re-establish or prove his corners at intervals proportionate to those given in the field notes of the original survey. *From this rule there can be no departure,* since it is the basis upon which the whole operation depends for accuracy and truth.

TO RESTORE LOST OR OBLITERATED CORNERS.

1. *To restore corners on base and correction lines.*—Run a right line between the nearest existing corners on such line, whether base or correction line, which corners must, however, be fully identified, and at the point proportionate to the distance given in the field notes of the original survey, establish a new corner. This point should be verified by measurements to the nearest known corners north or south of the base or correction line, or both.

Where several corners are missing between the corners to be connected, as directed above, their location will be determined upon the same principle and in the same manner; that is to say, the original distance of the entire line between the recognized corners is to the entire distance remeasured between the same corners as the original distance of the first, second, third, &c., interval of the original survey is to the new distance to be laid off for the corresponding new interval. After having checked each new location by measurement to the nearest known corners north or south of the line, new corners will be established permanently, and new bearings and measurements taken to prominent objects, which should be of as permanent a character as possible, and the same recorded for future reference.

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As has been observed, no existing original corner can be disturbed, and it will be plain that any excess or deficiency in measurements between existing corners cannot in any degree affect the distances beyond said existing corners, but must be added or subtracted proportionately to or from the intervals embraced between the corners which are still standing.

2. *Re-establishment of township corners common to four townships.*—Inasmuch as township lines are sometimes run in a direction not true north and south, or east and west, a line should first be run connecting the nearest known corners on the north and south township lines and a temporary corner established at the proportionate distance. This will establish the location of the township corner only so far as its relative position north and south is concerned. The nearest known corners on the east and west township lines will then be connected in the same manner, independent of the temporary corner previously set, and the proportionate point determined in that direction; any difference east or west of the temporary corner which may be developed by the last operation, by intersection with the line previously run north and south, will then be laid off in the direction required from the temporary corner, and a permanent corner established at such point, marked and witnessed as in the foregoing case.

9. Act of April 5, 1832. U. S. Statutes at Large, vol. 4, p. 503. Section 2397, U. S. Revised Statutes.

3. *Re-establishment of corners common to two townships.*—The two nearest known corners on the township line, the same not being a base or a correction line, will be connected as in case No. 1, by a right line, and the missing corner established by proportionate distance as directed in that case; the location thus found will be checked upon by measurements to nearest known section or quarter section corners north and south, or east and west, of the township line as the case may be.

4. *Re-establishment of closing corners.*—Measure from the quarter section, section or township corner east or west, as the case may be, to the next preceding or succeeding corner in the order of original establishment, and re-establish the missing closing corner by proportionate measurement. The line upon which the closing corner was originally established should always be remeasured, in order to check upon the correctness of the new location.

5. *Re-establishment of interior section corners.*—This class of corners should be re-established in the same manner as corners common to four townships. In such cases, when a number of corners are missing on all sides of the one sought to be re-established, the entire distance must, of course, be remeasured between the nearest existing recognized corners both north and south and east and west, in accordance with the rule laid down, and the new corner re-established by proportionate measurement. The mere measurement in any one of the required directions will not suffice, since the direction of the several section lines running northwards through a township, or running east and west, are only in the most exceptional cases true prolongations of the alignment of the section lines initiated on the south boundary of the township; while the east and west lines running through the township, and theoretically supposed to be at right angles with the former, are seldom in that condition, and the alignment of the closing lines on the east and west boundaries of the township, in connection with the interior section lines, even less seldom in accord. Moreover, the alignment of the section line itself from corner to corner, in point of fact, also very frequently diverges from a right line, although presumed to be so from the record contained in the field notes and so designated on the plats, and become either a broken or a curved line. This fact will be determined, in a

timbered country, by the blazes which may be found upon trees on either side of the line, and although such blazed line will not strictly govern as to the absolute direction assumed by such line, it will assist very materially in detemining its approximate direction and should never be neglected in retracements for the re-establishment of lost corners of any description. Sight trees described in the field notes, together with the recorded distances to same, when fully identified, will, it has been held, govern the line itself, even when not in a direct or straight line between established corners, which line is then necessarily a broken line by passing through said sight trees. Such trees, when in existence and properly identified beyond a question of doubt, will very materially assist in evidencing the correct relocation of a missing corner. It is greatly to be regretted that the earlier field notes of survey are so very meager in the notation of the topography found on the original line, which might in very many instances materially lessen a surveyor's labors in retracement of lines and re-establishment of the required missing corner. In the absence of such sight trees and other evidences regarding the line, as in an open country, or where such evidence has been destroyed by time, the elements, or the progress of improvement, the line connecting the known corners should be run straight from corner to corner.

6. *Re-establishment of quarter section corners on township boundaries.*—Only one set of quarter section corners are actually marked in the field on township lines, and they are established at the time when the township exteriors are run. When double section corners are found, the quarter section corners are considered generally as standing midway between the corners of their respective sections, and when required to be established or re-established, as the case may be, they should be generally so placed; but great care should be exercised not to mistake the corners of one section for those of another. After determining the proper section corners marking the line upon which the missing quarter section corner is to be re-established, and measuring said line, the missing quarter section corner will be re-established in accordance with the requirements of the original field notes of survey by proportionate measurement between the section corners marking the line.

Where there are double sets of section corners on township and range lines, and the quarter section corners for sections south of the township or east of the range lines are required to be established in the field, the said quarter section corners should be so placed as to suit the calculation of areas of the quarter sections adjoining the township boundaries as expressed upon the official township plat, adopting proportionate measurements when the present measurements of the north and west boundaries of the section differ from the original measurements.

7. *Re-establishment of quarter section corners on section lines closing upon the north and west township boundaries.*—This class of corners must be re-established according to the original measurement at forty chains from the last interior section corner. If the measurements do not agree with the original survey, the excess or deficiency must be divided proportionately between the two distances, as expressed in the field notes of original survey. The section corner started from and the corner closed upon should be connected by a right line, unless the retracement should develop the fact that the section line is either a broken or curved line, as is sometimes the case.

8. *Re-establishment of interior quarter section corners.*—In some of the older surveys these corners are placed at variable distances, in which case the field notes of the original survey must be consulted, and the

quarter section corner re-established at proportionate distances between the corresponding section corners, in accordance therewith. The later surveys being more uniform and in stricter accordance with law, the missing quarter section corner must be re-established equidistant between the section corners marking the line, according to the field notes of the original survey. The marks made under §5, in relation to

section lines, apply with full force here also; the caution there given not to neglect sight trees is equally applicable; since the proper re-establishment of the quarter section corner may in some instances very largely depend upon its observance, and avoid one of the many sources of litigation.

8. *Where double corners were originally established, one of which is standing, to re-establish the other.*—It being remembered that the corners established when the exterior township lines were run belong to the sections in the townships north and west of those lines, the surveyor must first determine beyond a doubt to which sections the existing corner belongs. This may be done by testing the courses and distances to witness trees or other objects noted in the original field notes of survey, and by remeasuring distances to known corners. Having determined to which township the existing corner belongs, the missing corner may be re-established in line north or south of the existing corner, as the case may be, at the distance stated in the field notes of the original survey, by proportionate measurement, and tested by remeasurement to the opposite corresponding corner of the section to which the missing section corner belongs. These double corners being generally not more than a few chains apart, the distance between them can be more accurately laid off, and it is considered preferable to first establish the missing corner as above, and check upon the corresponding interior corner, than to reverse the proceeding; since the result obtained is every way more accurate and satisfactory.

9. *Where double corners were originally established, and both are missing, to re-establish the one established when the township line was run.*—The surveyor will connect the nearest known corners on the township line, by a right line, being careful to distinguish the section from the closing corners, and re-establish the missing corner at the point indicated by the field notes of the original survey, by proportionate measurement. The corner thus restored will be common to two sections either north or west of the township boundary, and the section north or west, as the case may be, should be carefully retraced; thus checking upon the re-established corner, and testing the accuracy of the result. It cannot be too much impressed upon the surveyor, that any measurements to objects on line noted in the original survey are means of determining and testing the correctness of the operation.

10. *Where double corners were originally established, and both are missing, to re-establish the one established when the township was subdivided.*—The corner to be re-established being common to two sections south or east of the township line, the section line closing on the missing section corner should be first retraced to an intersection with the township line in the manner previously indicated, and a temporary corner established at the point of intersection. The township line will of course have been previously carefully retraced in accordance with the requirements of the original field notes of survey, and marked in such a manner as to be readily identified when reaching the same with the retraced section line. The location of the temporary corner planted at the point of intersection will then be carefully tested and verified by remeasurements to noted objects and known corners on the township line, as noted in the

original field notes of survey, and the necessary corrections made in such relocation. A permanent corner will then be erected at the corrected location on the township line, properly marked and witnessed, and recorded for future requirements.

11. *Where triple corners were originally established on range lines, one or two of which have become obliterated, to re-establish either of them.*—It will be borne in mind that only two corners were established as actual corners of sections, those established on the range line not corresponding with the subdivisional survey east or west of said range line. The surveyor will, therefore, first proceed to identify the existing corner or corners, as the case may be, and then re-establish the missing corner or corners in line north or south, according to the distances stated in the original field notes of survey in the manner indicated for the re-establishment of double corners, and testing the accuracy of the result obtained, as hereinbefore directed in other cases. If, however, the distances between the triple corners are not stated in the original field notes of survey, as is frequently the case in the returns of older surveys, the range line should be first carefully retraced, and marked in a manner sufficiently clear to admit of easy identification upon reaching same during the subsequent porceedings. The section lines closing upon the missing corners must then be retraced in accordance with the original field notes of survey, in the manner previously indicated and directed, and the corners re-established in the manner directed in the case of double corners. The surveyor cannot be too careful, in the matter of retracement, in following closely all the recorded indications of the original line, and nothing, however slight, should be neglected to insure the correctness of the retracement of the original line; since there is no other check upon the accuracy of the re-establishment of the missing corners, unless the entire corresponding section lines are remeasured by proportional measurement, and the result checked by a recalculation of the areas as originally returned, which, at best, is but a very poor check, because the areas expressed upon many plats of the older surveys are erroneously stated on the face of the plats, or have been carelessly calculated.

12. *Where triple corners were originally established on range lines, all of which are missing, to re-establish same.*—These corners should be re-established in accordance with the foregoing directions, commencing with the corner originally established when the range line was run, establishing the same in accordance with previously given directions for restoring section and quarter section corners; that is to say, by remeasuring between the nearest known corners on said township line, and re-establishing the same by proportionate measurement. The two remaining will then be re-established in conformity with the general rules for re-establishment of double corners.

13. *Re-establishment of meander corners and meanders.*—Before proceeding with the re-establishment of missing meander corners, the surveyor will carefully rechain at least three of the section lines between known corners of the

township within which the lost corner is to be relocated, in order to establish the proportionate measurement to be used. This requirement of preliminary remeasurement of section lines must in no case be omitted; since it is the only data upon which the fractional section line can be remeasured proportionately, the corner marking the terminus, or the meander corner, being missing, and which it is intended to re-establish. The missing meander corner will be re-established on the section or township line retraced in its original location, by the proportionate measurement found by the preceding operations, from the

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nearest known corner on such township or section line, in accordance with the requirements of the original field notes of survey. To retrace the original meander lines, between the meander corners re-established as above, is generally an operation of much greater difficulty, owing to the fact that the line connecting the meander corners is, in most instances, a broken line, and is, moreover, unmarked at each point of change in direction intermediate between the said meander corners, thus affording no check upon the work as it progresses through a section. The several deflections of line comprising the meanders in any one section being originally run by compass, their retracement by compass at a later period offers too many opportunities for error; inasmuch as the variation of the needle, as noted in the original field notes of survey, may have undergone violent changes by removal of the cause, such as timber, &c., or increased attractions by exposure of minerals, thus giving no means of correction to be applied in that direction at the time of retracement. Moreover, the variation of the needle as noted is not to be implicitly depended upon, since the observations for variation are in many instances crude and rough, and at best afford but an approximation in such work. It is, therefore, deemed preferable, where such variation has been carefully noted in the original field notes of survey, and the lines have been run with a true meridian throughout, to retrace the meanders by the angles made by the several successive courses. For instance, supposing the first course of a meander in a section to be initiated from a north and south section line, and the course by compass to be N. 30° 15′ E., true meridian, the surveyor will lay off the angle of 30° 15′ in the direction required; the second course being N. 85° 45′ E., makes an angle with the preceding course of 55° 30′; the next course being S. 23° 30′ E. makes an angle with the preceding course of 66° 30′, and so on through the section. The required distances on each course being carefully chained, the excess or deficiency of the aggregate distance should be proportionately distributed on each course between the meander corners from the data thus found; also any error that may develop itself in the angles will be proportionately distributed upon the several angles and the entire meanders corrected in accordance therewith. Where no variation has been noted in the original field notes of survey, the meanders can only be retraced by trial lines, on the courses and distances originally given, and corrected by proportionate measurement of angle and distance as above. The surveyor will, of course, take cognizance of any information furnished by the original field notes of survey, as to objects on each course to which distances may be given or bearings taken, as well as at the meander stations themselves.

14. *Fractional section lines.*—County and local surveyors being sometimes called upon to restore fractional section lines closing upon Indian, military, or other reservations, private grants, &c., such lines should be restored upon the same principles as directed in the foregoing pages, and checked whenever possible upon such corners of monuments as have been placed to mark such boundary lines.

In some instances corners have been moved from their original position, either by accident or design, and county surveyors are called upon to restore such corners to their original positions, but, owing to the absence of any and all means of identification of such location, are unable to make the result of their work acceptable to the owners of the lands affected by such corner. In such cases the advice of this office has invariably been to the effect that the relocation of such corner must be made in accordance with the orders of a court of competent jurisdiction,

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the United States having no longer any authority to order any changes where the lands affected by such corner have been disposed of.

The original evidences of the public land surveys in the following States, viz: Ohio, Indiana, Illinois, Michigan, Wisconsin, Iowa, Missouri, Arkansas, Mississippi, Alabama, and Kansas have been turned over, under the provisions of sections 2218, 2219, and 2220, United States Revised Statutes, to the State authorities, to whom application should be made for such copies of the original plats and field notes as may be desired.

N. C. MCFARLAND,
Commissioner.

DEPARTMENT OF THE INTERIOR,
March 13, 1883.
Approved.

H. M. TELLER,
Secretary.

XLI.

(This Circular No. 119 is copied from an original printing now in the possession of the National Archives.)

CIRCULAR (No. 119)

DEPARTMENT OF THE INTERIOR, GENERAL LAND OFFICE.

Washington, D. C., June 2, 1887.

This Office being in receipt of many letters making inquiry in regard to the proper method of subdividing sections of the public lands, the following general rules have been prepared as a reply to such inquiries. The rules for subdivision are based upon the laws governing the survey of the public lands. When cases arise which are not covered by these rules and the advice of this Office in the matter is desired, the letter of inquiry should, in every instance, contain a description of the particular tract or corner with reference to township, range, and section of the public surveys, to enable the Office to consult the record.

SUBDIVISION OF SECTIONS.

Under the provisions of the act of Congress approved February 11, 1805, the course to be pursued in the subdivision of sections is to run straight lines from the established quarter-section corners, United States surveys, to the opposite corresponding corners, and the point of intersection of the lines so run will be the corner common to the several quarter-sections, or, in other words, the legal center of the section.

In the subdivision of fractional quarter-sections where no opposite corresponding corners have been or can be fixed, the subdivision lines should be ascertained by running from the established corners due north, south, east or west lines, as the case may be, to the water-course, Indian boundary line, or other external boundary of such fractional section.

The law presupposes the section lines surveyed and marked in the field by the United States deputy surveyors to be due north and south or east and west lines, but in actual experience this is not always the case; hence, in order to carry out the spirit of the law, it will be necessary, in running the subdivisional lines through fractional sections, to adopt mean courses where the section lines are not due lines, or to run the subdivision line parallel to the section line when there is no opposite section line.

Upon the lines closing on the north and west boundaries of a township, the quarter-section corners are established by the United States deputy surveyors at precisely forty chains to the north or west of the last interior section corners, and the excess or deficiency in the measurement is thrown on the outer tier of lots, as per act of Congress approved May 10, 1800.

In the subdivision of quarter-sections the quarter-quarter corners are to be placed at points equidistant between the sections and quarter-sec-

tion corners and between the quarter corners and the common center of the section, except on the last half mile of the lines closing on the north or west boundaries of a township, where they should be placed at twenty chains, proportionate measurement, to the north or west of the quarter-section corner.

The subdivision lines of fractional quarter-sections should be run from points on the section lines intermediate between the section and quarter-section corners due north, south, east, or west, to the lake, water-course, or reservation which renders such tracts fractional.

When there are double sets of section corners on township and range lines, the quarter corners for the section south of the township lines and east of the range lines are not established in the field by the United States surveyors, but in subdividing such sections said quarter corner should be so placed as to suit the *calculations of the areas of the quarter-sections adjoining the township boundaries* as expressed upon the official plat, adopting proportionate measurements where the present measurements of the north or west boundaries of the sections differ from the original measurements.

By "proportionate measurement" as used in this circular is meant a measurement having the same ratio to that recorded in the original field notes as the *length of chain* used in the new measurement has to the *length of chain* used in the original survey, assuming that the original measurement was correctly made.

For example: The length of the line from the quarter-section corner on the west side of section 2, township 24 north, range 14 east, Wisconsin, to the north line of the township, by the United States surveyor's chain was reported as 45.40 chains, and by the county surveyor's measure is reported as 42.00 chains, then the distance which the quarter-quarter corner should be located north of the quarter-section corner would be determined as follows:

As 45.40 chains, the Government measure of the whole distance, is to 42.90 chains, the county surveyor's measure of the same distance, so is 20.00 *chains, original measurement,* to 18.90 chains by the county surveyor's measure, showing that by proportionate measurement in this case the quarter-quarter corner would be set at 18.90 chains north of the quarter-section corner instead of at 20.00 chains north of such corner as represented on the official plat. In this manner the deficiency of measurement by the county surveyor's chain from that by the Government surveyor's chain is equitably distributed.

Very respectfully,
WM. A. J. SPARKS,
Commissioner.

Approved June 2, 1887:
H. L. MULDROW,
Acting Secretary.

(This copy of the 1890 Manual is taken from an original in the possession of the BLM, Oregon State Office, Portland.)

MANUAL OF SURVEYING INSTRUCTIONS FOR THE SURVEY OF THE PUBLIC LANDS OF THE UNITED STATES AND PRIVATE LAND CLAIMS.

Prepared in conformity with law under the direction of
THE COMMISSIONER OF THE GENERAL LAND OFFICE.

JANUARY 1, 1890.

WASHINGTON:
GOVERNMENT PRINTING OFFICE
1890.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., December 2, 1889.

GENTLEMEN: The following instructions, including full and minute directions for the execution of surveys in the field, are issued under the authority given me by sections 453, 456, and 2398 United States Revised Statutes, and must be strictly complied with by yourselves and your deputy surveyors.

Very respectfully,

LEWIS A. GROFF,
Commissioner.

To SURVEYORS GENERAL OF THE UNITED STATES.

INTRODUCTORY.

The present system of survey of the public lands was inaugurated by a committee appointed by the Continental Congress, and consisting of the following delegates:

Hon. THOS. JEFFERSON, *Chairman* .....Virginia.
Hon. HUGH WILLIAMSON.....North Carolina.
Hon. DAVID HOWELL .....Rhode Island.
Hon. ELBRIDGE GERRY.....Massachusetts.
Hon. JACOB READ .....South Carolina.

On the 7th of May, 1784, this committee reported "An ordinance for ascertaining the mode of locating and disposing of lands in the western territory, and for other purposes therein mentioned." This ordinance required the public lands to be divided into "hundreds" of ten geographical miles square, and those again to be subdivided into lots of one mile square each, to be numbered from 1 to 100, commencing in the *northwestern* corner, and continuing from west to east and from east to west consecutively. This ordinance was considered, debated, and amended, and reported to Congress April 26, 1785, and required the surveyors "to divide the said territory into townships of 7 miles square, by lines running due north and south, and others crossing these at right angles. * * * The plats of the townships, respectively, shall be marked by subdivisions into sections of 1 mile square, or 640 acres, in the same direction as the external lines, and numbered from 1 to 49. * * * And these sections shall be subdivided into lots of 320 acres." This is the first record of the use of the terms "township" and "section."

May 3, 1785, on motion of Hon. William Grayson, of Virginia, seconded by Hon. James Monroe, of Virginia, the section respecting the extent of townships was amended by striking out the words "seven miles square" and substituting the words "six miles square." The record of these early sessions of Congress are not very full or complete; but it does not seem to have occurred to the members until the 6th of May, 1785, that a township six miles square could not contain 49 sections of 1 mile square. At that date a motion to amend was made, which provided, among other changes, that a township should contain 36 sections; and the amendment was *lost*. The ordinance as finally passed, however, on the 20th of May, 1785, provided f or townships, 6 miles square, containing 36 sections of 1 mile square. The first public surveys were made under this ordinance. The townships, 6 miles square, were laid out in ranges, extending northward from the Ohio River, the townships being numbered from south to north, and the ranges from east to west. The region embraced by the surveys under this law forms a part of the present State of Ohio, and is usually styled "The Seven Ranges." In these initial surveys only the *exterior lines* of the

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townships were surveyed, but the plats were marked by subdivisions into sections of 1 mile square, and mile corners were established on the township lines. The sections were numbered from 1 to 36, commencing with No. 1 in the southeast corner of the township, and running from *south* to *north* in each tier to No. 36 in the *northwest* corner of the township, as shown in the following diagram:

36	30	24	18	12	6
35	29	23	17	11	5
34	28	22	16	10	4
33	27	21	15	9	3
32	26	29	14	8	2
31	25	19	13	7	1

The surveys were made under the direction of the Geographer of the United States.

The act of Congress approved May 18, 1796 provided for the appointment of a surveyor-general, and directed the survey of the lands northwest of the Ohio River, and above the mouth of the Kentucky River, "in which the titles of the Indian tribes have been extinguished." Under this law *one-half* of the townships surveyed were subdivided into sections "by running through the same, each way, parallel lines at the end of every two miles, and by making a corner on each of said lines at the end of every mile," and it further provided that "the sections shall be numbered, respectively, beginning with the number one in the northeast section and proceeding west and east alternately, through the township, with progressive numbers till the thirty-sixth be completed." This method of numbering sections, as shown by the following diagram, is still in use:

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

The act of Congress approved May 10, 1800, required the "townships west of the Muskingum, which * * * are directed to be sold in quarter townships, to be subdivided into half sections of three hundred and twenty acres each, as nearly as may be, by running parallel lines through the same from east to west, and from south to north, at the distance of one mile from each other, and marking corners, at the dis-

tance of each half mile, on the lines running from east to west, and at the distance of each mile on those running from south to north. * * * And the interior lines of townships intersected by the Muskingum, and of all the townships lying east of that river, which have not been heretofore actually subdivided into sections, shall also be run and marked. * * * And in all cases where the exterior lines of the townships thus to be subdivided into sections or half sections shall exceed, or shall not extend, six miles, the excess or deficiency shall be specially noted, and added to or deducted from the western and northern ranges of sections or half sections in such township, according as the error may be in running the lines from east to west or from south to north."

The act of Congress approved February 11, 1805, directs the subdivision of the public lands into quarter sections, and provides that all the corners marked in the public surveys shall be established as the proper corners of sections, or subdivisions of sections, which they were intended to designate, and that corners of half and quarter sections *not marked* shall be placed, as nearly as possible, "equidistant from those two corners which stand on the same line." This act further provides that "The boundary lines actually run and marked * * * shall be established as the proper boundary lines of the sections or subdivisions for which they were intended; and the length of such lines as returned by * * * the surveyors * * * shall be held and considered as the true length thereof, and the boundary lines which shall not have been actually run and marked as aforesaid shall be ascertained by running straight lines from the established corners to the opposite corresponding corners; but in those portions of the fractional townships, where no such opposite or corresponding corners have been or can be fixed, the said boundary line shall be ascertained by running from the established corners due north and south or east and west lines, as the case may be, to the * * * external boundary of such fractional township."

The act of Congress approved April 25, 1812, provided "That there shall be established in the Department of the Treasury an office to be denominated the General Land Office, the chief officer of which shall be called the Commissioner of the General Land Office, whose duty it shall be, under the direction of the head of the department, to superintend, execute, and perform all such acts and things touching or respecting the public lands of the United States, and other lands patented or granted by the United States, as have heretofore been directed by law to be done or performed in the office of the Secretary of State, of the Secretary and Register of the Treasury, and of the Secretary of War, or which shall hereafter by law be assigned to the said office."

The act of Congress approved April 24, 1820, provides for the sale of public lands in half quarter sections, and requires that "in every case of the division of a quarter section the line for the division thereof shall run north and south * * * and fractional sections, containing 160 acres and upward, shall, in like manner, as nearly as practicable, be subdivided into half quarter sections, under such rules and regulations as may be prescribed by the Secretary of the Treasury; but fractional sections containing less than 160 acres shall not be divided."

The act of Congress approved May 24, 1824, provides "That whenever, in the opinion of the President of the United States, a departure from the ordinary mode of surveying land on any river, lake, bayou, or watercourse would promote the public interest, he may direct the surveyor-general in whose district such land is situated, and where the change is intended to be made, under such rules and regulations as the

President may prescribe, to cause the lands thus situated to be surveyed in tracts of two acres in width, fronting on any river, bayou, lake, or watercourse, and running back the depth of forty acres." * * *

The act of Congress approved May 29, 1830 (Secs. 2412, 2413, R. S.), provides for the fine and imprisonment of any person obstructing the survey of the public lands, and for the protection of surveyors, in the discharge of their official duties, by the United States marshal, with sufficient force, whenever necessary.

The act of Congress approved April 5, 1832, directed the subdivision of the public lands into quarter quarters; that in every case of the division of a half-quarter section the dividing line should run east and west, and that fractional sections should be subdivided under rules and regulations prescribed by the Secretary of the Treasury. Under the latter provision the Secretary directed that fractional sections containing less than 160 acres, or the residuary portion of a fractional section, after the subdivision into as many quarter-quarter sections as it is susceptible of, may be subdivided into lots, each containing the quantity of a quarter-quarter section, as nearly as practicable, by so laying down the line of subdivision that they shall be 20 chains wide, which distances are to be marked on the plat of subdivision, as are also the areas of the quarter-quarters and residuary fractions.

The two acts last above mentioned provided that the corners and contents of half-quarter and quarter-quarter sections should be ascertained, as nearly as possible, in the manner and on the principles directed and prescribed in the act of Congress approved February 11, 1805.

The act of Congress approved July 4, 1836, provided for the

reorganization of the General Land Office, and that the executive duties of said office "shall be subject to the supervision and control of the Commissioner of the General Land Office under the direction of the President of the United States." The repealing clause is, "That such provisions of the act of the twenty-fifth of April, in the year one thousand eight hundred and twelve, entitled 'An act for the establishment of a General Land Office in the Department of the Treasury,' and of all acts amendatory thereof as are inconsistent with the provisions of this act, be, and the same are hereby, repealed."

From the working of this act it would appear that the control of the General Land Office was removed from the Treasury Department, and that the Commissioner reported direct to the President, but, as a matter of fact, the Secretary of the Treasury still had supervisory control, for the act of Congress approved March 3, 1849, by which the Department of the Interior was established, provided "That the Secretary of the Interior shall perform all the duties in relation to the General Land Office, of supervision and appeal, now discharged by the Secretary of the Trasury * * *." By this act the General Land Office was transferred to the Department of the Interior, where it still remains.

In 1855 a manual of instructions to surveyors general was prepared, under the direction of the Commissioner of the General Land Office, by John M. Moore, then principal clerk of surveys, and the act of Congress approved May 30, 1862 (Sec. 2399 R. S.), provided "That the printed manual of instructions relating to the public surveys, prepared at the General Land Office, and bearing the date February twenty-second, eighteen hundred and fifty-five, the instructions of the Commissioner of the General Land Office, and the special instructions of the surveyor-general, when not in conflict with said printed manual or the instructions of said Commissioner, shall be taken and deemed to be a part of every contract for surveying the public lands of the United States."

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The instructions contained in this volume are issued under the authority given in the clause in said act providing that "The instructions of the Commissioner of the General Land Office * * * shall be taken and deemed to be a part of every contract for surveying the public lands of the United States."

The following comprise so much of the general laws relating to the survey of the public domain as it is deemed necessary to incorporate in this volume, reference being made by chapter and section to the codification of the Public Land Laws, prepared pursuant to acts of Congress approved March 3, 1879, and June 16, 1880, and by section number to the Revised Statutes of the United States.

[The remainder of page 9 and pages 10 through 16 and part of page 17 are deleted. These pages contain the Revised Statutes pertaining to the public land surveys, and forms of contracts between Surveyors General andthe Deputies.]

SYSTEM OF RECTANGULAR SURVEYING.

1. The public lands of the United States are ordinarily surveyed into rectangular tracts, bounded by lines conforming to the cardinal points.

2. The public lands shall be laid off, in the first place, into bodies of land of 24 miles square, as near as may be. This shall be done by the extension of standard lines from the principal meridian every 24 miles, and by the extension, from the base and standard lines, of guide meridians every 24 miles. Thereafter they shall be laid off into bodies of land of 6 miles square, as near as may be, called *townships*, containing as near as may be 23,040 acres. The townships shall be subdivided into 36 tracts, called sections, each containing as near as may be 640 acres. Any number or series of contiguous townships, situate north or south of each other, constitute a *range*.

The law requires that the lines of the public surveys shall be governed by the true merdian, and that the townships shall be *six miles square*—two things involving in connection a mathematical impossibility—for, strictly to conform to the meridian, necessarily throws the township out of square, by reason of the convergency of meridians, and hence, by adhering to the true meridian, results the necessity of departing from the strict requirements of law as respects the precise area of townships and the subdivisional parts thereof, the townships assuming something of a trapezoidal form, which inequality develops itself more and more as such, the higher the latitude of the surveys. It is doubtless in view of these circumstances that the law provides (see section 2 of the act of May 18, 1796) that the sections of a mile square shall contain the quantity of 640 acres, *as nearly as may be*; and, moreover, provides (see section 3 of the act of May 10, 1800) in the following words: "And in all cases where the exterior lines of the townships, thus to be subdivided into sections or half sections, shall exceed, or shall not extend 6 miles, the excess or deficiency shall be specially noted, and added to or deducted from the western or northern ranges of sections or half sections in such township, according as the error may be in running the lines from east to west, or from south to north; the sections and half sections bounded on the northern and western lines of such townships shall be sold as containing only the quantity expressed in the returns and plats, respectively, and all others as containing the complete legal quantity."

The accompanying diagram, marked B, and the specimen field-notes pertaining to the same, will serve to illustrate the method of running

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lines to form tracts of land 24 miles square, as well as the method of running out the exterior lines of townships, and the order and mode of subdividing townships will be found illustrated in the accompanying specimen field-notes conforming with the township diagram C. The method here presented is designed to insure as full a compliance with all the requirements, meaning, and intent of the surveying laws as, it believed, is practicable.

The section lines are surveyed from *south* to north on true meridians,[1] and from *east* to west, in order to throw the

1. See method of subdividing and remarks under the heading "Table III. Azimuths of the tangent to the parallel."

excesses or deficiencies in measurements on the north and west sides of the township, as required by law. In case where a township has been partially surveyed, and it is necessary to complete the survey of the same, or where the character of the land is such that the only north or west portions of the township can be surveyed, this rule can not be strictly adhered to, but, in such cases, must be departed from only so far as is absolutely necessary. It will also be necessary to depart from this rule where surveys close upon State or Territorial boundaries, or upon surveys extending from different meridians.

3. The townships are to bear numbers in respect to the base line, either north or south of it; and the tiers of townships called "ranges" will bear numbers in respect to the meridian line according to their relative position to it, either on the east or west.

4. The thirty-six sections into which a township is subdivided are numbered, commencing with number *one* at the *northeast* angle of the township, and proceeding west to number six, and thence proceeding east to number twelve, and so on, alternately, until THE NUMBER THIRTY/SIX IN THE SOUTHEAST ANGLE. In all cases of surveys of fractional townships, the sections should bear the same numbers as they would if the township was full.

5. Standard parallels shall be established at intervals of every 24 miles, north and south of the base line, and guide meridians at intervals of every 24 miles, east and west of the principal meridian; the object being to confine the errors resulting from convergence of meridians, and inaccuracies in measurements, within the tracts of lands bounded by the lines so established.

6. The survey of all principal base and meridian, standard parallels, and guide meridian, and township lines must be made with an instrument operating independently of the magnetic needle. Burt's *improved solar compass,* or other instrument of equal utility, must be used of necessity in such cases; and it is deemed best that such instrument should be used under all circumstances. Where the needle can be relied on, however, the ordinary compass, if provided with a revolving compass box and variation arc, may be used in subdividing and meandering. Whenever deputies use instruments with magnetic apparatus only, they must test the accuracy of their work and the condition of their instruments by at least three observations upon a circumpolar star, upon different days, between the commencement and the close of surveying operations in any given township, an preferably at the southeast and southwest corners of the township and at or near the corner to sections 9, 10, 15 and 16. Deputies using instruments with solar apparatus are also required to make observations of the star Polaris at the *beginning* of every survey and they must examine the adjustments of their instruments and take the latitude[2] daily, weather

permitting, in running base, standard, meridian, and range lines, and upon three different days during the execution of subdivisional surveys in each township. They must make complete records in their field-notes, under proper dates, of the making of *all observations* in compliance with these instructions, showing the style and condition of the instrument in use, and the angle formed, by comparing the line run with the meridian as by observation determined.

7. The construction and adjustments of all surveying instruments used in the surveying of the public lands of the United States must be tested at least once a year,[3] and oftener if necessary, by comparison with the true meridian, established under the direction of the surveyor-general of the district; and the instruments must be so modified in construction, or in such a way corrected, as may be necessary to produce the closest possible approximation to accuracy and uniformity in the operation of all such instruments. A record will be made of such examinations, showing the number and style of the instrument, name of the maker, the quantity of instrumental error discovered by comparison, in either solar or magnetic apparatus, or both, and means taken for correction. The surveyor-general will allow no surveys to be made until the instruments to be used therefor have been approved by him.

8. The township lines and the subdivison lines will usually be measured by a two-pole chain of 33 feet in length,[4] consisting of 50 links, and each link being seven and ninety-two hundredths of an inch long. On uniform and level ground, however, the four-pole chain may be used. The measurements will, however, always be represented according to the four-pole chain of 100 links. The deputy surveyor must provide himself with a measure of the standard chain kept at the office of the surveyor-general, to be used by him as a field standard. The chain in use must be compared and adjusted with this field standard each working day, and such field standard must be returned to the surveyor-general's office for examination when his work is completed.

OF TALLY PINS.

9. You will use eleven tally pins made of steel, not exceeding 14 inches in length, weighty enough toward the point to make them drop perpendicularly, and having a ring at the top, in which is to be fixed a piece of red cloth, or something else of conspicuous color, to make them readily seen when stuck in the ground.

PROCESS OF CHAINING.

10. In measuring lines with a two-pole chain, every *five* chains are called *"a tally;"* and in measuring lines with a four-pole chain, every *ten* chains are called *"a tally,"* because at that distance the last of the ten tally pins with which the forward chainman set out will have been stuck. He then cries "tally;" which cry is repeated by the other chainman, and each registers the distance by slipping a thimble, button, or ring of leather, or something of the kind, on a belt worn for that purpose, or by some other convenient method. The hind chainman then comes up, and having counted in the presence of his fellow the tally pins which he has taken up, so that both may be assured that none of the pins have been lost, he then takes the forward end of the chain, and proceeds to set the pins. Thus the chainmen alternately change places, each

2. Taking the latitude does not necessarily prove the correctness of adjustments.

3. The adjustments should be verified daily when the instrument is in use.

4. See R. S. 2395, sec. 99, par. 6 (page 11).

setting the pins that he has taken up, so that one is forward in all

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the odd, and the other in all the even tallies. Such procedure, it is believed, tends to insure accuracy in measurement, facilitates the recollection of the distances to objects on the line, and renders a mis-tally almost impossible.

LEVELING THE CHAIN AND PLUMBING THE PINS.

11. The length of every line you run is to be ascertained by precise horizontal measurement, as nearly approximating to an air line as is possible in practice on the earth's surface. This all-important object can only be attained by a rigid adherence to the three following observances:

(1) Ever keeping the chain *stretched* to its utmost degree of tension on even ground.

(2) On uneven ground, keeping the chain not only stretched as aforesaid, but horizontally *leveled.* And when ascending and descending steep ground, hills or mountains, the chain will have to be *shortened* to one-half its length (and sometimes more), in order accurately to obtain the true horizontal measure.

(3) The careful plumbing of the tally pins, so as to attain precisely the *spot* where they should be stuck. The more uneven the surface, the greater the caution needed to set the pins.

MARKING LINES.

12. All lines on which are to be established the legal corner boundaries are to be marked after this method, viz: Those trees which may intercept your line must have two chops or notches cut on each side of them without any other marks whatever. These are called *"sight trees"* or *"line trees."* A sufficient number of other trees standing within 50 links of the line, on either side of it, are to be *blazed* on two sides diagonally or quartering toward the line, in order to render the line conspicuous, and readily to be traced, the blazes to be opposite each other, coinciding in direction with the line where the trees stand very near it, and to approach nearer each other the farther the line passes from the blazed trees. Due care must ever be taken to have the lines so well marked as to be readily followed, and to cut the blazes deep enough to have recognizable scars as long as the trees stand.

Where trees 2 inches or more in diameter are found, the required blazes must not be omitted.

Bushes on or near the line should be bent at right angles therewith, and receive a blow of the ax at about the usual height of blazes from the ground sufficient to leave them in a bent position, but not to prevent their growth.

ON TRIAL, OR RANDOM LINES,

the trees are not to be blazed, unless occasionally, from indispensable necessity, and then it must be done so guardedly as to prevent the possibility of confounding the marks of the trial line with the *true.* But bushes and limbs of trees may be lopped, and *stakes set* on the trial or random line, at every *ten* chains, to enable the surveyor on his return to follow and correct the trial lines and establish therefrom the *true line.* To prevent confusion, the temporary stakes set on the trial or random lines must be *pulled up* when the surveyor returns to establish the true line.

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INSUPERABLE OBJECTS ON LINE— WITNESS POINTS.

13. Under circumstances where your course is obstructed by impassable obstacles, such as ponds, swamps, marshes, lakes, rivers, creeks, &c., you will prolong the line across such obstacles by taking the necessary right angle offsets; or, if such be inconvenient, by a traverse or trigonometrical operation, until you regain the line on the opposite side. And in case a north and south, or a true east and west, line is regained in advance of any such obstacle, you will prolong and mark the line back to the obstacle so passed, and state all the pariculars in relation thereto in your field-book. And at the intersection of lines with both margins of impassable obstacles, you will establish a *witness point* (for the purpose of perpetuating the intersections therewith), by setting a post, and giving in your field-book the course and distance therefrom to two trees on opposite sides of the line, each of which trees you will mark with a blaze and notch facing the post; but on the margins of navigable water-courses, or navigable lakes, you will mark the trees with the proper number of the fractional section, township, and range.

The best marking tools adapted to the purpose must be provided for marking neatly and *distinctly* all the letters and figures required to be made at corners, *arabic* figures being used exclusively; and the deputy is always to have at hand the necessary implements for keeping his marking irons in order.

ESTABLISHING CORNERS.

To procure the faithful execution of this portion of a surveyor's duty is a matter of the utmost importance. After a true coursing and most exact measurements the establishment of corners is the consummation of the work. If, therefore, the corner be not perpetuated in a permanent and workmanlike manner the *great aim* of the surveying service will not have been attained.

The following are the different points for perpetuating corners, viz:

1. For township boundaries, at intervals of every 6 miles.
2. For section boundaries, at intervals of every mile, or 80 chains.
3. For quarter-section boundaries, at intervals of every half mile, or 40 chains. Exceptions, however, occur as fully set forth hereafter in that portion of the manual showing the manner of running township lines and methods of subdividing.
4. Meander corners are established at all those points where the lines of the public surveys intersect the banks of such rivers, bayous, lakes, or islands as are by law directed to be meandered.

DESCRIPTION OF CORNERS.

The following is the form and language to be used by deputy surveyors in describing the establishment of corners in their field-notes, and their work in the field must strictly comply with the same.

STANDARD TOWNSHIP CORNERS.

SEC. 1. [5]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground, for Standard Cor. to (e. g.) Tps. 5 N., R's 2 & 3 W., marked S. C., with 6 notches on N., E., & W. edges, dug pits 24 x 18 x 12 ins. crosswise on each line, N., E., & W. of stone 6 ft. dist. and raised a mound of earth, 2½ ft. high, 5 ft. base alongside.

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SEC. 2. [6]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground, for Standard Cor. to (e. g.) Tps. 5 N., R's 2 & 3 W., maked S. C., with 6 notches on N., E. & W. edges, and raised a mound of stone,[7] ½ ft. high, 2 ft. base, alongside. Pits impracticable.

SEC. 3. [8]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground, for Standard Cor. to (e. g.) Tps. 5N., R's 2 & 3 W., marked S. C., with 6 notches on N., E. & W. edges, from which

A _____, _____ ins. diam., bears N. _____° E. _____ lks., dist. marked T. 5 N., R. 2 W. S. 31, B. T.

A _____, _____ ins. diam. bears N. _____° W. _____ lks., dist. marked T. 5 N., R. 3 W. S. 36, B. T.

A _____, _____ ins. diam., bears S _____° W. _____ lks., dist. marked[9] S. C. T. 5 N., R's 2 & 3 W., B. T.

SEC. 4. [10]Set a post, 4½ ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for Standard Cor. to (e. g.) Tps. 5 N., R's 2 & 3 W., marked

S. C. T. 5 N. on N.

R. 2 W. S. 31, on E. and

R. 3 W. S. 36 on W. faces, with 6 notches on N., E., & W. faces, dug pits, 24 x 18 x 12 ins. crosswise on each line, N., E., & W. of post, 6 ft. dist. and raised a mound of earth 2½ ft. high, 5 ft. base, around post.

SEC. 5. [11]Set a post, 4½ ft. long, 4 ins. square, 24 ins. in the ground for Standard Cor. to (e. g.) Tps. 5 N., R's 2 & 3 W. marked.

S. C. T. 5 N. on N.

R. 2 W. S. 31, on E. and

R. 3 W. S. 36 on W. faces, with 6 notches on N., E., & W. faces; from which

A _____, _____ ins. diam., bears N. _____° E. _____ lks., dist. marked T. 5 N., R. 2 W. S. 31, B. T.

A _____, _____ ins. diam., bears N. _____° W. _____ lks., dist. marked T. 5 N., R. 3 W. S. 36, B. T.

A _____, _____ ins., diam. bears S. _____° W. _____ lks., dist. marked[9] S. C. T. 5. N., R's 2 & 3 W., B. T.

SEC. 6. [12]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Standard Cor. to (e. g.) Tps. 5 N., R's 2 & 3 W., dug pits. 24 x 18 x 12 ins. crosswise on each line, N., E., & W. of cor., 6 ft. dist. and raised a mound of earth 2½ feet high, 5 ft. base, over it. In E. pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked

S. C. T. 5 N. on N.

R. 2 W. S. 31 on E. and

R. 3 W. S. 36 on W. faces, with 6 notches on N., E., & W. faces.

SEC. 7. [13]A _____, _____ ins. diam., which I marked (e. g.)

S. C. T. 5 N. on N.

R. 2 W. S. 31 on E. and

R. 3 W. S. 36 on W. sides, with 6 notches on N., E., & W. sides, dug pits 24 x 18 x 12 ins. crosswise on each line, N., E., & W. of tree 6 ft. dist. and raised a mound of earth around tree, for Standard Cor. to Tps. 5 N., R's 2 & 3 W.

SEC. 8. [14]A _____, _____ ins. diam., which I marked (e. g.)

T. 5 N. S. C. on N.

R. 2 W. S. 31, on E. and

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R. 3 W. S. 36 on W. sides, with 6 notches on N., E., & W. sides, for Standard Cor. to Tps. 5 N., R's 2 & 3 W.; from which

A _____, _____ ins. diam., bears N. _____° E. _____ lks. dist. marked T. 5 N., R. 2 W. S. 31, B. T.

A _____, _____ ins. diam., bears N. _____° W. _____ lks dist. marked T. 5 N., R. 3 W. S. 36, B. T.

A _____, _____ ins. diam., bears S. _____° W. _____ lks. dist. marked[9] S. C. T. 5 N., R's 2 & 3 W., B. T.

CLOSING TOWNSHIP CORNERS.

SEC. 1. [5]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground for Closing Cor. to (e. g.) Tps. 4 N., R's 2 & 3 W., marked C. C. with 6 notches on S. E. & W. edges, dug pits, 24 x 18 x 12 ins., crosswise on each line, S., E. & W. of stone, 6 ft. dist., and raised a mound of earth, 2½ ft. high, 5 ft. base alongside.

SEC. 2. [6]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground for Closing Cor. to (e. g.) Tps. 4 N., R's 2 & 3 W., marked C. C. with 6 notches on S., E. & W. edges, and raised a mound of stone 1½ ft. high, 2 ft. base, alongside. Pits impracticable.

SEC. 3. [8]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground for Closing Cor. to (e. g.) tps. 4 N., R's 2 & 3 W., marked C. C. with 6 notches on S., E., & W. edges; from which

A _____, _____ ins. diam. bears S. _____° E. _____ lks. dist. marked T. 4 N., R. 2 W. S. 6, B. T.

A _____, _____ ins. diam. bears S. _____° W. _____ lks. dist. marked T. 4 N., R. 3 W. S. 1, B. T.

5. Stone with Pits and Mound.

6. Stone with Mound of Stone.

7. To consist of not less than four stones. Mound to be at least 1½ ft. high, with 2 ft. base.

8. Stone with Bearing Trees.

9. See "Miscellaneous," sec. 4, page 32.

10. Post in Mound.

11. Post with Bearing Trees.

12. Mound without Post or Stone.

13. Tree Corner without Bearing Trees.

14. Tree Corner with Bearing Trees.

A _____, _____ ins. diam. bears N. _____° W. _____ lks. dist. marked[9] C. C. T. 4 N., R's 2 & 3 W., B. T.

SEC. 4. [10]Set a post, 4½ ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground for Closing Cor. to (e. g.) Tps. 4 N., R's 2 & 3 W., marked

C. C. T. 4 N. on S.

R. 2 W. S. 6, on E. and

R. 3 W. S. 1 on W. faces, with 6 notches on S., E., & W. faces, dug pits 24 x 18 x 12 ins., crosswise on each line, S., E., & W. of post, 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base, around post.

SEC. 5. [11]Set a post, 4½ ft. long, 4 ins. square, 24 ins. in the ground, for Closing Cor. to (e. g.) Tps. 4 N., R's 2 & 3 W., marked

C. C. T. 4 N. on S.

R. 2 W. S. 6, on E. and

R. 3 W. S. 1 on W. faces, with 6 notches on S., E. & W. faces; from which

A _____, _____ ins. diam. bears S. _____° E. _____ lks. dist. marked T. 4 N., R. 2 W. S. 6, B. T.

A _____, _____ ins. diam. bears S. _____° W. _____ lks. dist. marked T. 4 N., R. 3 W. S. 1, B. T.

A _____, _____ ins. diam., bears N. _____° W. _____ lks. dist., marked[9] C.C.T. 4 N., R's 2 & 3 W., B. T.

SEC. 6. [12]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Closing Cor., to (e. g.) Tps. 4 N., R's 2 & 3 W., dug pits 24 x 18 x 12 ins. crosswise on each line, S., E., & W. of corner, 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base, over it. In E pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked

C. C. T. 4 N. on S.

R. 2 W. S. 6, on E. and

R. 3 W. S. 1 on W. faces, with 6 notches on S., E. & W. faces.

SEC. 7. [13]A _____, _____ ins. diam., which I marked (e. g.)

C. C. T. 4 N. on S.

R. 2 W. S. 6, on E. and

R. 3 W. S. 1 on W. sides, with 6 notches on S., E. & W. sides, dug pits 24 x 18 x 12 ins. crosswise on each line S. E. & W. of tree, 6 ft. dist., and raised a mound of earth around tree, for Closing Cor. to Tps. 4 N., R's 2 & 3 W.

SEC. 8. [14]A _____, _____ ins. diam., which I marked (e. g.)

C. C. T. 4 N. on S.

R. 2 W. S. 6, on E. and

R. 3 W. S. 1 on W. sides, with 6 notches on S., E. & W. sides for Closing Cor. to Tps. 4 N., R's 2 & 3 W.; from which

A _____, _____ ins. diam. bears S. _____° E. _____ lks. dist., marked T. 4 N. R., 2 W. S. 6, B. T.

A _____, _____ ins. diam. bears S. _____° W. _____ lks. dist., marked T. 4 N., R. 3 W. S. 1, B. T.

A _____, _____ ins. diam. bears N. _____° W._____ lks. dist., marked[9] C. C. T. 4 N., R's 2 & 3 W., B. T.

SEC. 9. All Closing Township Corners must be connected with the nearest standard corner on the Standard Line.

STANDARD SECTION CORNERS.

SEC. 1. [5]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Standard Cor. to (e. g.) Secs. 35 & 36, marked S. C., with 1 notch on E. and 5 notches on W. edges, dug pits, 18 x 18 x 12 ins., N., E. & W. of stone 5½ ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base, alongside.

SEC. 2. [6]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Standard Cor. to (e. g.) Secs. 33 & 34, marked S. C., with 3 notches on E. & W. edges, and raised a mound of stone, ½ ft. high, 2 ft. base, alongside. Pits impracticable.

SEC. 3. [8]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Standard Cor. to (e. g.) Secs. 35 & 36, marked S. C., with 1 notch on E. and 5 notches on W. edges, from which

A _____, _____ ins. diam. bears N. _____° E. _____ lks. dist. marked T. 5 N., R. 3 W. S. 36, B. T.

A _____, _____ ins. diam. bears N. _____° W. _____ lks. dist. marked T. 5 N., R. 3 W. S. 35, B. T.

A _____, _____ ins. diam. bears S. _____° E. _____ lks. dist. marked[9] T. 5 N., R. 3 W. S. C. S. 35 & 36, B. T.

SEC. 4. [10]Set a post, 4 ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Standard Cor. to (e. g.) Secs. 35 & 36, marked

S. C. T. 5 N., R. 3 W., on N.

S. 36, on E., and

S. 35 on W. faces, with 1 notch on E. and 5 notches on W. faces, dug pits 18 x 18 x 12 ins., N., E. and W. of post, 5½ ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base round post.

SEC. 5. [11]Set a post 4 ft. long, 4 ins. square, 24 ins. in the ground, for Standard Cor. to (e. g.) Secs. 35 & 36, marked

S. C. T. 5 N., R. 3 W., on N.

S. 36, on E. and

S. 35 on W. faces, with 1 notch on E. and 5 notches on W. faces; from which

A _____, _____ ins. diam. bears N. _____° E. _____ lks. dist., marked T. 5 N., R. 3 W. S. 36, B. T.

A _____, _____ ins. diam. bears N. _____° W. _____ lks. dist. marked T. 5 N., R. 3 W. S. 35, B. T.

A _____, _____ ins. diam. bears S. _____° E. _____ lks. dist. marked[9] T. 5 N., R. 3 W. S. C. S. 35 & 36, B. T.

SEC. 6. [12]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Standard Cor. to (e. g.)

5. Stone with Pits and Mound.

6. Stone with Mound of Stone.

7. To consist of not less than four stones. Mound to be at least 1½ ft. high, with 2 ft. base.

8. Stone with Bearing Trees.

9. See "Miscellaneous," sec. 4, page 32.

10. Post in Mound.

11. Post with Bearing Trees.

12. Mound without Post or Stone.

13. Tree Corner without Bearing Trees.

14. Tree Corner with Bearing Trees.

Secs. 33 & 34, dug pits, 18 x 18 x 12 ins., N., E. and W. of corner, 5½ ft. dist., and raised a mound of earth 2 ft. high, 4¼ ft. base, over it. In E. pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked

T. 5 N., R. 3 W., S. C. on N.

S. 34 on E. and

S. 33 on W. faces, with 3 notches on E. & W. faces.

SEC. 7. [13]A _____, _____ ins. diam., which I marked (e. g.)

S. C. T. 5 N., R. 3 W., on N.

S. 36. on E. and

S. 35 on W. sides, with one notch on E. and 5 notches on W. sides, dug pits, 18 x 18 x 12 ins. N., E. & W. of tree, 5½ ft. dist. and raised a mound of earth around tree, for Standard Cor. to Secs. 35 & 36.

SEC. 8. [14]A _____, _____ ins. diam., which I marked (e. g.)

S. C. T. 5 N., R. 3 W., on N.

S. 36, on E. and

S. 35 on W. sides, with 1 notch on E. and 5 notches on W. sides, for Standard Cor. to Secs. 35 & 36; from which

A _____, _____ ins. diam. bears N. _____° E. _____ lks. dist. marked T. 5 N., R. 3 W., S. 36, B. T.

A _____, _____ ins. diam. bears N. _____° W. _____ lks. dist. marked T. 5 N., R. 3 W., S. 35, B. T.

A _____, _____ ins. diam. bears S _____° E. _____ lks. dist marked[9] T. 5 N., R. 3 W., S. C. S. 35 & 36, B. T.

CLOSING SECTION CORNERS.

SEC. 1. [5]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Closing Cor. to (e. g.) Secs. 1 & 2, marked C. C., with 1 notch on E. and 5 notches on W. edges, dug pits, 18 x 18 x 12 ins. S., E. & W. of stone, 5½ feet dist., and raised a mound of earth 2 ft. high, 4½ ft. base alongside.

SEC. 2. [6]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Closing Cor. to (e. g.) Secs. 3 & 4, marked C. C., with 3 notches on E. and W. edges, and raised a mound of stone 1½ ft. high, 2 ft. base, alongside. Pits impracticable.

SEC. 3. [8]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Closing Cor. to (e. g.) Secs. 1 & 2, marked C. C., with 1 notch on E. and 5 notches on W. edges; from which

A _____, _____ ins. diam., bears S. _____° E. _____ lks. dist. marked T. 4 N., R. 3 W., S. 1 B. T.

A _____, _____ ins. diam., bears S. _____° W. _____ lks. dist. marked T. 4 N., R. 3 W., S. 2, B. T.

A _____, _____ ins. diam., bears N. _____° E. _____ lks. dist. marked[9] T. 4 N., R. 3 W., C. C. S. 1 & 2 B. T.

SEC. 4 [10]Set a post 4 ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground for Closing Cor. to (e. g.) Secs. 1 & 2, marked

C. C. T. 4 N., R. 3 W., on S.

S. 1 on E., and

S. 2 on W. faces, with 1 notch on E. and 5 notches on W. faces, dug pits 18 x 18 x 12 ins., S., E. & W. of post 5½ ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base around post.

SEC. 5. [11]Set a post 4 ft. long, 4 ins. square, 24 ins. in the ground, for Closing Cor. to (e. g.) Secs. 1 & 2, marked

C. C. T. 4 N., R. 3 W., on S.

S. 1 on E. and

S. 2 on W. faces, with 1 notch on E and 5 notches on W. faces; from which

A _____, _____ ins. diam., bears S. _____° E. _____ lks. dist. marked T. 4 N., R. 3 W., S. 1, B. T.

A _____, _____ ins. diam., bears S. _____° W. _____ lks. dist. marked T. 4 N., R. 3 W., S. 2, B. T.

A _____, _____ ins. diam., bears N. _____° E. _____ lks. dist. marked[9] T. 4 N., R. 3W., C. C. S. 1 & 2, B. T.

SEC. 6. [12]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Closing Cor. to (e. g.) Secs. 3 & 4, dug pits, 18 x 18 x 12 ins., S., E. & W. of Cor. 5½ ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base, over it. In E. pit drove a stake, 2 ins. square, 2 ft. long, 12 ins. in the ground, marked

C. C. T. 4 N., R. 3 W., on S.

S. 3 on E., and

S. 4 on W. faces, with 3 notches on E. & W. faces.

SEC. 7 [13]A _____, _____ ins. diam., which I marked (e. g.)

C. C. T. 4 N., R. 3 W., on S.

S. 1, on E., and

S. 2 on W. sides, with 1 notch on E. and 5 notches on W. sides, dug pits 18 x 18 x 12 ins. S., E. & W. of tree, 5½ ft. dist., and raised a mound of earth around tree, for closing Cor. to Secs. 1 & 2.

SEC. 8. [14]A _____, _____ ins. diam., which I marked (e. g.)

C. C. T. 4 N., R. 3 W., on S.

S. 1, on E., and

S. 2 on W. sides, with one notch on E. and 5 notches on W. sides, for Closing Cor. to Secs. 1 & 2; from which

A _____, _____ ins. diam., bears S. _____° E. _____ lks. dist. marked T. 4 N., R. 3 W., S. 1, B. T.

A _____, _____ ins. diam., bears S. _____° W. _____ lks. dist. marked T. 4 N., R. 3 W., S. 2, B. T.

A _____, _____ ins. diam., bears N. _____° E. _____ lks. dist. marked[9] T. 4 N., R. 3 W., C. C. S. 1 & 2, B. T.

SEC. 9. [15]All Section Closing Corners must be connected with the nearest standard corner on the Standard line.

5. Stone with Pits and Mound.

6. Stone with Mound of Stone.

7. To consist of not less than four stones. Mound to be at least 1½ ft. high, with 2 ft. base.

8. Stone with Bearing Trees.

9. See "Miscellaneous," sec. 4, page 32.

10. Post in Mound.

11. Post with Bearing Trees.

12. Mound without Post or Stone.

13. Tree Corner without Bearing Trees.

14. Tree Corner with Bearing Trees.

15. Connection Lines.

CORNERS COMMON TO FOUR TOWNSHIPS.

SEC. 1. [5]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground for Cor. to (e. g.) Tps. 2 & 3 N., R's 2 & 3 W., marked with 6 notches on each edge, dug pits, 24 x 18 x 12 ins. lengthwise on each line, N., S., E. & W. of stone, 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base alongside.

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SEC. 2. [6]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Cor. to (e. g.) Tps. 2 & 3 N., R's 2 & 3 W. marked with 6 notches on each edge, and raised a mound of stone 1½ ft. high, 2 ft. base, alongside. Pits impracticable.

SEC. 3. [8]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Cor. to (e. g.) Tps. 2 & 3 N. R. 2 & 3. W. marked with 6 notches on each edge; from which

A _____, _____ ins., diam., bears N. _____° E. _____ lks. dist. marked T. 3 N., R. 2 W., S. 31, B. T.

A _____, _____ ins. diam., bears S. _____° E. _____ lks. dist. marked T. 2 N., R. 2 W., S. 6, B. T.

A _____, _____ ins. diam., bears S. _____° W. _____ lks. dist. marked T. 2 N., R. 3 W., S. 1, B. T.

A _____, _____ ins. diam., bears N. _____° W. _____ lks. dist. marked T. 3 N., R. 3 W., S. 36, B. T.

SEC. 4. [10]Set a post, 4½ ft. long 4 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Cor. to (e. g.) Tps. 2 & 3 N., R's 2 & 3 W., marked

T. 3 N., S. 31, on N. E.

R. 2 W., S. 6, on S. E.

T. 2 N., S. 1, on S. W. and

R. 3 W., S. 36 on N. W. faces, with 6 notches on each edge, dug pits, 24 x 18 x 12 ins., lengthwise on each line, N., S., E., & W. of post, 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base around post.

SEC. 5. [11]Set a post 4½ ft. long, 4 ins. square, 24 ins. in the ground, for Cor. to (e. g.) Tps., 2 & 3 N., R's 2 & 3 W., marked

T. 3 N. S. 31, on N. E.

R. 2 W. S. 6, on S. E.

T. 2 N. S. 1, on S. W. and

R. 3 W. S. 36 on N. W. faces, with 6 notches on each edge; from which

A _____, _____ ins. diam., bears N. _____° E. _____ lks. dist. marked T. 3 N., R. 2 W. S. 31, B. T.

A _____, _____ ins. diam., bears S. _____° E. _____ lks. dist. marked T. 2 N., R. 2 W. S. 6, B. T.

A _____, _____ ins. diam., bears S. _____° W. _____ lks. dist. marked T. 2 N., R. 3 W. S. 1, B. T.

A _____, _____ ins. diam., bears N. _____° W. _____ lks. dist. marked T. 3 N., R. 3 W. S. 36, B. T.

SEC. 6. [12]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground for Cor. to (e. g.) Tps. 2 & 3 N., R's 2 & 3 W., dug pits, 24 x 18 x 12 ins., lengthwise on each line, N., S., E., & W. of Cor., 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base over it. In E. pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked

T. 3 N. S. 31, on N. E.

R. 2 W. S. 6, on S. E.

T. 2 N. S. 1, on S. W. and

R. 3 W. S. 36, on N. W. faces, with 6 notches on each edge.

SEC. 7. [13]A _____, _____ ins. diam., which I marked (e. g.)

T. 3 N. S. 31, on N. E.

R. 2 W. S. 6, on S. E.

T. 2 N. S. 1, on S. W. and

R. 3 W. S. 36 on N. W. sides, with 6 notches facing each cardinal point, dug pits, 24 x 18 x 12 ins. lengthwise on each line, N., S., E., &

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W. of tree, 6 ft. dist., and raised a mound of earth around tree, for Cor. to Tps. 2 & 3 N., R's 2 & 3 W.

SEC. 8. [14]A _____, _____ ins diam., which I marked (e. g.)

T. 3 N. S. 31, on N. E.

R. 2 W. S. 6, on S. E.

T. 2 N. S. 1, on S. W. and

R. 3 W. S. 36, on N. W. sides, with 6 notches facing each cardinal point, for Cor. to Tps. 2 & 3 N., R's 2 & 3 W., fom which

A _____, _____ ins. diam., bears N. _____° E. _____ lks. dist. marked T. 3 N., R. 2 W. S. 31, B. T.

A. _____, _____ ins. diam., bears S. _____° E. _____ lks. dist. marked T. 2 N., R. 2 W. S. 6, B. T.

A. _____, _____ ins. diam., bears S. _____° W. _____ lks. dist. marked T. 2 N., R. 3 W. S. 1, B. T.

A. _____. _____ ins. diam., bears N. _____° W. _____° lks. dist. marked T. 3 N., R. 3 W. S. 36, B. T.

CORNERS COMMON TO FOUR SECTIONS.

SEC. 1. [5]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground for Cor. to (e. g.) Secs. 25, 26, 35, & 36, marked with 1 notch on S. & E. edges, dug pits, 18 x 18 x 12 ins. in each Sec., 5½ ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base alongside.

SEC. 2. [6]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground, for Cor. to (e. g.) Secs. 14, 15, 22, & 23, marked with 3 notches on S. and 2 notches on E. edges, and raised a mound of stone 1½ ft. high, 2 ft. base, alongside. Pits impracticable.

SEC. 3. [8]Set a _____ stone _____ x _____ x _____ ins. _____ ins. in the ground, for Cor. to (e. g.) Secs. 9, 10, 15, & 16, marked with 4 notches on S. & 3 notches on E. edges, from which

A _____, _____ ins. diam., bears N. _____° E. _____ lks. dist. marked T. 2 N., R. 2 W. S. 10, B. T.

5. Stone with Pits and Mound.

6. Stone with Mound of Stone.

7. To consist of not less than four stones. Mound to be at least 1½ ft. high, with 2 ft. base.

8. Stone with Bearing Trees.

9. See "Miscellaneous," sec. 4, page 32.

10. Post in Mound.

11. Post with Bearing Trees.

12. Mound without Post or Stone.

13. Tree Corner without Bearing Trees.

14. Tree Corner with Bearing Trees.

A _____, _____ ins. diam., bears S. _____° E. _____ lks. dist. marked T. 2 N., R. 2 W. S. 15, B. T.

A _____, _____ ins. diam., bears S. _____° W. _____ lks. dist. marked T. 2 N., R. 2 W. S. 16, B. T.

A _____, _____ ins. diam., bears N. _____° W. _____ lks. dist. marked T. 2 N., R. 2 W. S. 9, B. T.

SEC. 4 [10]Set a post 4 ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Cor. to (e. g.) Secs, 15, 16, 21, & 22, marked

T. 2 N. S. 15, on N. E.

R. 2 W. S. 22, on S. E.

S. 21, on S. W. and

S. 16 on N. W. faces, with 3 notches on S. & E. edges, dug pits, 18 x 18 x 12 ins. in each Sec., 5½ ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base around post.

SEC. 5. [11]Set a post 4 ft. long, 4 ins. square, 24 ins. in the ground, for Cor. to (e. g.) Secs. 25, 26, 35, & 36, marked

T. 2 N. S. 25, on N. E.

R. 2 W. S. 36, on S. E.

S. 35, on S. W. and

S. 26, on N. W. faces, with 1 notch on S. & E. edges; from which

A _____, _____ ins. diam., bears N. _____° E. _____ lks. dist. marked T. 2 N., R. 2 W. S. 25, B. T.

A _____, _____ ins. diam., bears S. _____° E. _____ lks. dist. marked T. 2 N., R. 2 W. S. 36, B. T.

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A _____, _____ ins. diam., bears S. _____° W. _____ lks. dist. marked T. 2 N., R. 2 W. S. 35, B. T.

A _____, _____ ins. diam., bears N. _____° W. _____ lks. dist. marked T. 2 N., R. 2 W. S. 26, B. T.

SEC. 6. [12]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Cor. to (e. g.) Secs. 25, 26, 35, & 36, dug pits, 18 x 18 x 12 ins. in each Sec., 5½ ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base over it.

In S. E. pit drove a stake 2 ins. square, 2 ft. long, 12 ins in the ground, marked

T. 2 N. S. 25, on N. E.

R. 2 W. S. 36, on S. E.

S. 35, on S. W. and

S. 26, on N. W. faces, with 1 notch on S. & E. edges.

SEC. 7. [13]A _____, _____ ins. diam., which I marked (e. g.)

T. 2 N. S. 29, on N. E.

R. 2 W. S. 32, on S. E.

S. 31, on S. W. and

S. 30, on N. W. sides, with 1 notch on S. and 5 notches on E. sides, dug pits, 18 x 18 x 12 ins. in each sec. 5½ ft. dist. and raised a mound of earth around tree, for Cor. to Secs. 29, 30, 31, & 32.

SEC. 8. [14]A _____, _____ ins. diam., which I marked (e. g.)

T. 2 N. S. 5, on N. E.

R. 2 W. S. 8, on S. E.

S. 7, on S. W. and

S. 6, on N. W. sides, with 5 notches on S. & E. sides, for Cor. to Secs. 5, 6, 7 & 8; from which

A _____, _____ ins. diam., bears N. _____° E. _____ lks. dist. marked T. 2 N., R. 2 W. S. 5, B. T.

A _____, _____ ins. diam., bears S. _____° E. _____ lks. dist. marked T. 2 N., R. 2 W. S. 8, B. T.

A _____, _____ ins. diam., bears S. _____° W. _____ lks. dist. marked T. 2 N., R. 2 W. S. 7, B. T.

A _____, _____ ins. diam., bears N. _____ W. _____ lks. dist. marked T. 2 N., R. 2 W. S. 6, B. T.

ARTICLE X.

QUARTER SECTION CORNERS.

SEC. 1. [5]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for ¼ Sec. Cor., marked ¼ on N. (or W.) face, dug pits, 18 x 18 x 12 ins., N. & S. (or E. & W.) of stone 5½ ft. dist., and raised a mound of earth 1½ ft. high, 3½ ft. base alongside.

SEC. 2. [6]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for ¼ Sec. Cor., marked ¼ on N. (or W.) face, and raised a mound of stone 1½ ft. high, 2 ft. base, alongside. Pits impracticable.

SEC. 3. [8]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for ¼ Sec. Cor., marked ¼ on N. (or W.) face; from which

A _____, _____ ins. diam., bears N. _____° E. _____ lks. dist. marked ¼ S. B. T.

A _____, _____ ins. diam , bears S. _____° W. _____ lks. dit. marked ¼ S. B. T.

SEC. 4. [10]Set a post 3 ft. long, 3 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for ¼ Sec. Cor., marked ¼ S. on N. (or W.) face, dug pits, 18 x 18 x 12 ins., N. & S., (or E. and W.) of post 5½ ft. dist., and raised a mound of earth 1½ ft. high, 3½ ft. base around post.

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SEC. 5. [11]Set a post 3 ft. long, 3 ins. square, 24 ins. in the ground, for ¼ Sec. Cor., marked ¼ S. on N. (or W.) face; from which

A _____, _____ ins. diam., bears N. _____° E. _____ lks., dist. marked ¼ S. B. T.

A _____, _____ ins. diam., bears S. _____ W. _____ lks., dist. marked ¼ S. B. T.

SEC. 6. [12]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for ¼ Sec. Cor., dug pits, 18 x 18 x 12 ins., N. & S. (or E. & W.) of corner 5½ ft. dist. and raised a mound of earth 1½ ft. high, 3½ ft. base over it. In E. (or N.) pit drove a stake 2 ft. long, 2 ins. square, 12 ins. in the ground, marked ¼ S. on N. (or W.) face.

5. Stone with Pits and Mound.

6. Stone with Mound of Stone.

7. To consist of not less than four stones. Mound to be at least 1½ ft. high, with 2 ft. base.

8. Stone with Bearing Trees.

9. See "Miscellaneous," sec. 4, page 32.

10. Post in Mound.

11. Post with Bearing Trees.

12. Mound without Post or Stone.

SEC 7. [13]A _____, _____ ins. diam., which I marked ¼ S. on N. (or W.) side, for ¼ Sec. Cor., dug pits, 18 x 18 x 12 ins. N. & S. (or E. & W.) of tree, 5½ ft. dist. and raised a mound of earth around tree.

SEC. 8. [14]A _____, _____ ins. diam., which I marked ¼ S. on N. (or W.) side, for ¼ Sec. Cor.; from which

A _____, _____ ins. diam., bears N. _____° E. _____ lks. dist. marked ¼ S. B. T.

A _____, _____ ins. diam., bears S. _____° W. _____ lks. dist. marked ¼ S. B. T.

SEC. 9. [16]On N. and S. lines the marks must be made on W. side, and on E. and W. lines on N. side of the stone, post, or tree.

SEC. 10. [17]On N. & S. lines the pits must be dug N. & S. of Cor., and on E. & W. lines E. & W. of Cor.

SEC. 11. [18]On N. & S. lines the stakes must be driven in N. pit, and on E. & W. lines in E. Pit.

STANDARD QUARTER SECTION CORNERS.

All Quarter Section Corners on Standard lines must be established in all respects like other Quarter Section Corners, with the addition of the letters S. C., and if bearing trees are established for such Corners, each tree must be marked S. C. ¼ S. B. T.

MEANDER CORNERS.

SEC. 1. [5]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground for Meander Cor. to (e. g.) Fractional Secs. 1 & 2, marked M. C. on _____ face, dug a pit 3 ft. square, 1 ft. deep, 8 lks. _____ of stone, and raised a mound of earth 2 ft. high, 4½ ft. base alongside.

SEC. 2. [6]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Meander Cor. to (e. g.) Fractional Secs. 35 & 36, marked M. C. on _____ face, and raised a mound of stone 1½ ft. high, 2 ft. base, alongside. Pits impracticable.

SEC. 3. [8]Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for Meander Cor. to (e. g.) Fractional Secs. 9 & 10, marked M. C. on _____ face; from which

A _____, _____ ins. diam., bears S. _____° E. _____ lks. dist. marked T. 2 N., R. 2 W. S. 10, M. C. B. T.

A _____, _____ ins. diam. bears S. _____° W. _____ lks. dist. marked T. 2 N. R. 2 W. S. 9, M. C. B. T.

SEC. 4. [10]Set a post 4 ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Meander Cor. to (e. g.) Fractional Secs. 35 & 36, marked M. C. on _____ face, with

T. 2 N. on N.

R. 2 W. S. 36, on E. and

S. 35 on W. faces, dug a pit 3 ft. square, 1 ft. deep, 8 lks. _____ of post, and raised a mound of earth 2 ft. high, 4½ ft. base, around post.

SEC. 5. [11]Set a post 4 ft. long, 4 ins. square, 24 ins. in the ground, for Meander Cor. to (e. g.) Fractional Secs. 20 & 21, marked M. C. on _____ face, with

T. 2 N. on S.

R. 2 W. S 21 on E. and

S. 20 on W. faces; from which

A _____, _____ ins. diam., bears S. _____° E. _____ lks. dist. marked T. 2 N., R. 2 W. S. 21, M. C. B. T.

A _____, _____ ins. diam., bears S. _____° W. _____ lks. dist. marked T. 2 N., R. 2 W. S. 20, M. C. B. T.

SEC. 6. [12]Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Meander Cor. to (e. g.) Fractional Secs. 11 & 12, dug a pit, 3 ft. square, 1 ft. deep, 8 lks. _____ of Cor., and raised a mound of earth 2 ft. high, 4½ ft. base, over it. In pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked M. C. on _____ face, with

T. 2 N. on S.

R. 2 W. S. 12 on E. and

S. 11 on W. faces.

SEC. 7. [13]A _____, _____ ins. diam., which I marked (e. g.) M. C. on _____ side, with

T. 2 N. on W.

R. 2 W. S. 13 on N. and

S. 24 on S. sides, for Meander Cor. to Fractional Secs. 13 & 24.

SEC. 8. [14]A _____, _____ ins. diam., which I marked (e. g.) M. C. on _____ side, with

T. 2 N. on E.

R. 2 W. S. 6 on N. and

S. 7 on S. sides, for Meander Cor. to Fractional Secs. 6 & 7; from which

A _____, _____ ins. diam. bears N. _____° W. _____ lks. dist. marked T. 2 N., R. 2 W. S. 6, M. C. B. T.

A _____, _____ ins. diam. bears S. _____° W. _____ lks. dist., marked T. 2 N., R. 2 W. S. 7, M. C. B. T.

SEC. 9. [17]When a pit is dug at a Meander Cor. it must be 8 lks. from the Cor., on the side opposite the river or lake meandered.

SEC. 10. [16]The letters "M. C." for Meander Corner must be marked on the side facing the river or lake meandered.

WITNESS CORNERS.

A Witness Corner must bear the same marks that would be placed upon the Corner for which it is a witness, with the addition of the letters W. C., and be established in all respects like such Corner.

If bearing trees are established for a Witness Corner, each tree must be marked W. C., in addition to the usual marks.

15. Connection Lines.

16. Marks.

17. Pits.

18. Stakes in Pits.

MISCELLANEOUS.

SEC. 1. [19]When a rock in place is established for a Corner, its dimensions above ground must be given, and a cross (x) marked at exact Corner point. In other respects the form for stone corners will be used.

SEC. 2. [20]Where mounds of earth are raised "alongside" of Corners, on N. and S. lines, they must be placed on the W. and on E. and W. lines on the N. side of Corner. In case the

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character of the land is such that this can not be done, the deputy will state in his notes instead of "alongside," "S" (or E.)

SEC. 3. [21]In case where pits are practicable the deputy prefers raising a mound of stone, or stone covered with earth,[22] as more likely to perpetuate the Corner, he will use the form given for mound of stone, omitting the words "pits impracticable," and adding "covered with earth," when so established. (See foot-note, p. 22.)

SEC. 4. [23]Where the requisite number of trees can be found within 300 links of the Corner point, three (3) bearing trees should be established for every Standard or Closing Cor., four (4) for every Cor. common to (four) Townships or Sections, and two (2) for every Quarter Sec. Cor. or Meander Cor. When a bearing tree is located on the side of a Base Line or Standard Parallel *opposite* the township to which the corner it witnesses belongs, it will be marked with the township and ranges, (if a *township* corner), and, (if a *section* corner), with the township, range, and sections to *which it belongs*, and with the letters S. C. (for Stand Cor.), or C. C. (for Closing Cor.), as the case may require. The number of the Section *in which the tree stands* will be omitted. See "Discription of Corners." In case the requisite number of trees can not be found within limits, the deputy must state in his field notes after describing those established, "no other trees within limits," and "dug pits in Secs. _____ & _____," or "raised a mound of stone alongside." The bearing trees, being the most important adjuncts of the corners, their *exact* bearings from the true meridian must be taken with the *instrument used in running the lines of survey,* and the distance should be measured *from* the center of the tree to the center of the corner. The height of the *top* of all blazes and markings on trees must be limited to *two and one-half feet above the ground.*

SEC. 5. [24]Stones 18 ins. and less long must be set two-thirds, and over 18 ins. long, three-fourths, of their length in the ground. No stones containing less than 504 cubic inches must be used for corners.

SEC. 6. [25]Particular attention is called to the "Summary of objects and data required to be noted," on pages 44 and 45 of these instructions, and it is expected that the deputy will thoroughly comply with same in his work and field notes.

SEC. 7. [26]No mountains or lands not classed as surveyable are to be meandered, and all lines approaching such lands must be discontinued at the section or quarter section corner.

SEC. 8. [27]Where by reason of impassable objects the south boundary of a township can not be established, an auxiliary base-line should be run through the Township, first random, then corrected, from one range line to the other, connecting corresponding corners, and as far *south* as possible, and from such line the section lines will be extended northwardly in the usual manner, and any fraction south of said line may be surveyed in the opposite direction from the Section Corners on the auxiliary base thus established.

SEC. 9. [28]When no part of the east or west boundaries can be run, both the north and south boundaries will be established as true lines.

SEC. 10. [29]Allowance for the convergency of meridians must be made whenever necessary.

SEC. 11. [30]All letters and figures cut in posts or trees must be marked over with red chalk to make them still more plain and durable.

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SEC. 12. [31]Township corners common to four townships, and section corners common to four sections, are to be set diagonally in the earth, with the angles in the direction of the lines. All other corners are to be set square, with the sides facing the direction of the lines.

SEC. 13. [32]The sizes of wooden posts, mounds, and pits noted in foregoing descriptions of corners are to be regarded as *minimum*, and whenever practicable to increase their dimensions it is desirable to do so.

SEC. 14. [33]In establishing corners, stones should be used wherever practicable; then, posts; and lastly, mounds, with stake in pit.

SEC. 15. [34]It is expected that the deputy surveyors will carefully read and familiarize themselves with these instructions, and all others contained in this volume, and will instruct their assistants as to their duties before commencing work. Extra copies will be furnished the deputies for the use of their assistants.

19. Rock in Place.
20. Mounds of Earth.
21. Mounds of Stone.
22. For mound of stone "covered with earth," the height and base will be the same as for mound of earth.
23. Bearing Trees.
24. Stones.
25. Objects to be Noted
26. Lines Discontinued at Legal Corners.
27. Fractional Townships.
28. Boundaries.
29. Convergency.
30. Red Chalk.
31. Mode of Setting Corners.
32. Size of Posts, etc.
33. Corner Materials.
34. Examine Instructions.

MEANDERING.

SEC. 1. Proceeding down stream, the bank on the *left* hand is termed the "left bank," and that on the *right* hand the "right bank." These terms are to be universally used to distinguish the two banks of a river or stream.

SEC. 2. Both banks of *navigable* rivers, as well as of all rivers not embraced in the class denominated as "navigable," the right angle width of which is *three chains* and upwards, will be meandered on *both* banks by taking the general courses and distances of their sinuosities, and the same are to be entered in the field book. Rivers not classed as navigable will not be meandered above the point where the average right-angle width is less than three chains.

At those points where either the township or section lines intersect the banks of a navigable stream, or any meanderable line, corners are to be established at the time of running these lines. These are called "meander corners;" and in meandering you are to commence at one of those corners, coursing the banks or boundary line, and measuring the distance of each course from your commencing corner to the next "meander corner." By the same method you are to meander the opposite bank of the same river.

The crossing distance *between* the MEANDER CORNERS on same line and the true bearing and distance between opposite meander corners is to be ascertained by triangulation or direct measurement, in order that the river may be protracted with entire accuracy. The particulars to be given in the field-notes.

The subdividing deputies will be required to establish meander corners on both banks of such meanderable streams at the intersection of all section lines, and the distances across the river, determined as above directed, will be noted in the field-book.

In meandering water-courses, where a distance is more than *ten chains* between stations, whole chains only should be taken; but if the distance is *less* than ten chains, and it is found convenient to employ chains and links, the number of links should be a multiple of ten, thereby saving time and labor in testing the closings both in the field and in the surveyor-general's office.

SEC. 3. You are also to meander, in manner aforesaid, all *lakes*, and deep ponds of the area of twenty-five acres and upwards; also naviga-

ble bayous; *shallow* ponds, readily to be drained, or likely to dry up, are not to be meandered.

In meandering lakes, bayous, or ponds you are to commence at a meander corner, and proceed as above directed for meandering the banks of navigable streams; and from said corner take the courses and distances of the entire margin of the same, noting the intersections with all meander corners established thereon.

You will notice all streams of water falling into the river, lake, or bayou you are surveying, stating the width of the same at their mouth; also all springs, noting the size thereof and depth, and whether the water be pure or mineral; also the head and mouth of all bayous; and all islands, rapids, and bars are to be noticed, with intersections to their upper and lower points to establish their exact situation. You will also note the elevation of the banks of river and streams, the heights of falls and cascades, and the length of rapids.

To meander a lake or deep pond lying entirely within the boundaries of a section, you will run and measure *two* lines thereunto from the nearest section or quarter-section corner on *opposite* sides of such pond, giving the courses of such lines. At *each* of the points where such lines shall intersect the margin of such pond or lake you will establish a meander corner as above directed. (See "Meander corners.")

The relative position of these points being thus definitely fixed in the section, the meandering will commence at one of them, and be continued to the other, noting the intersection, and thence to the beginning. The proceedings are to be fully entered in the field-book.

SEC. 4. Meander lines should not be established at the segregation line between dry and swamp or overflowed land, but at the ordinary low-water mark of the actual margin of the rivers or lakes on which such swamp or overflowed lands order. In cases where such meander lines were formerly established at the segregation line between dry and swamp or overflowed lands, new and proper meander lines may be established under the direction of the surveyor general, and the township and section lines extended over such swamp or overflowed lands and the corners established, as hereinbefore provided, in order that the plats and field-notes of surveys may show the actual facts in the case.

5. The precise relative position of islands, in a township made fractional by the river in which the same are situated, is to be determined trigonometrically; sighting to a flag or other fixed object on the island, from a special and carefully measured base line, connected with the surveyed lines, on or near the river bank, you are to form connection between the meander corners on the river to points corresponding thereto, in direct line, on the bank of the island, and there establish the proper meander corners, and calculate the distance across.

6. In taking the connection of an island with the main land, when there is no meander corner in line, opposite thereto, to sight from, you will measure a special base from the most convenient meander corner, and from such base you will triangulate to some fixed point on the shore of the island, ascertain the distance across, and there establish a *special* meander corner, wherefrom you will commence to meander the island.

7. In the survey of lands bordering on *tide water*, "meander corners" are to be established at the points where surveyed lines intersect *high-water mark,* and meanders are to follow the *high-water line.*

8. The field-notes of meanders will be set forth in the field-books showing the dates when the work is performed, as illustrated in the specimen notes annexed. They are to state and describe particularly

the meander corner from which they commenced, and each one upon which they close, and are to exhibit the meanders of each fractional section separately; following, and composing a part of such notes, will be given a description of the land, timber, depth of inundation to which the bottom is subject,

and the banks, current, and bottom of the stream or body of water you are meandering. The utmost care must be taken to pass no object of topography, or *change therein*, without giving a particular description thereof in its proper place in your meander notes.

SURVEYING.

Initial points from which the lines of the public surveys are to be extended must be established whenever necessary under such special instructions as may be prescribed in each case by the Commissioner of the General Land Office. The locus of such initial points must be selected with great care and due consideration for their prominence and easy identification, and must be established astronomically.

The initial point having been established, the lines of the public surveys are to be extended therefrom as follows:

BASE LINE.

The base line shall be extended east and west from the initial point by the use of solar instruments or transits, as may be directed by the surveyor-general, in his special written instructions. The *transit* should be designated for the alignment of all important lines. Where solar instruments are used the deputy must test said instruments in every 12 miles of line run by observation on the polar star; and in *all* cases where he has reason to suppose that said instrument is in error, he must take an observation on the polar star, and if error be found, must make the necessary corrections before proceeding with his survey. The proper corners shall be established at each 40 and 80 chains, and at the intersection of the line with rivers, lakes, or bayous that should be meandered, in accordance with the instructions for the establishment of corners. In order to check errors in measurement, two sets of chainmen, operating independently of each other, must be employed.

Where transits are used, the line will be run by setting off at the point of departure on the principal meridian[35] a tangent to the parallel of latitude, which will be a line falling at right angles to said meridian. The line thus determined will be prolonged by *two* back and *two* fore sights at *each* setting of the instrument, turning the horizontal limb 180 in azimuth between the observations. The survey will be continued on this line for twelve (12) miles,[36] but the corners will be established at the proper points by offsets northerly from said line, at the end of each half mile. In order to offset correctly from the tangent to the parallel, the deputy will be guided by the tables of offsets and azimuths contained in this volume[37]. As the azimuth of the tangent is shown, the angle thence to the true meridian at each mile is readily found, thus indicating the direction of the offset line. The computations are made for a distance of 12 miles, at the end of which observations on the polar star must be taken for the projection of a new tangent. The computations are also upon whole degrees of latitude; offsets for intervening parallels can be readily determined by interpolation. Where offset distances to quarter-section corners exceed 50 links, their direction to the parallel can be determined in like manner by interpolation for azimuth.

Where said distances are less than 50 links interpolations for determining directions will not be required.

PRINCIPAL MERIDIAN.

The principal meridian shall be extended north and south from the initial point, by the use of solar instruments or transits, as may be directed by the surveyor general in his special written instructions. Where solar instruments are used, the line will be run in the same manner as prescribed for running the base line by solar instruments. Where transits are used, observations upon the polar star must be taken within each 12 miles of line run. In addition to the above general instructions, it is required that in all cases where the establishment of a new principal meridian seems to be necessary to the surveyor-general, he shall submit the matter, together with his reasons therefor, to the Commissioner of the General Land Office, and the survey of such principal meridian shall not be commenced until written authority, together with such special instructions as he may deem necessary, shall have been received from the Commissioner. Two set of chainmen, operating independently of each other, must be employed.

STANDARD PARALLELS.

Standard parallels, which are also called correction lines, shall be extended east and west from the principal meridian, at intervals of every 24 miles north and south of the base line, in the same manner as prescribed for running the base line, and two sets of chainmen must be employed.

GUIDE MERIDIANS.

Guide meridians shall be extended north and south from the base line, at intervals of every 24 miles east and west from the principal meridian, in the same manner as prescribed for running the principal meridian, and two sets of chainmen must be employed.

It is contemplated that these base, principal meridian, standard, and guide meridian lines shall first be extended over the territory to be surveyed, and that afterwards township and section lines shall be run, where needed, within these tracts of 24 miles square, formed by the extension of these principal lines; and each surveyor-general will therefore cause said principal lines to be extended as rapidly as practicable.

Paragraph 5, "System of rectangular surveying,"[38] declares that the object of running standard parallels and guide meridians is "to confine the errors resulting from convergency of meridians, and inaccuracies in measurement, within the tracts of lands bounded by the lines so established."

As the convergency is rapidly increased in the higher latitudes and resulting inaccuracies developed in about the same

35. See diagram A, Fig. 1.

36. Or a less distance.

37. See Tables III, IV, and V, and Diagram A, Fig. 1.

38. Page 18.

proportion, it would seem to be consistent with the spirit of the above paragraph to so contract the blocks of 24 miles square, by diminishing either the distances between correction lines, or by reducing the interval between guide meridians, or by using both contractions simultaneously, as to confine convergency errors, as near as practicable, to a uniform amount.

Unfortunately, guide meridians have been so irregularly spaced in the several surveying districts, in some cases exceeding the authorized 24 miles by *three times its amount* or even more, that any attempt to provide a general rule for use in all parts of the country would

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probably result in failure to correct existing irregularities and help still further to increase the present confusion.

Therefore, the only thing that can be done is to reiterate the above directions limiting the tracts bounded by guide meridians and standard parallels to 24 *miles square* and *direct, that in future, compliance with the above requirement will be insisted upon.*

EXTERIORS OR TOWNSHIP LINES.

The east and west boundaries of townships are always to be run from south to north on a true meridian line; and the north and south boundaries are to be run from east to west, or from west to east (according to the location of the township to be surveyed with reference to prior surveys), on a *random* or trial line and corrected back on a true line. The distance north or south of the township corner to be closed upon, from the point of intersection of these random lines with the east or west boundary of the township, must be carefully measured and noted. Should it happen, however, that such random line should fall short, or overrun in length, or interset the east or west boundary more than *three chains'* distance from the township corner thereon, as compared with the corresponding boundary on the south (due allowance being made for covergency), the line, and if necessary the entire exterior boundaries of the township, must be retraced, so as to discover and correct the error. In running random lines temporary corners are to be set at each 40 and 80 chains, and permanent corners established upon the true line as corrected back, in accordance with instructions, throwing the excess or deficiency on the west half mile, as prescribed by law. Permanent corners are to be established in accordance with instructions on the east and west township boundaries at the time they are run. Whenever practicable the township lines within these tracts of 24 miles square must be surveyed in regular order from *south* to *north*, i. e., the exterior boundaries of the township in any one range lying immediately north of the south boundary of such tract of 24 miles square must first be surveyed, and the exteriors of the other three townships in said range extended therefrom, in regular order from *south* to *north*, and it is preferable to first survey the entire range of townships in such tract adjoining the east boundary or adjoining the west boundary, and the other three ranges in regular sequence. In cases, however, where the character of the land is such that this rule cannot be complied with, the following will be observed:

In extending the *south* or *north* boundaries of a township to the *west*, where the *southwest* or *northwest* corners cannot be established in the regular way by running a north and south line, such boundaries will be run *west on a true line*, allowing for convergency on the west half mile; and from the township corner established at the end of such boundary, the west boundary will be run *north* or *south*, as the case may be. In extending *south* or *north* boundaries of a township to the *east*, where the *southeast* or *northeast* corner cannot be established in the regular way, the same rule will be observed, except that such boundaries wil be run *east on a true line*, and the *east* boundary run *north* or *south*, as the case may be. One set of chainmen only is required in running township lines.

METHOD OF SUBDIVIDING.

1. The variation is to be found by observations on Polaris taken at or near the S. E. corner of the township. The first mile, both of the

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south and east boundaries of each township you are required to subdivide, is to be carefully traced and measured before you enter upon the subdivision thereof. This will enable you to observe any errors that may have been made in former surveys either in direction or length of the lines and will also enable you to compare your chaining with that upon the township boundaries.

2. Any discrepancy arising either from a disagreement of bearings or a difference in measurement, is to be carefully noted in the field-notes. In this article the term "bearing" is to be construed to mean the *true* bearing or angle made with the *true meridian.*

3. After adjusting our compass to the variation which you have determined by observation, you will commence at the corner to sections 35 and 36, on the south boundary, and run a line northwardly *with the true bearing of the range line,* forty chains, to the quarter-section corner, which you are to establish between sections 35 and 36; continuing on said course forty chains farther, you will establish the corner to sections 25, 26, 35, and 36.

4. From the section corner last named run a *random* line, without blazing, *parallel to the south boundary of section* 36, for the corner of sections 25 and 36, on east boundary, and at forty chains from the starting point set a post for *temporary* quarter-section corner. If you intersect exactly at the corner, you will blaze your random line back, and establish it as the *true* line; but if your random line intersects the said east boundary, either north or south of said corner, you will measure the distance of such intersection, from which you will calculate a course that will run a *true* line back to the corner from which your random started. You will establish the *permanent* quarter-section corner at a point equidistant from the two terminations of the *true* line.

5. From the corner of sections 25, 26, 35, and 36, run northwardly with the *true* bearing of the range line between sections 25 and 26, setting the quarter-section post as before, at forty chains, and at eighty chains establishing the corner of sections 23, 24, 25, and 26. Then run a random *parallel to the south boundary of section* 36 for the corner of sections 24

and 25 on east boundary; setting temporary quarter-section post at forty chains; correcting back, and establishing permanent quarter-section corner at the equidistant point on the true line, in the manner directed on the line between sections 25 and 36.

6. In this manner you will proceed with the survey of each successive section in the first tier, until you arrive at the north boundary of the township, which you will reach in running up a random line between sections 1 and 2, *with the true bearing of the range line,* setting the temporary quarter-section corner at forty chains from the interior section corner so as to throw the excess or deficiency of measurement on the quarter-sections adjoining the north boundary of the township. If this random line should not intersect at the corner established for sections 1, 2, 35, and 36, upon the township line, you will note the distance that you fall east or west of the same, from which distance you will calculate a course that will run a *true line* to the corner from which your random started, on which line you will establish the permanent quarter-section corner. If the north boundary of a township is a base or standard line, the line between sections 1 and 2 is to be run *with the true bearing of the range line* as a *true* line, and the closing corner established at the point of intersection with such base or standard line; and in such case the distance from said closing corner to the nearest standard corner on such base or standard line must be carefully measured and noted as a *connection line.*

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7. In like manner proceed with the survey of each successive tier of sections, until you arrive at the fifth tier; and from each section corner which you establish upon the west boundary of this tier you are to run random lines *parallel to the south boundary of section* 31, towards the corresponding corners established upon the range line forming the western boundary of the township; setting, as you proceed, each *temporary* quarter-section corner at forty chains from the interior section corner, so as to throw the excess or deficiency of measurement on the extreme tier of quarter sections contiguous to the township boundary; and on returning establish the *true* line, and establish thereon the *permanent* quarter-section corner. The *random* of an east and west section line must always be run *parallel to the south boundary of the tier of sections to which it belongs and with the true bearing of said boundary.*

8. It is not required that the deputy shall complete the survey of the first tier of sections from south to north, before commencing the survey of the second or any subsequent tier, but the corner on which the random line closes must have been previously established by running the line which determines its position, except as follows: Where it is impracticable to establish such section corner in the regular manner it may be established by running the east and west line as *a true line*, with a *true bearing*, determined as above directed for *random* lines, setting the quarter-section corner at 40 chains and the section corner at 80 chains.

9. Quarter-section corners, both upon north and south and upon east and west lines, are to be established at a point equidistant from the corresponding section corners, except upon the lines closing on the north and west boundaries of the township, and in those situations the quarter-section corners will always be established at precisely *forty chains* to the north or west (as the case may be) of the respective section corners from which those lines respectively *start,* by which procedure the excess or deficiency in the measurements will be thrown, according to law, on the extreme tier of quarter sections.

If, in the subdivision of part of a township, the lands to be surveyed can not be reached by lines extending from the south boundary of the township, a line corresponding to the south boundary of the same shall be extended from some section corner on the east boundary of the township to the west boundary thereof, in order that it may constitute the south boundary of the surveyable area; from which subdivisional meridian lines will be projected northward, and the surveys carried forward in the same manner as for the subdivision of a full township, in order that regular and fractional areas shall occupy their true and legal positions.

Fragmentary portions of surveyable lands lying south of the provisional base last described may be included in the survey by extending lines *southwardly* from the same in harmony with the general system.

When the proper point for the establishment of a section corner is inaccessible, and a witness monument can be erected upon each of the two lines which approach the same at distances not exceeding twenty chains therefrom the quarter-sections depending thereon will be disposed of in the same manner as if the corner had been regularly established.

The witness monument must be marked as conspicuously as a section corner, and bearing trees used wherever possible.

The deputy will be required to furnish good evidence that the section corner is actually inaccessible.

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PRESCRIBED LIMITS FOR CLOSINGS AND LENGTH OF LINES IN CERTAIN CASES.

1. Every north-and-south section line, except those terminating in the north boundary of the township, must be *eighty chains* in length.

2. The east-and-west *section lines,* except those terminating in the west boundary of the township, are to be within *eighty links* of the actual distance established on the south boundary line of the township for the width of said tier of sections, and must close within fifty links north or south of the section corner.

3. The north boundary and south boundary of any one section, except in the extreme western tier, are to be within *eighty links* of equal length.

4. The meanders within each fractional section, or between any two meander posts, or of an island in the interior of a section, must close within a limit determined by allowing *five-eighths of a link* for *each chain* of said meander line when less than 80 chains in length. When the meander line is more than 80 chains in length the closing error must in no *case exceed* 150 links.

5. In running *random* township exteriors, if such random lines fall short or overrun in length, or intersect the eastern or western boundary, as the case may be, of the township, at more than *three chains* north or south of the true corner, the

lines must be *retraced*, even if found necessary to remeasure the meridional boundaries of the township. One set of chainmen only is required in subdividing.

RETRACING TOWNSHIP LINES AND BOUNDARIES OF PRIVATE LAND CLAIMS.

If, in subdividing a township, it is found that the exterior boundaries have been improperly run, measured, or marked, or the corners established thereon have been obliterated, the deputy will resurvey so much of said exterior boundaries as may be necessary, and establish new corners upon same wherever necessary. Where no subdivisions have been made on either side of a township boundary, it will be corrected, if necessary, in point of alignment as well as measurement, by establishing the section corners at lawful distances from the south or east boundaries of the township (as the case may be), and upon a right line extending between the township corners; and in such case, the old corners on said township boundaries will be destroyed.

Where subdivisional lines have been closed upon a township boundary in advance of the preliminary survey of the same, its alignment will not be changed. If it is found necessary to establish new corners on such boundary they will receive only the marks referring to the sections in the township being subdivided, and the marks on the old corners on such boundary, which refer to such sections, will be obliterated.

In all cases such necessary corrections will be made as will place the section corners at the aforesaid lawful distances from the south or east boundary, in order that a legal subdivision of the township may be made, and where new corners are thus necessarily established, the distance and direction between new and old corners must be carfully noted.

New corners on township boundaries must be established by a survey of such lines, and *in no case* will such corners be established from *data* acquired in running lines closing such boundaries. One set of chainmen, only, is required in retracing township lines.

When township or subdivision lines intersect the boundaries of confirmed private land claims, the latter must be retraced so far as may be necessary to establish the corners to the fractional sections at their

proper places, and such corners must be established, in all respects, like meander corners, except that instead of the letters "M. C." the letters used to designate such private land claim must be marked on corners. In retracing the boundary of such claim the deputy must set stakes thereon, at each forty chains, where the ground is level, and on broken ground, at every spur, ridge, or other prominent point, and also at each angle formed by a change in the direction of such boundary.

SPECIAL INSTRUCTIONS ISSUED BY UNITED STATES SURVEYORS-GENERAL TO UNITED STATES DEPUTY SURVEYORS.

One of the most important duties to be performed by the surveyor-general, is to provide the deputy surveyor with *Special Instructions,* in connection with the contract, prepared in accordance with law, which instructions are not to be limited to calling attention to certain paragraphs in this Manual, reiteration of its requirements and in providing the deputy with a printed copy of directions of a *general* nature; but they must, in all cases, and particularly for the survey of exteriors, be *specific* in character, with all necessary *detailed statements* setting forth *what* the deputy is to do and *how* the work is to be performed. Before making out special instructions, the surveyor-general will cause a thorough examination to be made of the field notes and plats of older surveys of standard and township lines upon which the deputy is to base his work, and give him full information—both *written and graphic*—of the exact condition of adjoining surveys, with all *irregularities* that may be found, carefully and clearly noted, with all necessary instructions for his guidance if he finds everything *as it should be*, and, in addition, advise him, so far as he can, what to do in case the surveys on the ground are *not as represented* in the old notes.

If the contract includes exterior lines, the surveyor-general will specify in detail *where* the deputy is to commence, in what *order* and in what *direction* he is to run the lines, inform him how much *convergency* to use, and provide for his use a *diagram,* giving full and accurate information in regard to lengths and bearings of all lines of old surveys, *from* which he is to work, or *upon* which he is to close. The diagrams will be made in triplicate, one copy for the General Land Office, one for the deputy, and one to be retained. They may be either original drawings, blue prints, or tracings. *In no case must the deputy be sent into the field without full and accurate information in regard to all irregularities which will in any manner affect the extent or accuracy of his survey.*

FIELD NOTES.

The proper blank books for field notes will be furnished by the surveyor-general, and in such books the deputy surveyor must make a faithful, distinct, and minute record of everything officially done and observed by himself and his assistants, pursuant to instructions, in relation to running, measuring, and marking lines, establishing corners, etc., and present, as far as possible, a full and complete topographical description of the country surveyed.

From the *data* thus recorded at the time when the work is done on the ground, the deputy must prepare *true* field notes of the surveys executed by him, in the manner hereinafter prescribed, and return same to the surveyor-general, together with the required sketches, at the earliest practicable date after the completion of his work in the field.

The true field notes are in no case to be made out in the office of the surveyor-general.

The field notes of the survey of base, meridian, standard, exterior,

and subdivision lines are each to be written in *separate books.* The subdivisions of *each* township will form one book. *No adhesive material of any kind will be used to fasten the leaves or covers.*

The first, or title page of each field-note book is to describe the subject matter of the same, the locus of the survey, by

whom surveyed, date of contract, and the dates of commencement and completion of the work. The second page is to contain the names and duties of the assistants, and the index is to be placed on same or following page. Whenever a new assistant is employed, or the duties of any one of them changed, such facts are to be stated in an appropriate entry immediately preceding the notes taken under such changed arrangements.

The exhibition of every mile of surveying, whether on township, or subdivisional lines, and of meanders in each section, must be *complete in itself*, and be separated by a black line drawn across the paper.

The *change* in the variation, if any is observed, the *hour* of the day and *cause* of the change will be stated at the commencement of every line run.

The variation of the *needle* must always occupy a *separate line* preceding the notes of measurements on line.

The description of the surface, soil, minerals, timber, undergrowth, etc., on *each mile* of line, is to follow the notes of survey of such line, and not be mixed up with them.

The date of each day's work must follow immediately after the notes thereof.

No abbreviations of words are allowable, except of such words as are *constantly* occurring, such as *"sec."* for *"section"; "in. diam."* for *"inches diameter"; "chs."* for *"chains"; "lks."* for *"links"; "dist."* for *"distant"; "¼ sec. cor."* for *"quarter-section corner"; "va."* for *"variation,"* etc.; for 14 inches long, 12 inches wide, and 3 inches thick, in describing a corner stone, use 14 x 12 x 3, being particular to always observe the same order of length, width, and thickness. Proper names must never be abbreviated, however often their recurrence.

When the lines of survey cross hills or ravines, the height or depth of same, in feet, must be noted as nearly as practicable.

The corners established in previous surveys, from which the lines start, or upon which they close, must be fully described in the field notes. A full description of such corners will in all cases be furnished the deputy from the surveyor-general's office at the date authority is given for commencing work.

In all cases where a corner is re-established the field notes must describe fully the manner in which it is done.

Field notes of the survey of base, standard, and meridian lines must describe all corners established thereon, how established, the crossings of streams, ravines, hills, and mountains; character of soil, timber, minerals, etc.; and after the description of each township corner established in running such lines, the deputy will note particularly in the "general description" the townships on each side of the lines run.

Field notes of the survey of exterior boundaries of townships must describe the corners and topography, as above required, and the "general description" at the end of such notes must describe the townships as fully as may be, and also state whether or not they should be subdivided.

Near the end of his field notes and immediately before the "general description," the deputy surveyor will add, in form similar to that shown in specimen field notes, No. 3, a tabular statement of the latitude and departure of each boundary line of the township, taken from a traverse table, giving the *totals* and *errors* in latitude and departure, which must in no case exceed the "prescribed limits for closings" contained in this manual.[39] If a part or the whole of one or more of the boundaries is made up of meander lines,[40] the *total* northings, southings, eastings and westings of such lines will take the place of the missing N. and S. or E. and W. lines, so as to present the *total errors* of the township boundaries, considered as a closed survey. If all the exterior lines have been surveyed by the deputy, the bearings and distances for the table will be taken from his own notes. In a case where some of the boundaries have been surveyed under an older contract, the deputy will use the bearings and distances supplied by the Surveyor General in connection with his own lines, and if the errors *exceed* the allowance defined in paragraphs 4 and 5 of the "prescribed limits," he will determine *where* the error occurs, correct the same *before he leaves the field,* and place the table in his *field note book*. This requirement is made necessary by the frequent occurrence of errors in the exterior lines, of which nothing is known in this office until after the township has been subdivided and the returns taken up for examination and settlement of the account, and *then* much correspondence and delay results in injury to the service and sometimes in trouble for settlers.

Field notes of the subdivisional survey of townships must describe the corners and topography as above required, and the "general description" at the end of such notes must state minutely the character of the land, soil, timber, etc., found in such townships.

The topography must be given on the *true line* in all cases, and must be taken correctly, not estimated or approximated.

A blank line must be left at the bottom of each page of the field notes, and the notes must be written in a plain, legible hand, and in clear and precise language, so that the figures, letters, words, and meaning will always be unmistakable, and erasures and interlineations avoided, as far as possible.

With the notes of the survey of principal lines forming a tract of 24 miles square the deputy will submit a plat of the lines run on a scale of one-half inch to the mile, and with the notes of survey of the exterior lines of townships a plat of the lines run on the scale of two inches to the mile, on which are to be noted all the objects of topography on line necessary to illustrate the notes, viz, the distance on line at the crossings of streams, so far as such can be noted on the paper, and the direction of each by an arrow-head pointing down stream; also, the intersection of line by prairies, marshes, swamps, ravines, ponds, lakes, hills, mountains, and all other matters indicated by the notes, to the fullest extent practicable.

With the instructions for making subdivisional surveys of townships into sections, the deputy will be furnished by the surveyor-general with a diagram of the *exterior* lines previously established of the townships to be subdivided (on the above-named scale), upon which are carefully to be laid down the measurements of each of the lines on such boundaries whereon he is to close, and the magnetic variation of each mile. And on such diagram the deputy who subdivides will make appropriate sketches of the various objects of topography as they occur on his lines, so as to exhibit not only the

39. See page 40.

40. In the table, meanderable lines of new surveys will be left blank.

points on line at which the same occur, but also the direction and position of each between the lines, or within each section, as far as practicable, so that every object of topography may be properly completed or connected in the showing.

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SUMMARY OF OBJECTS AND DATA REQUIRED TO BE NOTED.

1. The precise length of every line run, noting all necessary offsets therefrom, with the reason and mode thereof.

2. The kind and diameter of all *"bearing trees,"* with the course and distance of the same from their respective corners; and the precise relative position of WITNESS CORNERS to the *true corners.*

3. The kind of materials of which corners are constructed.

4. *Trees on line.* The name, diameter, and distance on line to all trees which it intersects.

5. Intersections by line of *land objects.* The distance at which the line first intersects and then leaves every *settler's claim and improvement*; prairie, river, creek, or other "bottom;" or swamp, marsh, grove, and wind-fall, with the course of the same at both points of intersection; also the distances at which you begin to ascend, arrive at the top, begin to descend, and reach the foot of all remarkable hills and ridges, with their courses, and *estimated* height, in feet, above the level land of the surrounding country, or above the bottom lands, ravines, or waters near which they are situated.

6. Intersections by line of *water objects.* All rivers, creeks, and smaller streams of water which the line crosses; the distances on line at the points of intersection, and their *widths on line.* In cases of *navigable* streams, their width will be ascertained between the *meander corners*, as set forth under the proper head.

7. The land's *surface*—whether level, rolling, broken, or hilly.

8. The *soil*—whether first, second, third, or fourth rate.

9. *Timber*—the several kinds of timber and undergrowth, in the order in which they predominate.

10. *Bottom lands*—to be described as wet or dry, and if subject to inundation, state to what depth.

11. *Springs of water*—whether fresh, saline, or mineral, with the course of the stream flowing from them.

12. *Lakes and ponds*—describing their banks and giving their height, and also depth of water, and whether it be pure or stagnant.

13. *Improvements.* Towns and villages; houses or cabins; fields, or other improvements; sugar-tree groves, sugar camps, mill seats, forges, and factories. To be located by bearing and distance or intersecting bearings from given points.

14. *Coal* banks or beds; *peat* or turf grounds; *minerals* and ores; with particular description of the same as to quality and extent, and all *diggings* therefor; also *salt* springs and licks. All reliable information you can obtain respecting these objects, whether they be on your immediate line or not, is to appear on the general description to be given at the end of the notes.

15. *Roads and trails*, with their directions, whence and whither.

16. Rapids, cataracts, cascades, or falls of water, with the estimated height of their fall in feet.

17. Precipices, caves, sink holes, ravines, stone quarries, ledges of rocks, with the kind of stone they afford.

18. *Natural curiosities,* interesting fossils, petrifications, organic remains, etc.; also all ancient works of art, such as mounds, fortifications, embankments, ditches, or objects of like nature.

19. The *variation* of the needle must be noted at all points or places on the lines where there is found any material *change* of variation, and the position of such points must be perfectly identified in the notes.

20. Besides the ordinary notes taken on line (and which must always be written down on the spot, leaving nothing to be supplied by mem-

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ory), the deputy will subjoin, at the conclusion of his book, such further description or information touching any matter or thing connected with the township (or other survey) which he may be able to afford, and may deem useful or necessary to be known—with a *general description* of the township in the *aggregate,* as respects the face of the country, its soil and geological features, timber, minerals, waters, etc.

Following the "general description" of the township is to be "A list of the names of the individuals employed to assist in running, measuring, and marking the lines and corners described in the foregoing field notes of township No. _____ of the BASE LINE of range No. _____ of the _____ MERIDIAN, showing the respective capacities in which they acted."

AFFIDAVITS TO FIELD NOTES.

The following are the forms of official oaths to be taken by deputy surveyors and their assistants. The original oaths are to be affixed to the *true* field notes returned to the surveyor-general by the deputy surveyor; the preliminary oaths being placed immediately after the index of the first book, and the final oaths at the end of the last book of field notes of the surveys to which they refer:

PRELIMINARY OATHS OF ASSISTANTS.

We, _____ _____ and _____ _____, do solemnly swear that we will well and faithfully execute the duties of chain-carriers; that we will level the chain upon even and uneven ground and plumb the tally pins, either by sticking or dropping the same; that we will report the true distance to all notable objects, and the true length of all lines that we assist in measuring, to the best of our skill and ability, and in accordance with instructions given us, in the survey of the _____ _____.

_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*

Subscribed and sworn to before me this _____ day of _____, 18__.

_____ _____,
_____.

We, _____ _____ and _____ _____, do solemnly swear that we will well and truly perform the duties of axemen, in the establishment of corners and other duties, according to instructions given us, and to the best of our skill and ability, in the survey of _____ _____.

_____ _____, *Axeman.*
_____ _____, *Axeman.*

Subscribed and sworn to before me this _____ day of _____, 18__.

_____ _____,
_____.

I, _____ _____, do solemnly swear that I will well and truly perform the duties of flagman, according to instructions given me, to the best of my skill and ability, in the survey of _____ _____.

_____ _____, *Flagman.*

Subscribed and sworn to before me this _____ day of _____ 18__.

_____ _____,
_____.

FINAL OATHS FOR SURVEYS.

List of Names.

A list of the names of the individuals employed by _____ _____, United States deputy surveyor, to assist in running, measuring, and marking the lines and corners described in the foregoing field notes of the survey of _____ showing the respective capacities in which they acted.

_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Axeman.*
_____ _____, *Axeman.*
_____ _____, *Flagman.*

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FINAL OATHS OF ASSISTANTS.

We hereby certify that we assisted _____ _____, United States deputy surveyor, in surveying all those parts or portions of the _____ of the _____ base and _____ meridian, _____ of _____, as are represented in the foregoing field notes as having been surveyed by him and under his direction; and that said survey has been in all respects, to the best of our knowledge and belief, well and faithfully surveyed, and the corner monuments established according to the instructions furnished by the United States surveyor-general for _____.

_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Axeman.*
_____ _____, *Axeman.*
_____ _____, *Flagman.*

Subscribed and sworn to before me this _____ day of _____, 18__.

_____ _____,
_____.

FINAL OATH OF UNITED STATES DEPUTY SURVEYOR.

I, _____ _____, United States deputy surveyor, do solemnly swear that in pursuance of instructions received from _____ _____, United States surveyor-general for _____, bearing date of the _____ day of _____, 18__, I have well, faithfully, and truly, in my own proper person, and in strict conformity with the instruction furnished by the United States surveyor-general for _____, the surveying manual, and the laws of the United States, surveyed all those parts or portions of _____ _____ of the _____ base and _____ meridian in the _____ of _____, as are represented in the foregoing field notes as having been surveyed by me and under my directions; and I do further solemnly swear that all the corners of said survey have been established and perpetuated in strict accordance with the surveying manual, printed instructions, the special written instructions of the United States surveyor-general for _____, and in the specific manner described in the field notes, and that the foregoing are the true field notes of such survey; and should any fraud be detected, I will suffer the penalty of perjury, under the provisions of an act of Congress approved August 8, 1846.

_____ _____,
United States Deputy Surveyor.

Subscribed by said _____ _____, deputy surveyor, and sworn to before me this _____ day of _____, 18__.

_____ _____,
U. S. Surveyor-General for _____ _____.

The final oath of the deputy surveyor must, in all cases, be taken before the *U. S. Surveyor-General* for the State or Territory in which the survey is executed. Before the above final oath is administered to the deputy surveyor, the surveyor-general will make such *personal* examination of the *notes taken in the field* and such general investigation of the returns as he may consider necessary to fully assure himself that *all* the observations for determination of the true meridian and variation and the tabular statement of closing errors, when one is required, are actually contained in the *original notes taken by the deputy on the ground*, and that his contract and special instructions have been complied with in *every particular*. It is preferable that all oaths—both preliminary and final—of assistants should be taken before some officer duly authorized to administer oaths other than the deputy surveyor. In cases, however, where great delay, expense, or inconvenience would result from a strict compliance with this rule, the deputy surveyor is authorized to administer the necessary oaths to his assistants, but in each case where this is done he must submit a full written report to the proper surveyor general of the circumstances of such case.

To enable the deputy surveyor to fully understand and appreciate the responsibility under which he is acting, his attention is invited to the

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provisions of the second section of the act of Congress approved August 8, 1846, entitled "An act to equalize the compensation of the surveyors-general of the public lands of the United States, and for other purposes," and which is as follows:

"SEC. 2. That the surveyors-general of the public lands of the United States, in addition to the oath now authorized by law to be administered to deputies on their appointment to office, shall require each of their deputies, on the return of his surveys, to take and subscribe an oath or affirmation that those surveys have been faithfully and correctly executed according to law and the instructions of the surveyor-general; and on satisfactory evidence being presented to any court of competent jurisdiction that such surveys, or any part thereof, had not been thus executed, the deputy making such false oath or affirmation shall be deemed guilty of perjury, and shall suffer all the pains and penalties attached to that offense; and the district attorney of the United States for the time being in whose district any such false, erroneous, or fraudulent surveys shall have been executed, shall, upon the application of the proper surveyor-general, immediately institute suit upon the bond of such deputy; and the institution of such suit shall act as a lien upon any property owned or held by such deputy, or his sureties, at the time such suit was instituted."

SPECIMEN FIELD NOTES AND PLATS.

Diagram B illustrates the method of laying off tracts of land 24 miles square, as nearly as practicable, by the survey of principal lines, and the survey of exteriors or township lines within such tracts, north of the base line and east of the principal meridian. The same general principles will apply equally to the survey of such tracts differently located with reference to the initial point. The topography noted on said diagram is on those portions of the lines of surveys for which specimen field notes are given.

Diagram C illustrates the method of laying off a township into sections and quarter sections. In the subdivision of townships lying *south* of and *contiguous* to the base line, or to any standard parallel, the lines between the sections of the northern tier will be run with the true bearing of the east boundary of the township as *true* lines; quarter-section corners will be established at 40 chains, closing section corners will be established at the points of intersection of such lines with the base or standard lines (as the case may be), and the *course* and *distance* from such corners to the nearest standard corner upon the line closed upon are to be accurately ascertained and setdown in the field notes.

Diagram D illustrates the mode of establishing stone, post, and mound corners for townships, sections, and quarter sections.

Specimen field notes Nos. 1, 2, 3, 4, and 5 illustrate, respectively, the mode and order of surveying standard lines, meridian lines, exteriors or township lines, resurveying exteriors or township lines, and subdividing a township into sections and quarter sections. The attention of the deputy is particularly directed to these specimens, as indicating not only the method in which his work is to be conducted, but also the order, manner, language, etc., in which his field notes are required to be returned to the surveyor general's office; and such specimens are to be deemed part of these instructions, and any *departure* from their details, without special authority, in cases where the circumstances are

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analogous in practice, *will be regarded as a violation of his contract and oath.*

The subdivisions of fractional sections into the 40-acre lots (as near as may be) are to be so laid down on the official township plat in broken black lines as to admit of giving to each a specific designation, if possible, according to its relative position in the fractional section, as per example afforded by Diagram C, as well as by a number, in all cases where the lot can not properly be designated as a quarter-quarter. Those fractional subdivision lots which are not susceptible of being described according to relative local position, are to be numbered in regular series; those bordering on the north boundary of a township to be numbered progressively from east to west, and those bordering on the west boundary of a township to be numbered progressively from north to south, in each section. As section 6 borders on both the north and west boundaries of the township, the fractional lots in the same will be numbered as follows: Commencing with No. 1 in the northeast, thence progressively west to No. 4 in the northwest, and south to No. 7 in the southwest corner of the section.

In numbering fractional lots, other than those above specified (wherever practicable and as a general rule), the series should commence with No. 1 in the northeastern or the most easterly fractional lot, and continue from east to west, and west to east, alternately, to the end of the series, as shown in Diagram C; but such general rule is departed from under circumstances given as examples in said diagram.

Interior lots are to be, as nearly as possible, 20 chains long by 20 chains wide; and the excess or deficiency of measurement is always to be thrown on the lots bordering on the northern and western boundaries of the township, or those made fractional by meander lines.

The official township plat to be returned to the General Land Office is to show on its face, on the right-hand margin, the meanders of navigable streams, islands, and lakes. Such details are wanted in the adjustment of the surveying accounts, but may be omitted in the copy of the township plat to be furnished to the district land office by the surveyor general. A suitable margin for *binding* is to be preserved on the left-hand side of each plat. Each plat is to be certified, with table annexed, according to the forms subjoined to "Diagram C," and is to show the areas of public land, of private surveys, and of water, with the aggregate area as shown on the diagram.

Each township plat is to be prepared in *triplicate:* one for the General Land Office, one for the United States district land office, and the third to be retained as the record in the office of the surveyor-general.

The plat for the local land office must not be forwarded until notice is received by the surveyor-general from the Commissioner of the General Land Office that the survey represented on said plat has been accepted, and that he is authorized to file the triplicate plat.

The plats must be prepared as nearly as possible in accordance with the specimen plat designated as "Diagram C." The use of all fluids, except a preparation of India ink of good quality, must be avoided by the draughtsman in delineations relating to the public surveys. All lines, figures, etc., must be sharply defined. All lettering on the plats must be clear and sharp in outline and design, and ornamentation of any kind is prohibited. These requirements are necessary in order that everything shown upon original plats may be fairly reproduced in making photolithographic copies of he same.

All towns, settlements, permanent buildings, private claims, reservations, water courses, ditches, lakes, islands, mountains, buttes, canons,

roads, railroads, telegraph lines, canals, etc., will be shown upon the plats and designated by proper names where such are known.

The true meridian and declination of the magnetic needle, or variation of the compass, must be determined, by *observation on Polaris*, at or near the southeast corner of the township, or at the point where the survey begins. The mean local time of observation and all particulars will be stated in the field notes. In all cases the *mean declination* will be the value to insert in the tabular statement (See Diagram C), below the plat. A table will be found in this manual[41] for reducing the *observed* to the *mean* declination. If the observation is taken away from the corner, the point must be so connected with the township line as to define its exact direction with reference to the *true meridian*. For the above determination the surveyor may use any one of methods herein described.

All township plats are to be drawn to a uniform scale of 40 chains to 1 inch, United States standard, and diagrams of exteriors to a scale of 160 chains to 1 inch.

Surveyors-general will require that the specimen plat shall be closely followed in order that uniformity of appearance and expression of drawings representing the public land surveys may be attained.

The true field books, each bearing the *written approval* of the surveyor-general, are to be substantially bound into volumes of suitable size, and retained in the surveyor-general's office, and certified *transcripts* of such field books (to be of *foolscap* size) are to be prepared and forwarded, from time to time, to the General Land Office.

All transcripts of surveys, made out as described under the head "FIELD NOTES," must be written in a bold, legible hand, with durable black ink, and such transcripts of any series of surveys included in one account forwarded to the General Land Office must be securely put up in *one package*, but not fastened together, at the office of the surveyor-general prior to transmittal.

With the copy of each township plat furnished to a district land office, the surveyor-general is required by law to furnish *descriptive notes* as to the character and quality of the soil and timber found on and in the vicinity of each surveyed line, and giving a description of each corner.

Printed blank forms for such notes will be furnished by the General Land Office. The forms provide eighteen spaces for *meander corners,* which, in most cases, will be sufficient; but when the number shall exceed eighteen, the residue will have to be inserted on the face of the township plat, to be furnished to the rgister of the district land office, or on the supplemental blank form.

There is shown a series of meander corners on Diagram C, viz, from No. 1 to No 12 on the river and island, and No. 1 to No. 5 on Lin's Lake, and No. 1 to No. 2 on small lake in Sec. 33.

GEOGRAPHICAL POSITIONS OF BASE-LINES AND PRINCIPAL MERIDIANS GOVERNING THE PUBLIC SURVEYS.

Since the adoption of the rectangular system of public surveys, May 20, 1785, twenty-four initial points, or the intersection of the principal bases with surveying meridians, have been brought into requisition to secure the certainty and brevity of description in the transfer of public lands to individual ownership. From the principal bases townships of six miles square are run out and established, with regular series of numbers counting north and south thereof, and from

the surveying meridians a like series of ranges are numbered both east and west of the principal meridians.

During the period of ninety years since the organization of the system the following numerical and independent principal meridians and bases have been initiated, to wit:

The first principal meridian divides the States of Ohio and Indiana, having for its base the Ohio River, the meridian being coincident with 84° 51′ of longitude west from Greenwich. The meridian governs the surveys of public lands in the State of Ohio.

The second principal meridian coincides with 86° 28′ of longitude west from Greenwich, starts from the confluence of the Little Blue River with the Ohio, runs north to the northern boundary of Indiana, and governs the surveys in Indiana and a portion of those in Illinois.

The third principal meridian starts from the mouth of the Ohio River and extends to the northern boundary of the State of Illinois, and governs the surveys in said State east of the meridian, with the exception of those projected from the second meridian, and the surveys on the west to the Illinois River. This meridian coincides with 89° 10′ 30″ of longitude west from Greenwich.

The fourth principal meridian begins in the middle of the channel of the mouth of the Illinois River, in latitude 38° 58′ 12″ north and longitude 90° 29′ 56″ west from Greenwich, and governs the surveys in Illinois west of the Illinois River and west of the third principal meridian lying north of the river. It also extends due north through Wisconsin and northeastern Minnesota, governing all the surveys in the former and those in the latter State lying east of the Mississippi and the

41. On page 55.

third guide meridian (west of the fifth principal meridian) north of the river.

The fifth principal meridian starts from the mouth of the Arkansas River, and, with a common base-line running due west from the mouth of the Saint Francis River, in Arkansas, governs the surveys in Arkansas, Missouri, Iowa, Minnesota west of the Mississippi, and the third guide meridian north of the river, and in Dakota Territory east of the Missouri River. This meridian is coincident with 90° 58′ longitude west from Greenwich.

The sixth principal meridian coincides with longitude 97° 22′ west from Greenwich, and, with the principal base line intersecting it on the 40th degree of north latitude, extends north to the intersection of the Missouri River and south to the 37th degree of north latitude, controlling the surveys in Kansas, Nebraska, that part of Dakota lying south and west of the Missouri River, Wyoming, and Colorado, excepting the valley of the Rio Grande del Norte, in southwestern Colorado, where the surveys are projected from the New Mexico meridian.

In addition to the foregoing six principal meridians and bases governing public surveys, there have been established the following meridians and bases, viz:

The Michigan meridian, in longitude 84° 19′ 09″ west from Greenwich, with a base-line on a parallel seven miles north of Detroit, governing the surveys in Michigan.

The Tallahassee meridian, in longitude 84° 18′ west from Greenwich, runs due north and south from the point of intersection with the base-line at Tallahassee, and governs the surveys in Florida.

The Saint Stephen's meridian, longitude 88° 02′ west from Greenwich, starts from Mobile, passes through Saint Stephen's, intersects the base line on the 31st degree of north latitude, and controls the surveys of

the southern district in Alabama and of the Pearl River district lying east of the river and south of township 10 north in the State of Mississippi.

The Huntsville meridian, longitude 86° 31′ west from Greenwich, extends from the northern boundary of Alabama as a base, passes through the town of Huntsville, and governs the surveys of the northern district in Alabama.

The Choctaw meridian, longitude 89° 10′ 30″ west from Greenwich, passes two miles west of the town of Jackson, in the State of Mississippi, starting from the base-line twenty-nine miles south of Jackson, and terminating on the south boundary of the Chickasaw cession, controlling the surveys east and west of the meridian and north of the base.

The Washington meridian, longitude 91° 05′ west from Greenwich, seven miles east of the town of Washington, in the State of Mississippi, with the base-line corresponding with the 31st degree of north latitude, governs the surveys in the southwestern angle of the State.

The Saint Helena meridian, 91° 11′ longitude west from Greenwich, extends from the 31st degree of north latitude, as a base, due south, and passing one mile east of Baton Rouge, controls the surveys in the Greensburgh and the southeastern districts of Louisiana, both lying east of the Mississippi.

The Louisiana meridian, longitude 92° 20′ west from Greenwich, intersects the 31st degree north latitude at a distance of forty-eight miles west of the eastern bank of the Mississippi River, and, with the base-line coincident with the said parallel of north latitude, governs the surveys in Louisiana west of the Mississippi.

The New Mexico meridian, longitude 106° 52′ 09″ west from Greenwich, intersects the principal base-line on the Rio Grande del Norte about ten miles below the mouth of the Puerco River, on the parallel of 34° 19′ north latitude, and controls the surveys in New Mexico, and in the valley of the Rio Grande del Norte, in Colorado.

The Great Salt Lake meridian, longitude 111° 53′ 47″ west from Greenwich, intersects the base-line at the corner of Temple Block, in Salt Lake City, Utah, on the parallel of 40° 46′ 04″ north latitude, and governs the surveys in the Territory of Utah.

The Boise meridian, longitude 116° 20′ west from Greenwich, intersects the principal base between the Snake and Boise Rivers, in latitude 43° 26′ north. The initial monument, at the intersection of the base and meridian, is nineteen miles distant from Boise City, on a course of south 29° 30′ west. This meridian governs the surveys in the Territory of Idaho.

The Mount Diablo meridian, California, coincides with longitude 121° 54′ west from Greenwich, intersects the base-line on the summit of the mountain from which it takes its name, in latitude 37° 53′ north, and governs the surveys of all central and northeastern California and the entire State of Nevada.

The San Bernardino meridian, California, longitude 116° 56′ west from Greenwich, intersects the base-line at Mount San Bernardino, latitude 34° 06′ north, and governs the surveys in southern California lying east of the meridian and that part of the surveys situated west of it which are south of the eighth standard parallel south of the Mount Diablo base-line.

The Humboldt meridian, longitude 124° 11′ west from Greenwich, intersects the principal base-line on the summit of Mount Pierce, in latitude 40° 25′ 30″ north, and controls the surveys in the northwestern

corner of California lying west of the Coast range of mountains and north of township 5 south of the Humboldt base.

The Willamette meridian is coincident wite longitude 122° 44′ west from Greenwich, its intersection with the base-line is on the parallel of 45° 30′ north latitude, and it controls the public surveys in Oregon and Washington Territory.

The Montana meridian extends north and south from the initial monument established on the summit of a limestone hill, eight hundred feet high, longitude 111° 40′ 54″ west from Greenwich. The base line runs east and west from the monument on the parallel of 45° 46′ 27″ north latitude. The surveys for the entire Territory of Montana are governed by this meridian.

The Gila and Salt River meridian intersects the base-line on the south side of the Gila River, opposite the mouth of Salt River, in longitude 112° 15′ 46″ west from Greenwich, and latitude 33° 22′ 57″ north, and governs the public surveys in the Territory of Arizona.

The Indian meridian intersects the base-line at Fort

Arbuckle, Indian Territory, in longitude 97° 15′ 56″ west from Greenwich, latitude 34° 31′ north, and governs the surveys in that Territory.

THE MAGNETIC DECLINATION OR VARIATION OF THE NEEDLE.

The following account of the geographical distribution and of the annual change of the magnetic declination or variation of the needle, with tables, explanations, and charts, presenting the latest information on the subject, were prepared by direction of the Superintendent of the U. S. Coast and Geodetic Survey, in accordance with a request of the Commissioner of the General Land Office.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D.C., November 30, 1889.

For the following article with tables and their explanation, relating to the use of the compass in surveying, the Commissioner of the General Land Office is indebted to Prof. T. C. Mendenhall, Superintendent of the U. S. Coast and Geodetic Survey; it was furnished at the request of the Commissioner.

The paper originally written in January, 1878, by Assistant C. A. Schott, in charge of the computing division, has been revised and enlarged by him in order to present the latest information on the subject; it is also accompanied by two charts, taken from the Coast and Geodetic Survey Report for 1889 illustrating the present distribution of the magnetic declination.

This paper is designed to take the place of the chapter commencing at the foot of page 25 and ending in the middle of page 29 of the "Manual of Instructions to Surveyors-General of the United States," printed in 1871, part of which in the course of time had become obsolete. The article will be found of great interest and value as an aid in the prosecution of the surveys of the public lands.

AN ACCOUNT OF THE PRESENT GEOGRAPHICAL DISTRIBUTION AND OF THE ANNUAL CHANGE OF THE MAGNETIC DECLINATION (COMMONLY KNOWN AS THE VARIATION OF THE COMPASS NEEDLE[42]) WITHIN THE LIMITS OF THE UNITED STATES.

The magnetic declination at any place is the angle contained between two vertical planes, one being the astronomical or true meridian of the place and the other a plane in which the horizontal axis of a freely suspended magnetic needle lies at the time. The former is a fixed plane, the latter is variable since observation shows that the direction of a magnetic needle, when delicately suspended, is constantly changing, nor is it the same at different places. The magnetic declination, thus varying with respect to locality and time, it is necessary on the part of the observer to give with his statement of the declination the exact local time, year, month, day and hour, and fraction when the measure was taken, as well as the geographical position or the latitude and longitude of the place, which co-ordinates may be expressed in minutes of arc, and it generally suffices to give the nearest whole minute; longitudes are to be reckoned westward from Greenwich as the initial meridian.

The declination is called "west" when the north-seeking end of the magnet or needle points to the west of the true meridian, and is called "east" when the same end points to the east of the true meridian. The north end of the needle tends approximately toward the north and more particularly toward a region which surrounds the magnetic pole of dip; the magnetic declination within the limits of the United States presents, such great extremes as 18½° west at Eastport, Me., 3° east at Key West, Fla., 13¼° east at San Diego, Cal., 23° east in the Strait of Fuca, Washington Territory, and about 33° east at Fort Yukon, Alaska. The general distribution of the declination in the United States at the present time is shown on the accompanying charts, taken from the annual report of the Coast and Geodetic Survey for 1889 (as yet unpublished), the large MS. charts on two sheets having been greatly reduced to suit the present publication. These charts are for the epoch 1890 (January).

With regard to changes with the lapse of time the declinations, as observed, have undergone variations of several degrees. Thus at Boston, Mass., the declination changed from 10° west in 1700 to about 6½° west in 1778, and is now approaching 12° west and still increasing; at Monterey, Cal., the declination was 11½° east in 1780; it is now 16° east. On this subject the reader may consult the Coast and Geodetic Survey Report for 1888.[43]

The accuracy with which the declination may be determined depends chiefly upon the instrumental means at command, but also in a great measure upon the ability and care of the observer in using his instruments and in selecting the proper method and best time for observation. The instruments ordinarily in the hands of the observer are sufficiently described in works on surveying or in catalogues of instrument-makers; but for descriptions and illustrations of more refined instruments and for their adjustment and the methods of using them the reader may be

referred to Coast and Geodetic Survey Report for 1881, Appendix No. 8, entitled "Directions for Measurement of Terrestrial Magnetism."

It is a matter of observation that the needle, especially when light and delicately suspended, is seldom or never at rest; the principal laws of the angular changes have been made out; others and minor ones are known with more or less certainty and some are conjectural. These motions have, for convenience, been classified as regular and irregular variations, but we shall notice here only the principal ones.

To the former class belongs the solar variation depending upon the hour of the day, the time of the year, and the condition of the sun with respect to spot-activity; to the same class belongs the lunar variation depending on the moon's

42. In scientific treatises on terrestrial magnetism the term magnetic declination is always used in order to avoid any confusion which would arise when treating of such notions of the needle as the diurnal annual, and secular variations.

43. The Coast and Geodetic Survey Report for 1888, Appendix No. 7, it is expected, will soon pass through the press.

hour-angle and her position in the orbit, but this is of little interest to the practical surveyor on account of the small amplitude. In the same class is also included the secular variation, which is a systematic alteration in the earth's magnetism involving centuries to unfold itself, and as yet of unexplained origin. To the second class belong the so-called magnetic disturbances or storms, which frequently and simultaneously affect large parts and sometimes apparently the whole surface of the earth. On large averages these disturbances are found subject to complex laws, and they are noticed generally to accompany auroral displays and strong earth-currents.

They may be expected to occur at any time. Omitting any detailed notice of these disturbances and confining our attention to those more or less systematic changes which are of special interest to the surveyor as possibly affecting his work, we shall briefly review the effects of the principal regular variations as exhibited within the area of the United States.

The solar diurnal variation consists in a systematic movement of the direction of a magnet, having for its period the solar day; its character is the same for the greater part of the northern hemisphere. About the time of sunrise, or soon after it, the north-seeking end of the needle is generally found approaching to or near its easternmost position, i. e., near or at its *eastern* elongation. This phase happens, for instance, at Philadelphia, Pa., on the yearly average about 8^h a. m., at Key West, Fla, about $8\frac{1}{4}^h$ a. m., and at Los Angeles, Cal., at $8\frac{1}{3}^h$ a. m.; it is subject to an annual variation, the time being earlier in summer and near $7\frac{1}{2}^h$ a. m. at Philadelphia, near $7\frac{1}{2}^h$ a. m. at Key West, near $7\frac{2}{3}^h$ at Los Angeles, near 8^h a. m. at Fort Steilacoom, Wash., and near $7\frac{3}{4}^h$ a. m. at Camp Date Creek, Arizona. In the winter, this phase is reached later—about $8\frac{3}{4}^h$ or 9^h a. m. at Philadelphia, about $9\frac{1}{2}^h$ a. m. at Key West and Los Angeles. The needle after remaining nearly stationary about this time, soon begins its principal daily motion toward the west, at first slowly, but after about $9\frac{1}{2}^h$ a. m. quite rapidly, and slackening again when nearing its western daily extreme, known as the *western* elongation, about $1\frac{1}{2}^h$ p. m. This phase is reached on the yearly average about $1\frac{1}{3}^h$ p. m. at Philadelphia, abut $1\frac{3}{4}^h$ p. m. at Key West, and about $1\frac{1}{4}^h$ at Los Angeles, a few minutes earlier in summer and a few minutes later in winter, but it will generally fall between 1^h and 2^h p. m. After this second temporary stand the needle reverses its angular motion and gradually returns to the direction from which it had set out in the early morning. Not infrequently a small or secondary oscillation takes place during the night. The *average* daily direction of the needle is reached in summer about $10\frac{1}{4}^h$ a. m. and in winter about $10\frac{3}{4}^h$ a. m. at Philadelphia, about $10\frac{1}{4}^h$ a. m. and $11\frac{3}{4}^h$ a. m., at Key West, and about 10^h a. m. and $11\frac{1}{2}^h$ a. m., respectively, at Los Angeles.

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The needle crosses a second time the average magnetic meridian about 7^h p. m. at the former place, and about $8\frac{1}{2}^h$ p. m. at the latter places, but these p. m. times are subject to considerable irregularity. The amount of displacement between the morning and afternoon elongations is called the diurnal range; it is about 8′ on the average during the year at Philadelphia, about 5½′ at Key West, and about 6⅓′ at Los Angeles. This range is greater for northern stations than for southern stations, and is also subject to an annual inequality, being more conspicuous in summer than in winter; thus, at Philadelphia, it reaches in August 12′, but in November only 5′, and at Key West it is in August 8′, and in November 3′; at Los Angeles, the ranges in these months are 8¾′ and 4′. This change from the maximum to the minimum and return is gradual. The solar diurnal variation is further subject to a periodic inequality related to the eleven-year cycle of the sun-spots. The diurnal range is least in years of minimum spots, as in 1878 or 1889, and is greatest in years of maximum sun spots, generally occurring about four years after the minima, as in 1883. In minimum years the range is about 0.8 and in maximum years about 1.3 of the average range. The daily variation appears at times intensified, at other times irregular and occasionally, and especially in the winter season, there are days when it is obscured or not recognizable.

The following table will be found useful for reducing observed declinations, taken at any time of the day between 6 a. m. and 6 p. m., on any day of the year, to the average value of the day, or that value which would have been obtained had hourly or continuous observations been made. The tabular values answer approximately to the middle epoch in the sun-spot cycle, and the nearest whole minute derived from them will give a degree of accuracy quite sufficient in view of the ordinary irregularities in the diurnal motion itself.

The tabular quantities give the average deviations of the direction of the needle at the respective hours of the day from the direction that would have been obtained had the mean been taken of twenty-four hourly observations. The letter W indicates that the needle points to the westward of the daily average, the letter E the reverse, whence the sign of the correction can be inferred whether the declination be westerly or easterly. Two sets of figures are given; the upper one is the mean from observations at Toronto, Canada; Philadelphia, Pa.; and Madison, Wis.; and answers, therefore, for northern stations; the lower one is the mean from observations at Key West, Fla., and Los Angeles, Cal., and answers, therefore, for southern stations.

Table for reducing an observed declination to the average declination of the day.

Mean local time.	6^h a. m.	7^h a. m.	8^h a. m.	9^h a. m.	10^h a. m.	11^h a. m.
	E. ′	E. ′	E. ′	E. ′	E. ′	W. ′
December, January, February:						
Northern stations	0.7	1.1	1.9	2.2	1.5	0.1
Southern stations	0.1	0.3	1.4	2.3	2.4	1.3*
March, April, May:						
Northern stations	2.6	3.8	4.4	3.5	1.2	1.6
Southern stations	1.4	2.7	3.2	2.6	1.2	0.4
June, July, August:						
Northern stations	4.0	5.6	5.7	4.5	1.7	1.6
Southern stations	2.1	3.5	3.6	2.4	0.3	1.5
September, October, November:						
Northern stations	1.8	2.6	3.1	2.5	1.0	1.5
Southern stations	9.6	2.1	2.5	1.9	0.6	0.9

*East

Table for reducing an observed declination to the average declination of the day—Cont'd.

Mean local time.	Noon.	1h p. m.	2h p. m.	3h p. m.	4h p. m.	5h p. m.	6h p. m.
	W. ′	W. ′	W. ′	W. ′	W. ′	W. ′	W. ′
December, January, February:							
Northern stations	1.8	2.9	2.8	2.1	1.3	0.7	0.2
Southern stations	0.4	1.3	1.5	1.3	0.8	0.3*	0.0
March, April, May:							
Northern stations	3.8	4.8	4.6	3.8	2.5	1.4	0.7
Southern stations	1.6	2.3	2.6	2.2	1.5	0.8	0.4
June, July, August:							
Northern stations	4.1	5.6	5.6	4.6	3.0	1.4	0.6
Southern stations	2.6	3.1	2.9	2.4	1.5	0.9	0.5
September, October, Novmber:							
Northern stations	3.3	4.0	3.4	2.3	1.2	0.6	0.1
Southern stations	1.9	2.1	1.7	1.2	0.8	0.7	0.4

*East

The *annual variation* of the declination is so small that a mere mention here suffices; its amplitude is at most 1½ minutes of angular measure.

The lunar variations and inequalities.—These we likewise pass over briefly on account of their small amplitude or general minute effect. The principal inequality is the lunar diurnal variation, which exhibits the peculiarity of two maximum and two minimum values each lunar day. The range at Philadephia is about 27″ and at Toronto about 38″. Other lunar inequalities are generally of smaller order.

The secular variation of the magnetic declination is, as has already been pointed out, a subject of great importance to the surveyor, expecially when he is called upon to re-run old compass lines or to decide between conflicting claims as to the position of boundary lines marked out by compass many years ago, but the traces of which on the ground have become lost in the course of time. The most complete investigation of this remarkable change is contained in Coast and Geodetic Survey Report for 1888,[44] Appendix No. 7, and the tables here given of decennial values of the declination have been taken from this appendix. The variation in question is most probably of a periodic character, requiring centuries for its complete development, whence its specific name; it is undoubtedly of a highly complex nature. As yet at no station has a complete cycle been observed or completed, nor do we know whether the needle will ever trace out a similar one in period, in amplitude, or in other particulars; hence the necessity of continuing systematic observations at a number of stations specially selected for following up the inquiry.

These observations will enable us in time to introduce any needed change in the law as hitherto observed and improve the expression of the same, or gain a deeper insight into the secular variation. The motion may be compared to that of an oscillation of a pendulum, which alternately comes to rest at its extreme elongations and moves fastest midway between these extremes. Smaller oscillations within the period have also been discovered. About the times of maximum deflections the needle seems to fluctuate about an average position, apparently stationary for several years to ordinary or coarsely-divided instruments; but soon a perceptible change takes place, and the direction of motion is noticed to have slowly changed to one opposite to that followed before the stationary epoch. The annual change increases year by year, until the motion reaches a maximum speed, after which it

gradually declines till the opposite stationary phase is attained, when it becomes once more zero.

This stately swing is gone through within our geographical limits in from about two hundred and fifty to about three hundred and fifty years. Thus, for example, at Baltimore and vicinity the needle was observed to be stationary about 1680, the north end of the needle pointing then nearly 6° west; in 1802 it had reached the opposite phase and was observed to point nearly ½° west; since that time the westerly motion has been kept up, and at present has already reached 4¾° west.

As might be expected the range varies greatly with geographical position, and so does the epoch of the elongations: thus the last easterly extreme occurred earliest in Maine; later in Florida, Texas, and Mexico, and has just reached but not yet touched all parts of the Pacific coast north of southern California; beyond the Straits of Fuca and for Alaska we have but little information. We have here at present a region or broad belt of no annual change or where the effect of secular variation is nil; it passes off and on the coast from the Strait of Fuca to near Point Conception, California, where it leaves the coast and stretches southward to the west of Lower California. On the other hand there is a region of no annual change but of opposite phase, and passing through Nova Scotia and New Brunswick. Between these two belts, and comprising the greater part of the United States, the effect of the secular variation is to increase west declination, or, what comes to the same thing, to decrease east declination, whereas on the Pacific coast there is still a narrrow strip of land to the west of the belt first described, where the annual change is opposite, i. e., easterly declination is still slightly increasing.

The following table gives the latitude and longitude as well as the annual change of the declination for each station, and the next table the computed decennial values of the declination (and after 1850 for every fifth year), at all places where the observations were sufficiently numerous and of sufficient range to admit of the recognition of the law of secular variation:

Geographical position of stations and annual change of declination for 1890 and 1895.

+ signifies increasing west or decreasing east declination.

Name of places.	Latitude	Longitude west from Greenwich.	Annual change of declination. For 1890.	Annual change of declination. For 1895.
Eastern Group	° ′	° ′	′	′
Eastport, Me.....	44 54.4	66 59.2	+0.8	+0.2
Bangor, Me.....	44 48.2	68 46.9	+2.4	+1.9
Portland, Me.....	43 38.8	70 16.6	+2.6	+2.2
Burlington, Vt.....	44 28.5	73 12.0	+5.0	+3.8
Hanover, N. H.....	43 42.3	72 17.1	+4.4	+3.9

44. Still in MS, in the hands of the printer.

(Ed. Note: The remainder of this table, which continued on pages 58 through 65 are deleted.)

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It will be observed that the character of the secular variation is the same over large areas, though each place has apparently minor features peculiar to itself. In consequence of our very imperfect data the deduced annual change (in minutes of arc) due to the action of the secular variation, can only claim to be a fair approximation for the several States and Territories at the present time.

In the following table the + sign indicates an increase of west declination, or its equivalent a decrease of east declination.

Table showing the annual change of the magnetic declination for the epoch 1890 and referring to the central part of each State, Territory, or subdivision.

Locality	Annual Change		Locality	Annual Change	
Alabama	+3.5		Mississippi	+3.5	
Alaska:			Missouri	4.2	
Dixon Entrance	1	(?)	Montana	2	(?)
Sitka Bay	3		Nebraska		
Off Mount St. Elias	9	(?)	Western part	3	(?)
Arizona	2	(?)	Eastern part	4	(?)

[The remainder of the table is deleted.]

It is to be hoped that before long we shall be in possession of sufficient material to render the above table more comprehensive and satisfactory. The numbers may be used for a few years (five) without serious error, but they certainly need recomputing after the lapse of a few years.

Isogonic charts.—If for any epoch we connect by curves all positions where the needle was observed to have the same declination, we trace out the so-called isogonic lines. On the accompanying charts they are laid down for equal differences of 1°, every fifth line, for greater distinction, being heavier. Such charts need reconstruction from time to time, not only for the purpose of improvements, but in consequence of the ever changing direction of the magnetic force. Thus, for instance, the line of no declination, or agonic line, as such lines are called, but which have no other distinction (beyond declination equal to zero), over any other isogonic line, is now seen to pass through the Strait of Mackinaw, Mich., Toledo, Ohio, and crossing the coast near Charleston, S. C.;

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whereas about the years 1797 and 1803, when this same agonic line had its most northeasterly position on this coast, it passed near Buffalo, N. Y., Harrisburg, Pa., Annapolis, Md., to Cape Henry, Va. This and its neighboring lines will continue for some time to move southwestward on the Atlantic coast.

Magnetic disturbances.—These irregular motions of the needle may not infrequently be a source of annoyance to the surveyor; they may occur at any time, and are, when taken individually, beyond our power of prediction, but when averages are taken of many thousands they are nevertheless found to be subject to precise laws.

Their presence is generally indicated by sudden deflections and by rapid and great fluctuations in the direction of the needle, greatly exceeding all ordinary variations.

These deflections occur alternately on opposite sides of the normal position, and often take place simultaneously at distant regions of the globe; they may last from a few hours to a day, or even several days, and are frequently accompanied by auroral displays. These disturbances are found to be strictly under solar influence. Irrespective of direction of the disturbing force, the most disturbed hours of the day are frequently those between 7^h and 10^h a. m., and the least disturbed those between 2^h and 6^h p. m., but we can not here enter more fully into this subject. The greatest number of disturbances occur in the months of August, September, and October, the least number in January and June, and the disturbances are most active in years of sunspot maxima, and least so in years of minima. In the United States (excepting Alaska) deflections on either side of the normal of ¼° are common; deflections of ¼° may occasionally be noticed, but those exceeding 1° are rare, unless the place be near the northern boundary.—[C. A. S., AUGUST 26, 1889.]

METHOD OF ASCERTAINING THE MAGNETIC DECLINATION OR VARIATION OF THE COMPASS.

The following chapter, on the subject of the declination of the magnetic needle, is extracted from the revised edition of the work on surveying by Dr. Charles Davies, a graduate of the Military Academy at West Point. The work itself will be a valuable acquisition to the deputy surveyor, and his attention is particularly invited to the following chapter, which sets forth the usual easy modes by which the true meridian and magnetic declination may be approximately ascertained; his attention is also called to more complete statements on the subject given in the work "A treatise on land-surveying, etc.," by Dr. W. M. Gillespie, professor of engineering, Union College, in chapter treating of the declination of the magnetic needle. For more refined methods, he may consult Coast and Geodetic Survey Report for 1881, Appendx No. 8.

METHOD OF ASCERTAINING THE VARIATION.

"The best practical method of determining the true meridian of a place is by observing the north star. If this star were precisely at the point in which the axis of the earth, prolonged, pierces the heavens, then the intersection of the vertical plane passing through it and the place, with the surface of the earth, would be the true meridian. But the star being at a distance from the pole equal to 1° 30′ nearly,[45] it performs a revolution about the pole in a circle, the polar distance of which is 1° 30′;[45] the time of revolution is 23 hours and 56 minutes.

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"To the eye of an observer this star is continually in motion and is due north but twice in 23 hours and 56 minutes; and is then said to be on the meridian. Now, when it departs from

45. 1° 17′ in 1890.

the meridian, it apparently moves east or west for 5 hours and 59[46] minutes, and then returns to the meridian again.

"When at its greatest distance from the meridian, east or west, it is said to be at its *eastern* or *western* elongation."

The following table[47] shows the times of the eastern and western elongations for 1889, computed for latitude 40° and for longitude 90° W. of Greenwich, also the times of culminations of Polaris; with directions for use for any year between 1889 and 1910; and for different latitudes.

Local mean (astronomical[48]) time of the culminations and elongations of Polaris in the year 1889.

[Computed for latitude +40° and longitude 6^h west from Greenwich.]

Date.		Eastern elongation.	Upper culmination.	Western elongation.	Lower culmination.
1889.		h. m.	h. m.	h. m.	h. m.
Jan.	1	**0 36.2**	6 31.0	12 25.7	18 29.1
	15	23 37.0	5 35.7	11 30.4	17 33.8
Feb.	1	22 29.9	4 28.6	10 23.3	16 26.7
	15	21 34.6	3 33.3	9 28.1	15 31.4
Mar.	1	20 39.4	2 38.1	8 32.8	14 36.2
	15	19 44.4	1 43.0	7 37.7	13 41.1
April	1	18 37.4	**0 36.0**	6 30.7	12 34.1
	15	17 42.4	23 37.1	5 35.7	11 39.0
May	1	16 39.5	22 34.2	4 32.9	10 36.1
	15	15 44.6	21 39.3	3 38.0	9 41.2
June	1	14 37.9	20 32.7	2 31.3	8 34.6
	15	13 43.0	19 37.8	1 36.4	7 39.7
July	1	12 40.4	18 35.2	**0 33.8**	6 37.1
	15	11 45.5	17 40.3	23 35.0	5 42.2
Aug.	1	10 39.0	16 33.8	22 28.4	4 35.7
	15	9 44.1	15 38.9	21 33.5	3 40.8
Sept.	1	8 37.5	14 32.3	20 26.9	2 34.2
	15	7 42.6	13 37.4	19 32.0	1 39.3
Oct.	1	6 39.7	12 34.5	18 29.1	**0 36.4**
	15	5 44.7	11 39.5	17 34.1	23 37.6
Nov.	1	4 37.9	10 32.1	6 27.3	22 30.8
	15	3 42.7	9 37.5	15 32.2	21 35.6
Dec.	1	2 39.7	8 34.5	14 29.2	20 32.6
	15	1 44.4	7 39.3	13 34.0	19 37.3

It will be noted that for the tabular year two eastern elongations occur on January 10 and two western elongations on July 9; there are also two culminations on April 10 and on October 9.

The lower culmination either follows or precedes the upper culmination by 11 hours 58.1 minutes.

For other dates and positions than those implied by the table we need to apply the following corrections:

To refer the tabular times to any year subsequent to the tabular year (1889) add 0.33 minutes for every year. To refer the tabular times, corrected as above, to any year in a quadriennium observe that for first year after a leap year the table is correct; for second year after a leap year add 0.9 minutes to the tabular value; for third year after a leap year add 1.7 minutes to the tabular value; for leap year,

46. In 1890 and latitude 40°, for about 5^h 55^m easterly and 6^h 03^m westerly.

47. Computed at the Coast and Geodetic Survey Office, as was also the table of azimuths.

48. Counted from noon and from zero to twenty-four hours.

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and *before* March 1, add 2.6 minutes to the tabular value; for leap year *from* and *after* March 1, subtract 1.2 minutes from the tabular value.

To refer to any calendar day other than the first and fifteenth of each month, subtract 3.94 minutes for every day between it and the preceding tabular day, or add 3.94 minutes for every day between it and the succeeding tabular day. The longitude correction will amount to 0.16 minutes for each hour.

To refer to any other than the tabular latitude and between the limits of 25° and 50° north, add to the time of west elongation 0.13 minutes for every degree *south* of 40° and subtract from the time of west elongation 0.18 minutes for every degree *north* of 40°; reverse these signs for corrections to times of east elongation.

It will be important to direct attention to the fact that the year 1900 is *not* a leap year, and this must be kept in view when dealing with dates from and after March 1 of that year. The twentieth century begins after the expiration of December 31, 1900.

The deduced tabular times may generally be depended upon with no greater error than 0.3 minute.

The following table exhibits the angle which the meridian plane makes with the vertical plane passing through the pole-star when at its eastern or western longation; this angle is called the azimuth of the star at elongation:

[Ed. Note: Pages 70 through 89 and most of page 90 is deleted. These pages contain tables of Azimuths of Polaris, instructions for polaris observations, time of Upper Culmination, Azimuths of the Tangent to the Parallel, offsets from the Tangent to the Parallel and difference in latitude and departure for 80 chains. The copy picks up again with the bottom of page 90.]

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Random bearings, determined as above directed, are actually the *true* bearings of the lines and are so used for running fractional *true lines.* Any deviation from random bearings, derived from the application of the falling [Table VI], changes the random bearing by an amount due to unavoidable errors, and should give for a final result a bearing *as near the true bearing* as the field work will permit. A *true* bearing means the angular deviation from the *true meridian* in contradistinction to the *magnetic* bearing, or angle made with the *magnetic meridian.* A true line is to be understood to refer to *the line upon which the corners are established.*

Table VI [A and B] is used to determine the *return* from the *random* course by the following rules, the meridians being regarded as *parallel.*

I.—If the random line is run *east or west,* subtract the falling [in minutes of arc] from 90°, reverse the departure letter, and name the meridianal letter N. or S., like the falling.

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II.—When the random course is nearly east and west, take the sum of the random course and closing error [in minutes of

arc], if they are of the same name—that is, both north or both south—but their difference when of different names; in either case changing the meridional and departure letters of the random line. [This is easily remembered by bearing in mind the initial letters of Sum and Same and Difference and Different].

III.—In any case when the sum exceeds 90°, the return course is found by subtracting said sum from 180° and retaining the meridional letter of the random course unchanged. If the sum is exactly 90°, the return course is evidently west [or east] to the starting point.

THE RANDOM AND TRUE LINE AND USE OF THE VARIATION.

In the article entitled "METHOD OF SUBDIVIDING," directions have been given to run east and west *random* lines *parallel* to the south boundary of the tier of sections to which they belong, instead of *due east* as given in former editions of these instructions. In many instances the south boundary of townships to be subdivided are found to depart, sometimes considerably, from the true east and west line, or parallel of latitude, which they are supposed to follow. The present instructions are intended to reduce the falling of the random to the smallest practicable amount and to show at once how much the *random* line departs from the *true* line, instead of complicating its departure with the deviation of the south boundary. When the south boundary makes a comparatively large angle with the parallel, the *random* line, if run *due east*, necessarily falls at a considerable distance north or south of the objective corner, and it appears to have been the practice of some surveyors to turn around the compass box until the north end of the needle points to the north mark, and to call the resulting reading of the vernier the *variation*. Thus, many old plats give the *variation* on east and west lines *one value* throughout, and on the north and south lines another *uniform variation*, the two differing by ten or fifteen minutes, or even more. In other instances two lines, making an angle of one or two degrees with each other, will be run, for example, *north*, and the *variation* recorded as differing by the angle between them. By this practice neither the *magnetic* nor the *true* bearing is given, and what is called the *variation* is simply an *arbitrary* angle, which may in some cases be the variation by accident, but oftener something else. The bearing of the south boundary will be the same from one end to the other if correctly run, and its bearing is of course the *true* bearing of *east* and *west section lines* if the corners are at the proper distance from said boundary. Therefore, for the sake of uniformity, it necessarily follows that the bearing of *random* lines should be *the same as that of the south boundary of the tier of sections to which they belong and the lines are to be so run.*

When the lines are run as above directed, that portion of the falling due to deviation of the south boundary no longer enters into consideration and the limit for the closing error may be consistently reduced to the limit allowed on exterior lines, or *fifty links per mile*, and this change has been made in the prescribed limits (on page 40), which are, even after this reduction, much greater than good work will ever require.

The variation, when once properly determined, is to be set off on the variation arc, which should then be clamped and not again moved until natural causes—such as diurnal change or local attraction—require it to be corrected. Whenever any change in the variation is made on

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the instrument, all particulars relating thereto must be recorded, as illustrated in Specimen Field Notes.

The compass used as above directed will always give the bearing from the *true meridian* or the *true bearing* of any point, or of any line upon which the compass is directed.

TABLES VII AND VIII.

These tables, which require no special description, are useful for converting linear into angular, and angular into linear, measures, as well as for determining the convergencies and divergencies of the meridians, on the speroidal surface of the earth. As the tabular values are given in *chains*, the tables will be found convenient for the surveyor's use. The following rules and examples will illustrate their application:

1. *Given the latitudes of any two places on the same meridian, to find the distance between them.*

RULE.—Find from Table VII the length of a degree of the meridian at each latitude, and take half their sum for the mean length of a degree. Then say, as 60 minutes is to the difference of latitude, so is the mean length of a degree to the distance required.

The latitude of the north boundary of Wyoming is 45° N., and that of the 1st Standard Parallel South, Montana, 45° 26′ 4″.08; what is the meridional distance between them?

Chains. Chains.
As 60′ : 26′ 4″.08 :: 5524.02 : 2400, the distance required.

2. *Given the distance between any two places on the same meridian, and the latitude of one of them, to find the difference of latitude.*

RULE.—Find from Table VII the length of a degree of the meridian, in the given latitude, and also in that differing from it, by the meridional distance, converted into arc at the rate of 52 seconds per mile, and take half their sum for the mean length of a degree. Then say, as the mean length of a degree is to the meridional distance, so is 60 minutes to the difference of latitude required.

The latitude of the north boundary of Wyoming is 45° N.; what is the latitude of the 1st Standard Parallel South, Montana, the meridional distance being 30 miles?

Chains. Chains.
As 5524.02 : 2400 :: 60′ : 26′4″.08, the difference of latitude required.

3. *Given the longitudes of any two places, on the same parallel, in a given latitude, to find the distance between them.*

RULE.—Find from Table VIII the length of a degree of longitude in the given latitude; and say, as 60 minutes is to the difference of longitude, so is the length of a degree of longitude to the distance required.

The longitude of the Willamette Meridian is 122° 44′, and that of east boundary of Range 6 east, 121° 59′ 31″; what is the distance between them, on the Base Line, in latitude 45° 30′?

Chains. Chains.
As 60′ : 44′29″ :: 3884.81 : 2880, the distance required.

4. *Given the distance between any two places on the same parallel, in a given latitude, to find their difference of longitude.*

RULE.—Find from Table VIII the length of a degree of longitude in the given latitude; and say, as the length of the degree of longitude is to the given distance, so is 60 minutes to the difference of longitude.

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The longitude of the Willamette Meridian is 122° 44′; what is the difference of longitude to east boundary of Range 6 east, the distance on the Base Line, in latitude 45° 30′, being 36 miles?

Chains. Chains.
As 3884.81 : 2880 :: 60′ : 44° 29′, the difference of longitude required.

5. *Given the distance between two meridians, on any parallel, in a given latitude, to find the convergency of the meridians for any distance north of that parallel.*

RULE.—Find the length of a degree of longitude, at each latitude, by the foregoing rules; and say, as the greater of the two lengths is to their difference, so is the given distance to the convergency required.

The distance between the Principal Meridian and first Range Line west is 6 miles, in latitude 42° 39′ 12″; what is the convergency of the two range lines at the Base Line, the meridional distance being 24 miles?

Chains. Chains. Chains. Chains.
As 4075.67 : 22.71 :: 480 : 2.67, the convergency required.

6. *Given the distance between two meridians, on any parallel in a given latitude, to find the divergency of the meridians for any distance south of that parallel.*

RULE.—Find the length of a degree of longitude, at each latitude, by the foregoing rules; and say, as the less of the two lengths is to their difference, so is the given distance to the divergency required.

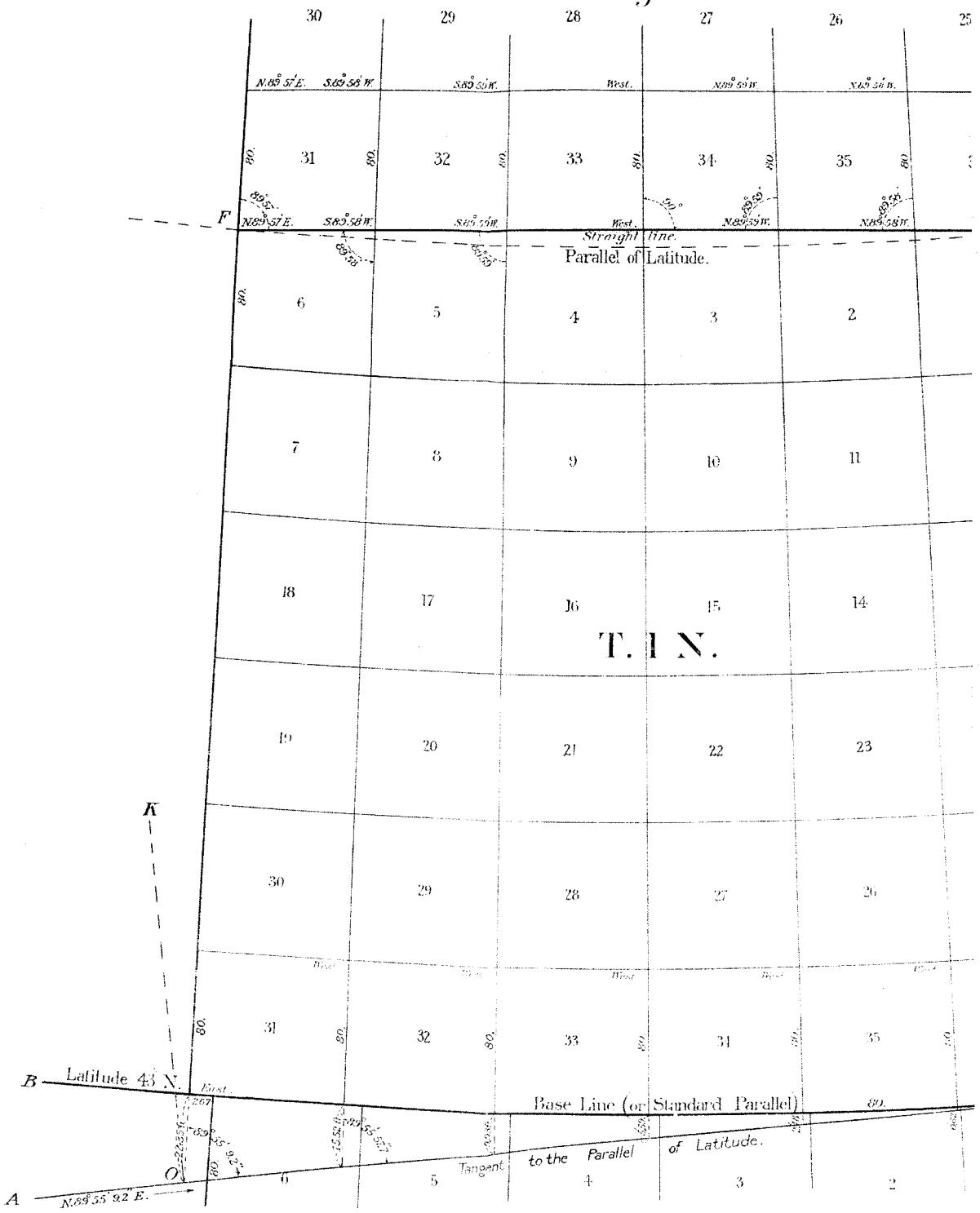
The distance between the Principal Meridian and first Range Line on the Base Line in latitude 43°, is 5 miles 77.33 chains; what is the divergency of the two range lines at the parallel 42° 39′ 12″, the meridional distance being 24 miles?

Chains. Chains. Chains. Chains.
As 4052.96 : 22.71 :: 477.33 : 2.67, the divergency required.

[Pages 94 through 99 deleted. They contain tables of the length of a degree of Latitude and degree of Longitude, and computations for convergency of meridians.]

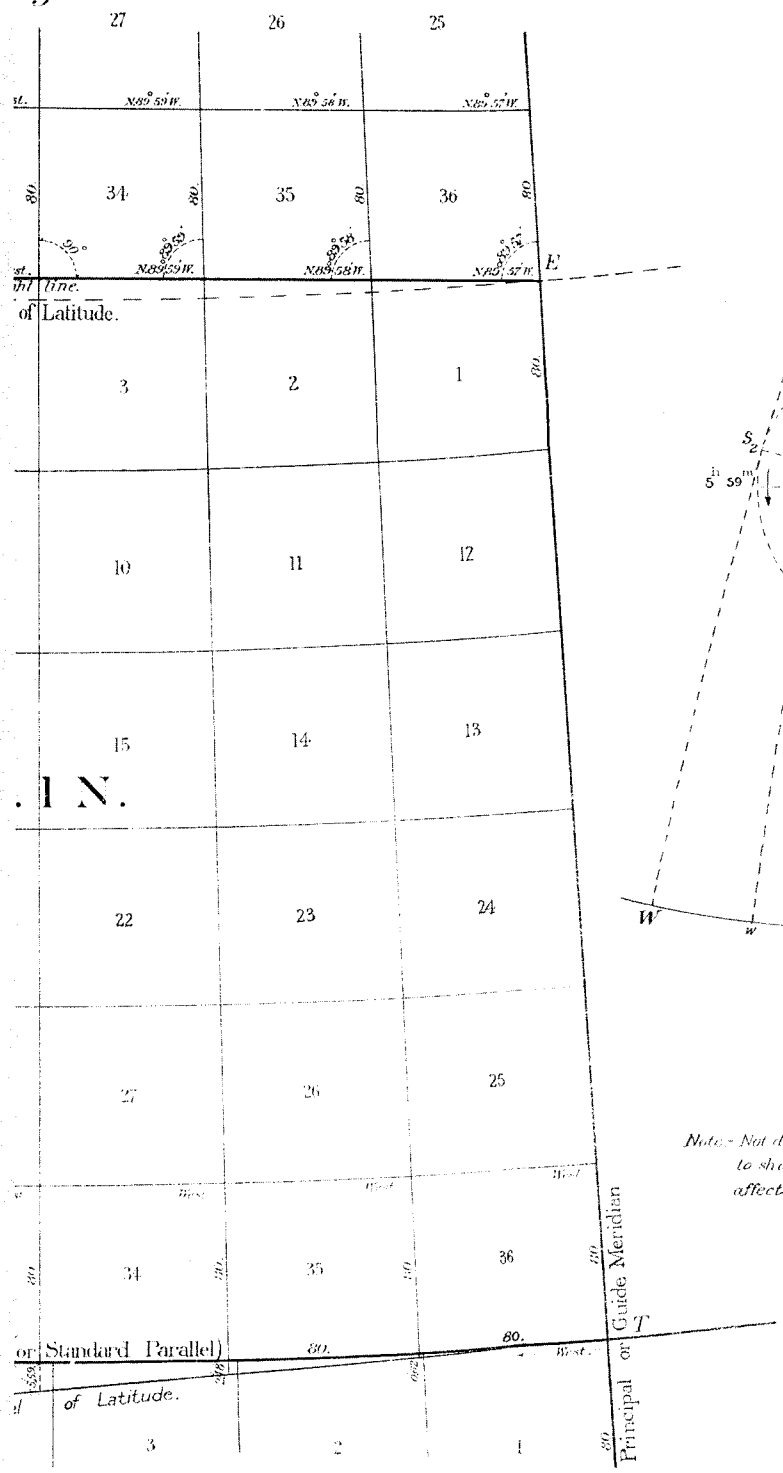
DIAGRAM A.

Fig. 1.



RAM A.

Fig. 1.



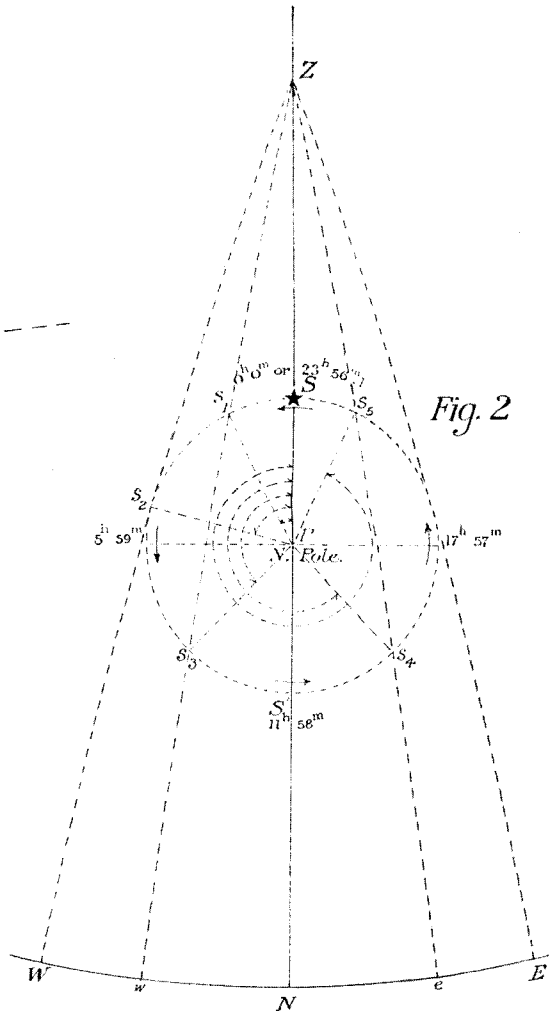


Fig. 2

Note:- Not drawn to scale. Intentionally distorted to show convergency of meridians and how it affects offsets, bearings, and length of lines.

DIAGRAM B

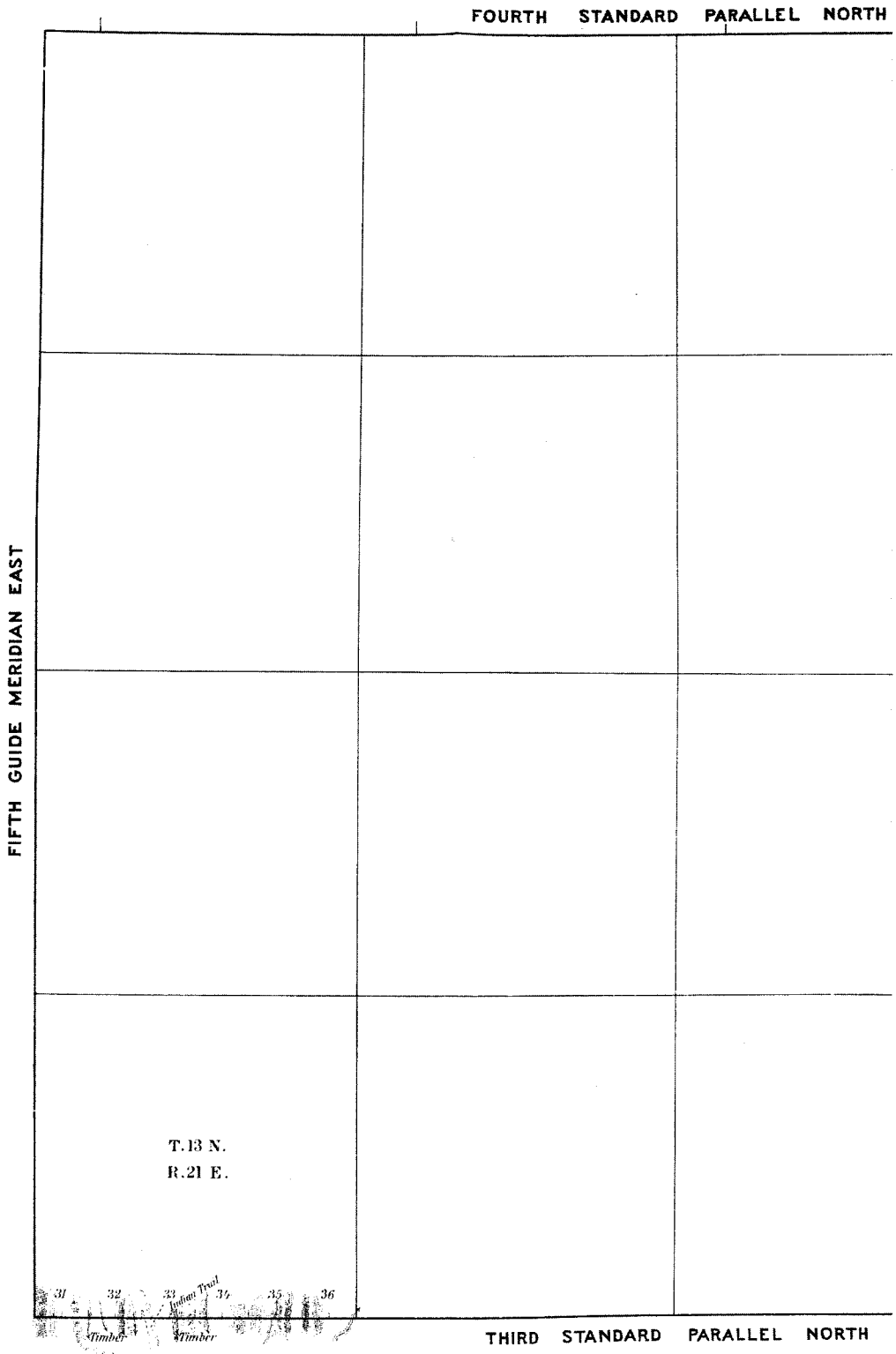

FOURTH STANDARD PARALLEL NORTH
FIFTH GUIDE MERIDIAN EAST
T.13 N.
R.21 E.
31
32
33
Indian Trail
34
35
36
Timber
Timber
THIRD STANDARD PARALLEL NORTH

DIAGRAM B

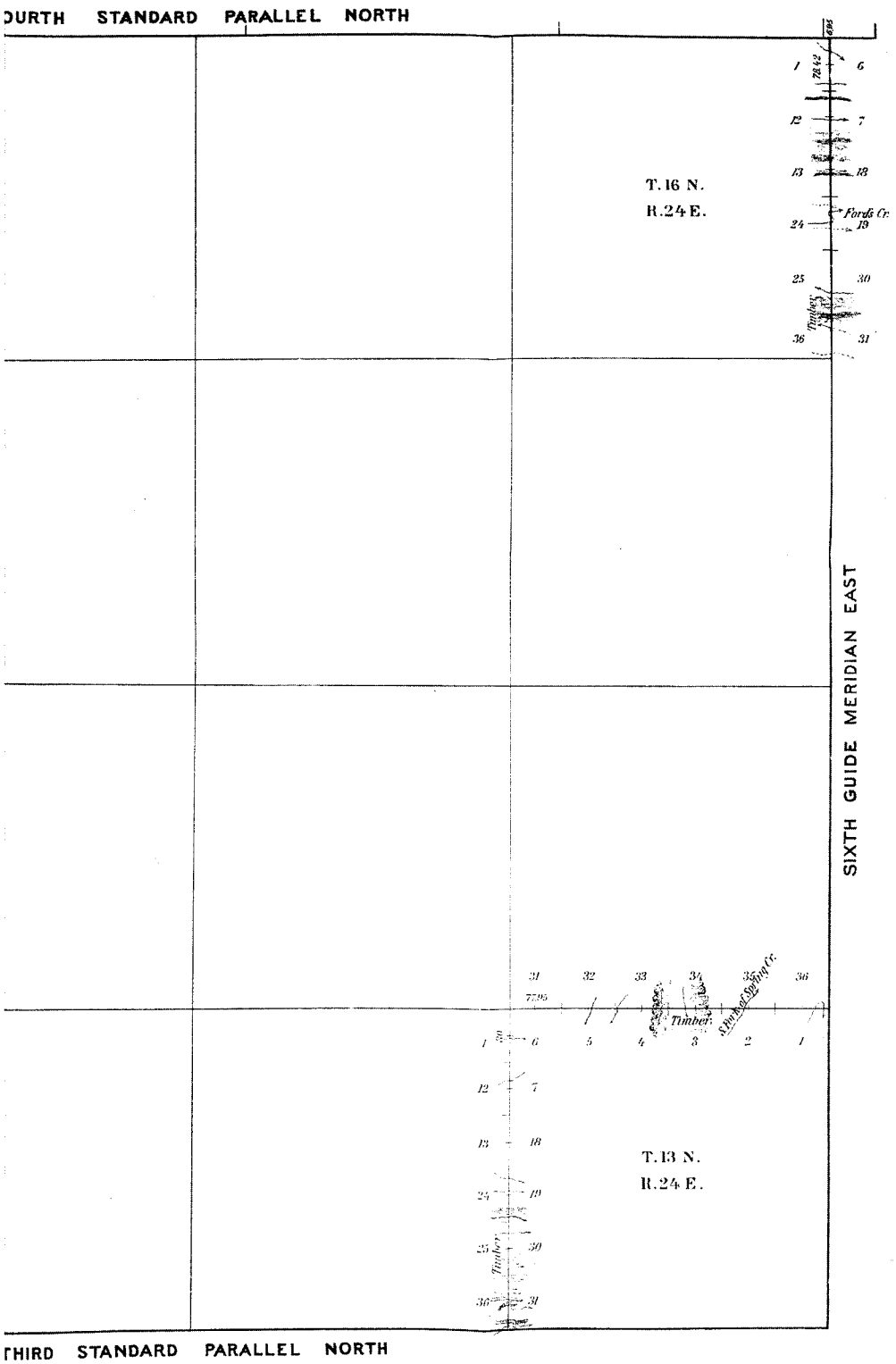
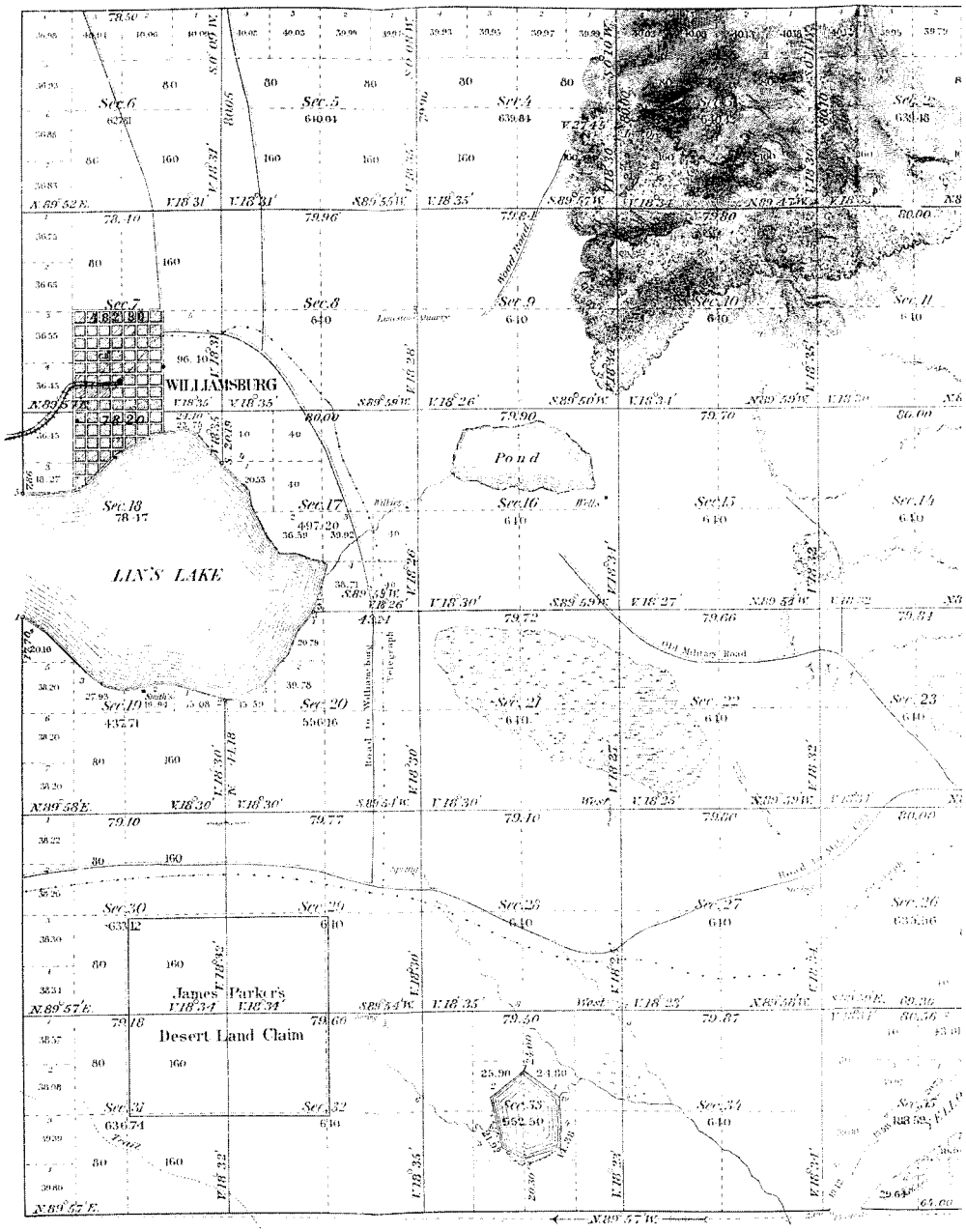

OURTH STANDARD PARALLEL NORTH
T. 16 N.
R. 24 E.
Fords Cr.
Timber
SIXTH GUIDE MERIDIAN EAST
Timber
T. 13 N.
R. 24 E.
Timber
THIRD STANDARD PARALLEL NORTH

DIAGRAM C

TOWNSHIP Nº 6 NORTH RANGE Nº 34 EAST OF THE PRIN

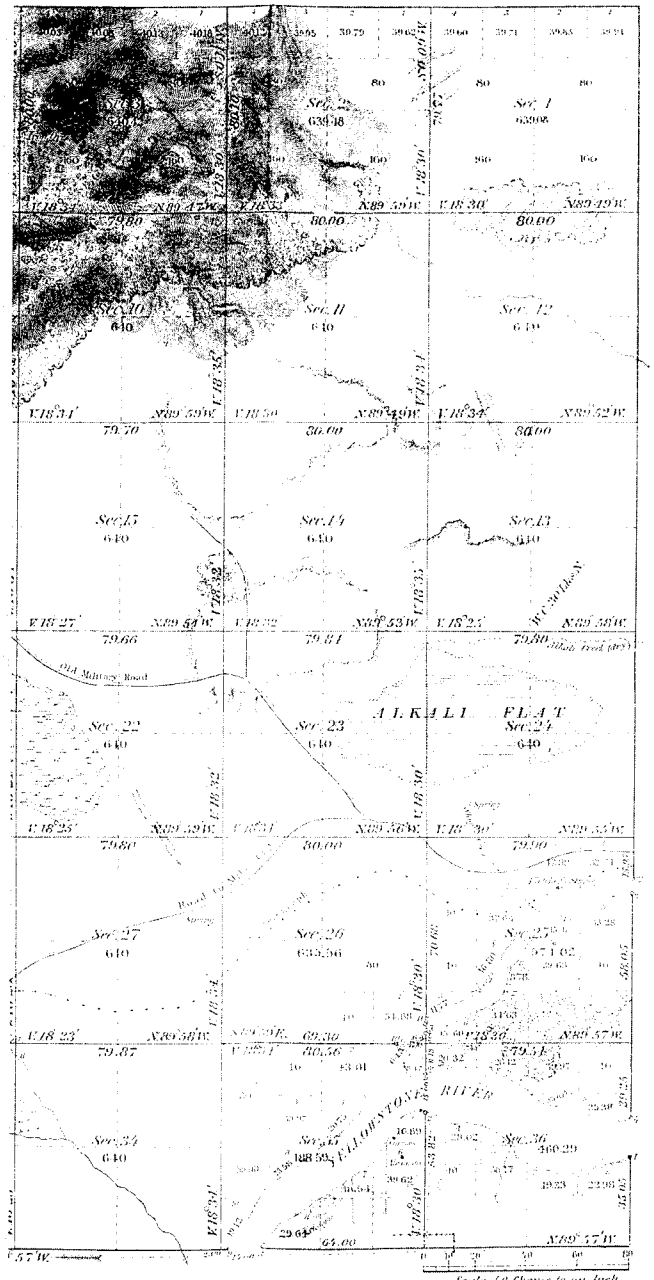


Area of Public Land 2137983 Acres. of Water Surface 139481 Acres. of Town Site 20669 Acres. Total number of Acres = 2298133

Surveys Designated	By Whom Surveyed	Date of Contract	Amount of Surveys			When Surveyed	Mean Declination
			Mi.	Ch.	Li.		
Township Lines							
Subdivisions	Robert Acres	March 22nd 1889	57	18	49	Aug. 5th to 20th 1889	16° 30' East
Meanders	"	"	12	74	99	"	
Connections	"	"		44	30		

DIAGRAM C

34 EAST OF THE PRINCIPAL MERIDIAN MONTANA



Meanders of Yellowstone River

Posts	Courses	Ch.	Lks.
	Right Bank		
	Sec. 36		
1	N 65° W	4	00
	N 74½° W	2	70
	N 63° W	7	60
	N 50½° W	8	50
	N 7° W	10	00
	N 6° W	7	00
	N 33° W	4	70
	N 60° W	7	00
	N 60° W	4	00
	N 22½° W	3	80
	N 7° W	4	00
	N 22½° W	3	50
	N 25° W	5	00
	N 74° W	2	70
	N 25° W	2	60
	N 74° W	3	50
2	N 7° W	1	70
	Sec. 24		
2	N 52° W	3	00
	N 75° W	2	50
	N 65° W	2	50
	N 35° W	11	00
	N 55° W	5	60
	N 56° W	2	00
	N 51° W	5	00
	N 13° W	2	00
	N 65° W	2	60
	N 55° W	8	70
	N 55° W	2	80
	N 48½° W	3	50
	N 56° W	8	70
3	N 50° W	16	12
	Island in Sections 23, 26, 35 & 36		
	Sec. 36		
4	N 70½° W	2	60
	N 36° W	3	00
	N 81° W	3	50
	N 68½° W	7	00
	N 73½° W	7	50
	N 84° W	3	50
	N 64½° W	1	50
	N 60½° W	3	50
	N 53½° W	2	50
	N 61½° W	2	00
	N 57½° W	4	00
	N 62½° W	8	20
	N 71½° W	1	00
	N 77° W	3	50
	N 88½° W	3	50
	N 80° W	2	00
5	N 78° W	3	50
	Sec. 35		
5	N 79° W	4	50
	N 55° W	2	00
	N 75° W	3	00
	N 47° W	1	00
6	N 50° W	2	00
	Sec. 26		
6	N 52½° W	1	00
	Sec. 25		
7	N 65° W	2	00
	N 60½° W	2	00
	N 63½° W	1	00
	N 63½° W	1	00
	N 49° W	2	00
	N 33° W	1	00
	N 13½° W	1	00
	N 5½° W	1	00
	N 27½° W	1	00
	N 34½° W	2	00
	N 45° W	1	00

Posts	Courses	Ch.	Lks.
	Sec. 25 Cont'd		
	N 61½° E	17	00
	N 74½° E	11	00
	N 69½° E	7	10
8	N 54½° E	9	60
	Left Bank		
	Sec. 35		
9	N 47° E	2	00
	N 37° E	6	50
	N 21° E	3	00
	N 31½° E	6	70
	N 30½° E	7	10
	N 27° E	2	70
	N 39½° E	4	00
	N 47½° E	3	00
	N 51½° E	6	00
	N 35½° E	12	00
	N 52½° E	6	00
	N 47½° E	3	90
	N 40½° E	8	30
	N 29½° E	7	60
	N 31° E	3	70
	N 13½° E	9	20
	N 31½° E	3	80
10	N 50½° E	6	52
	Sec. 26		
10	N 50° E	2	00
	N 45½° E	7	80
11	N 42° E	2	05
	Sec. 25		
11	N 65½° E	7	10
	N 63½° E	5	30
	N 61½° E	12	00
	N 50½° E	1	60
	N 55° E	7	70
	N 73½° E	2	50
	N 12° E	2	70
	N 41½° E	2	00
	N 45° E	1	70
	N 41° E	4	60
	N 40½° E	5	60
	N 51½° E	3	00
	N 54° E	2	00
	N 62½° E	11	30
	N 71° E	3	50
	N 87½° E	13	00
12	N 67½° E	0	80
	Lin's Lake		
	Sec. 19		
1	S 50° E	5	50
	S 66½° E	3	70
	S 44½° E	2	50
	S 45° E	3	70
	S 53° E	1	50
	S 56½° E	3	50
	S 72½° E	3	70
	S 53½° E	1	50
	S 70½° E	3	50
	S 73½° E	3	00
	S 88½° E	4	00
	S 79° E	9	00
	S 86½° E	6	50
	S 72½° E	6	70
2	S 71½° E	11	00
	Sec. 20		
2	N 59° E	6	20
	N 55½° E	11	50
	N 52½° E	9	00
	N 45½° E	6	70
	N 31½° E	5	00
	N 24½° E	3	90
	N 22½° E	2	00
	N 33° E	2	60
	N 32½° E	3	50

Posts	Courses	Ch.	Lks.
	Sec. 20 Cont'd		
3	N 51½° E	3	50
	Sec. 17		
3	N 20° E	11	00
	N 8½° E	10	10
	N 35½° W	2	00
	N 7° W	2	50
	N 69½° W	7	00
	N 65° W	6	50
	N 25½° W	3	00
	N 20½° W	13	00
	N 13½° W	6	50
	N 30° W	2	50
	N 17½° W	6	00
	N 19½° W	5	00
	N 33½° W	3	50
4	N 19½° W	0	50
	Sec. 16		
4	N 30½° W	15	00
	N 63½° W	5	00
	S 84° W	15	00
	S 61½° W	19	00
	S 43° W	15	00
	S 45½° W	4	00
	S 71½° W	4	70
	S 85½° W	5	60
5	N 88½° W	12	47
	Lake Sec. 33		
1	S 53° E	17	75
	S 5° E	13	00
	S 04½° W	7	00
2	N 70° W	15	70
	N 65° W	10	00
	N 13° W	21	00
3	N 52° E	17	30
	Total Meanders 12 Mi. 74 Ch. 99 Lks.		

...en Site 20669 Acres. Total number of Acres = 22961.33

...urveys	When Surveyed	Mean Declination
...18		
...49	Aug. 5th to 20th 1869	16° 30' East
...99	" "	
...30		

The above Map of Township No 6 North, of Range No 34 East of the Principal Meridian Montana, is strictly conformable to the field notes of the survey thereof on file in this Office which have been examined and approved

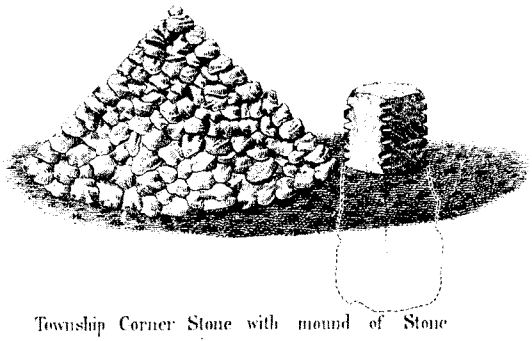
Surveyor General's Office

Surv. Genl.

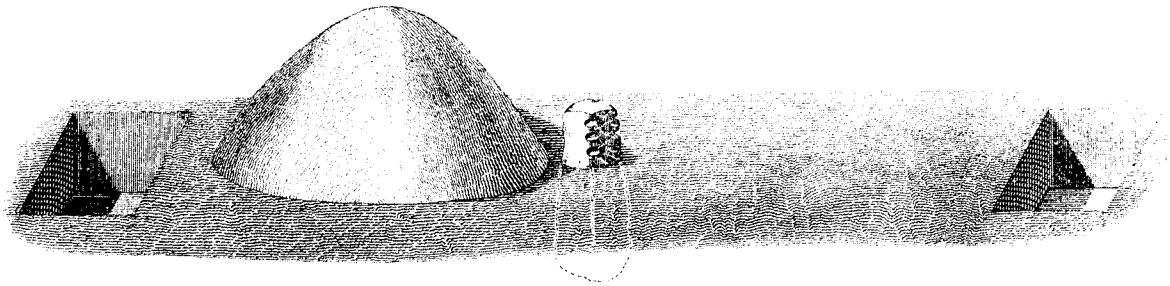
Sheet N°1

DIAGRAM D

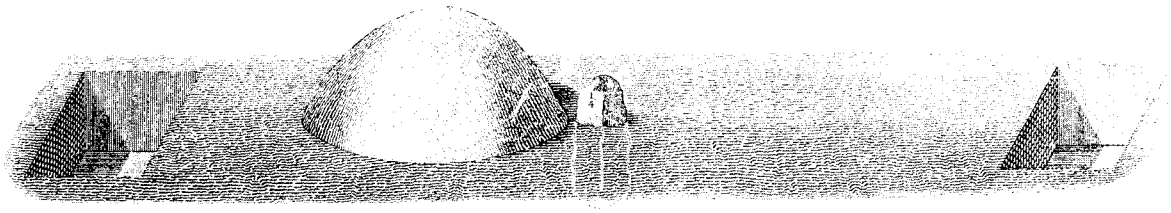
Illustrating mode of establishing Stone, Post and Mound Corners



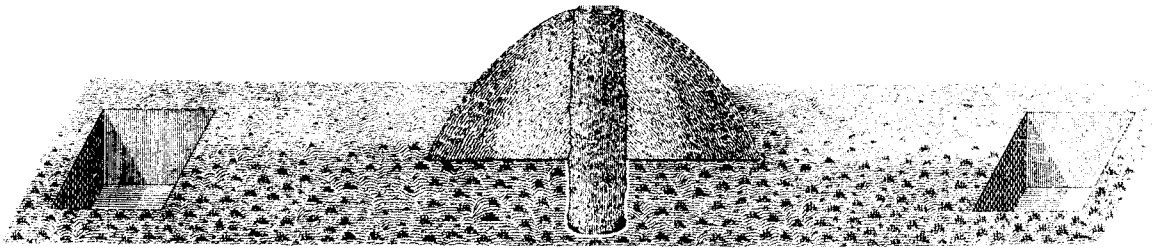
Township Corner Stone with mound of Stone



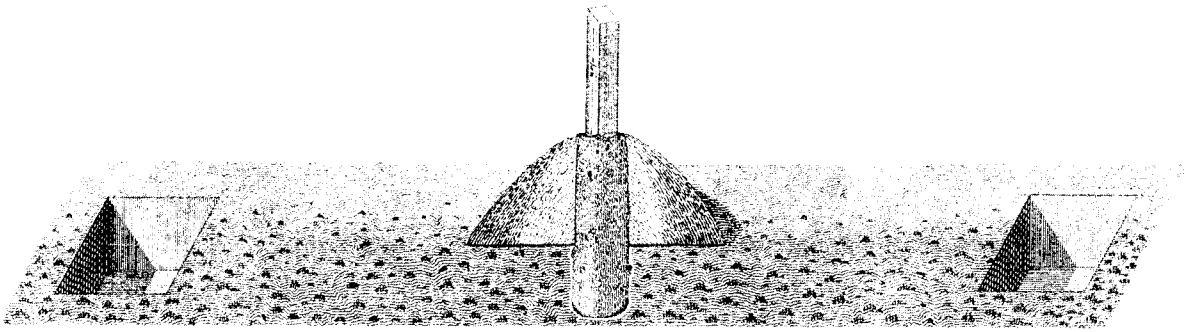
Section Corner Stone with pits and mound of earth



Quarter Section Corner with mound of earth



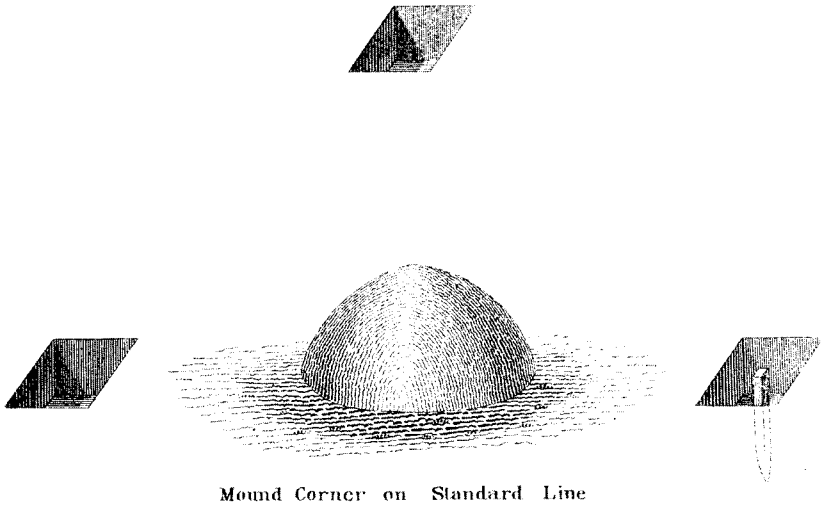
Section Corner Post with mound of earth



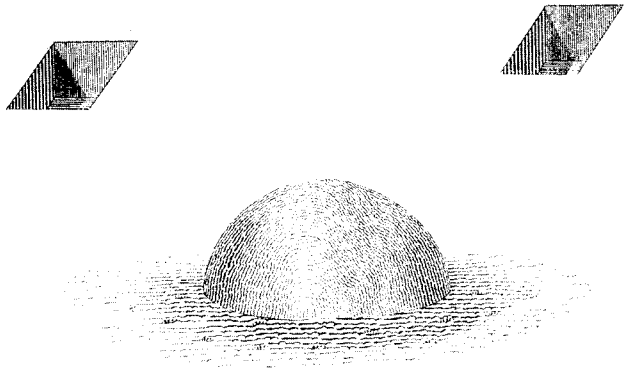
Quarter Section Corner Post with mound of earth

Sheet Nº 3

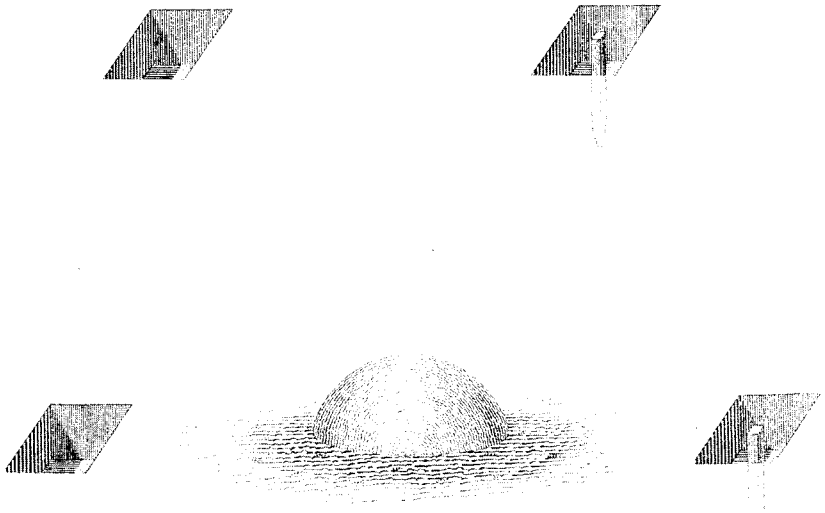
DIAGRAM D



Mound Corner on Standard Line



Mound Corner Common to 4 Sections



Quarter Section Mound Corner

(This copy of the 1894 Manual is taken from an original volume in the possession of the BLM, Oregon State Office, Portland.)

1894 MANUAL OF SURVEYING INSTRUCTIONS FOR THE SURVEY OF THE PUBLIC LANDS OF THE UNITED STATES AND PRIVATE LAND CLAIMS.

Prepared in conformity with law under the direction of
THE COMMISSIONER OF THE GENERAL LAND OFFICE.

JUNE 30, 1894.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1894.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., June 30, 1894.

GENTLEMEN:

The following instructions, including full and minute directions for the execution of surveys in the field, are issued under the authority given me by sections 453, 456, and 2398, United States Revised Statutes, and must be strictly complied with by yourselves, your office assistants, and deputy surveyors.

All directions in conflict with these instructions are hereby abrogated.

In all official communications, this edition will be known and referred to as the Manual of 1894.

Very respectfully,

S. W. LAMOREUX,
Commissioner.

To SURVEYORS GENERAL OF THE UNITED STATES.

MANUAL OF SURVEYING INSTRUCTIONS.

HISTORY OF LEGISLATION FOR SURVEYS.

The present system of survey of the public lands was inaugurated by a committee appointed by the Continental Congress, consisting of the following delegates:

Hon. THOS. JEFFERSON, *Chairman* .....Virginia.
Hon. HUGH WILLIAMSON .....North Carolina.
Hon. DAVID HOWELL.....Rhode Island.
Hon. ELBRIDGE GERRY .....Massachusetts.
Hon. JACOB READ.....South Carolina.

On the 7th of May, 1784, this committee reported "An ordinance for ascertaining the mode of locating and disposing of lands in the western territory, and for other purposes therein mentioned." This ordinance required the public lands to be divided into "hundreds" of ten geographical miles square, and those again to be subdivided into lots of one mile square each, to be numbered from 1 to 100, commencing in the *north-western* corner, and continuing from west to east and from east to west consecutively. This ordinance was considered, debated, and amended, and reported to Congress April 26, 1785, and required the surveyors "to divide the said territory into townships of 7 miles square, by lines running due north and south, and others crossing these at right angles. * * * The plats of the townships, respectively, shall be marked by subdivisions into sections of 1 mile square, or 640 acres, in the same direction as the external lines, and numbered from 1 to 49. * * * And these sections shall be subdivided into lots of 320 acres." This is the first record of the use of the terms "township" and "section."

May 3, 1785, on motion of Hon. William Grayson, of Virginia, seconded by Hon. James Monroe, of Virginia, the section respecting the extent of townships was amended by striking out the words "seven miles square" and substituting the words "six miles square." The records of these early sessions of Congress are not very full or complete; but it does not seem to have occurred to the members until the 6th of May, 1785, that a township six miles square could not contain 49 sections of 1 mile square. At that date a motion to amend was made, which provided, among other changes, that a township should contain 36 sections; and the amendment was *lost.* The ordinance as finally passed, however, on the 20th of May, 1785, provided for townships 6 miles square, containing 36 sections of 1 mile square. The first public surveys were made under this ordinance. The townships, 6 miles square, were laid out in ranges, extending northward from the Ohio River, the townships being numbered from south to north, and the ranges from east to west. The region embraced by the surveys under this law forms a part of the present State of Ohio, and is usually styled "The

Seven Ranges." In these initial surveys only the *exterior lines* of the townships were surveyed, but the plats were marked by subdivisions into sections of 1 mile square, and mile corners were established on the township lines. The sections were numbered from 1 to 36, commencing with No. 1 in the *south-east* corner of the township, and running from *south* to *north* in each tier to No. 36 in the *northwest* corner of the township, as shown in the following diagram:

36	30	24	18	12	6
35	29	23	17	11	5
34	28	22	16	10	4
33	27	21	15	9	3
32	26	20	14	8	2
31	25	19	13	7	1

The surveys were made under the direction of the Geographer of the United States.

The act of Congress approved May 18, 1796, provided for the appointment of a surveyor general, and directed the survey of the lands northwest of the Ohio River, and above the mouth of the Kentucky River, "in which the titles of the Indian tribes have been extinguished." Under this law *one half* of the townships surveyed were subdivided into sections "by running through the same, each way, parallel lines at the end of every two miles, and by making a corner on each of said lines at the end of every mile," and it further provided that "the sections shall be numbered, respectively, beginning with the number one in the northeast section and proceeding west and east alternately, through the township, with progressive numbers till the thirty-sixth be completed." This method of numbering sections, as shown by the following diagram, is still in use:

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

The act of Congress approved May 10, 1800, required the "townships west of the Muskingum, which * * * are directed to be sold in quarter townships, to be subdivided into half sections of three hundred

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and twenty acres each, as nearly as may be, by running parallel lines through the same from east to west, and from south to north, at the distance of one mile from each other, and marking corners, at the distance of each half mile, on the lines running from east to west, and at the distance of each mile on those running from south to north. * * * And the interior lines of townships intersected by the Muskingum, and of all the townships lying east of that river, which have not been heretofore actually subdivided into sections, shall also be run and marked. * * * And in all cases where the exterior lines of the townships thus to be subdivided into sections or half sections shall exceed, or shall not extend, six miles, the excess or deficiency shall be specially noted, and added to or deducted from the western and northern ranges of sections or half sections in such townships, according as the error may be in running the lines from east to west or from south to north."

The act of Congress approved February 11, 1805, directs the subdivision of the public lands into quarter sections, and provides that all the corners marked in the public surveys shall be established as the proper corners of sections, or subdivisions of sections, which they were intended to designate, and that corners of half and quarter sections *not marked* shall be placed, as nearly as possible, "equidistant from those two corners which stand on the same line." This act further provides that "The boundary lines actually run and marked * * * shall be established as the proper boundary lines of the sections or subdivisions for which they were intended; and the length of such lines as returned by * * * the surveyors * * * shall be held and considered as the true length thereof, and the boundary lines which shall not have been actually run and marked as aforesaid shall be ascertained by running straight lines from the established corners to the opposite corresponding corners; but in those portions of the fractional townships, where no such opposite or corresponding corners have been or can be fixed, the said boundary line shall be ascertained by running from the established corners due north and south or east and west lines, as the case may be, to the * * * external boundary of such fractional township."

The act of Congress approved April 25, 1812, provided "That there shall be established in the Department of the Treasury an office to be denominated the General Land Office, the chief officer of which shall be called the Commissioner of the General Land Office, whose duty it shall be, under the direction of the head of the Department, to superintend, execute, and perform all such acts and things touching or respecting the public lands of the United States, and other lands patented or granted by the United States, as have heretofore been directed by law to be done or performed in the office of the Secretary of State, of the Secretary and Register of the Treasury, and of the Secretary of War, or which shall hereafter by law be assigned to the said office."

The act of Congress approved April 24, 1820, provides for the sale of public lands in half quarter sections, and requires that "in every case of the division of a quarter section the line for the division thereof shall run north and south * * * and fractional sections, containing 160 acres and upward, shall, in like manner, as nearly as practicable, be subdivided into half quarter sections, under such rules and regulations as may be prescribed by the Secretary of the Treasury; but fractional sections containing less than 160 acres shall not be divided."

The act of Congress approved May 24, 1824, provides "That whenever, in the opinion of the President of the United States, a departure

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from the ordinary mode of surveying land on any river, lake, bayou, or water course would promote the public interest, he may direct the surveyor general in whose district such land is situated, and where the change is intended to be made, under such rules and regulations as the President may prescribe, to cause the lands thus situated to be surveyed in tracts of two acres in width, fronting on any river, bayou, lake, or water course, and running back the depth of forty acres."

The act of Congress approved May 29, 1830 (secs. 2412, 2413, R. S.), provides for the fine and imprisonment of any person obstructing the survey of the public lands, and for the protection of surveyors, in the discharge of their official duties, by the United States marshal, with sufficient force, whenever necessary.

The act of Congress approved April 5, 1832, directed the subdivision of the public lands into quarter quarters; that in every case of the division of a half quarter section the dividing line should run east and west; and that fractional sections should be subdivided under rules and regulations prescribed by the Secretary of the Treasury. Under the latter provision the Secretary directed that fractional sections containing less than 160 acres, or the residuary portion of a fractional section, after the subdivision into as many quarter quarter sections as it is susceptible of, may be subdivided into lots, each containing the quantity of a quarter quarter section, as nearly as practicable, by so laying down the line of subdivision that they shall be 20 chains wide, which distances are to be marked on the plat of subdivision, as are also the areas of the quarter quarters and residuary fractions.

The last two acts above mentioned provided that the corners and contents of half-quarter and quarter-quarter sections should be ascertained, as nearly as possible, in the manner and on the principles directed and prescribed in the act of Congress approved February 11, 1805.

The act of Congress approved July 4, 1836, provided for the reorganization of the General Land Office, and that the executive duties of said office "shall be subject to the supervision and control of the Commissioner of the General Land Office under the direction of the President of the United States." The repealing clause is, "That such provisions of the act of the twenty-fifth of April, in the year one thousand eight hundred and twelve, entitled 'An act for the establishment of a General Land Office in the Department of the Treasury,' and of all acts amendatory thereof, as are inconsistent with the provisions of this act, be, and the same are hereby, repealed."

From the wording of this act it would appear that the control of the General Land Office was removed from the Treasury Department, and that the Commissioner reported directly to the President; but, as a matter of fact, the Secretary of the Treasuy still had supervisory control, for the act of Congress approved March 3, 1849, by which the Department of the Interior was established, provided, "That the Secretary of the Interior shall perform all the duties in relation to the General Land Office, of supervision and appeal, now discharged by the Secretary of the Treasury * * *." By this act the General Land Office was transferred to the Department of the Interior, where it still remains.

In 1855 a manual of instructions to surveyors general was prepared, under the direction of the Commissioner of the General Land Office, by John M. Moore, then principal clerk of surveys, and the act of Congress approved May 30, 1862 (sec. 2399, R. S.), provided "That the printed manual of instructions relating to the public surveys, prepared at the General Land Office, and bearing the date February twenty-second, eighteen hundred and fifty-five, the instructions of the Commissioner

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of the General Land Office, and the special instructions of the surveyor general, when not in conflict with said printed manual or the instructions of said Commissioner, shall be taken and deemed to be a part of every contract for surveying the public lands of the United States."

The instructions contained in this volume are issued under the authority given in the clause in said act providing that "The instructions of the Commissioner of the General Land Office * * * shall be taken and deemed to be a part of every contract for surveying the public lands of the United States."

The following comprises so much of the general laws relating to the survey of the public domain as it is deemed necessary to incorporate in this volume, reference being made by chapter and section to the codification of the Public Land Laws, prepared pursuant to acts of Congress approved March 3, 1879 and June 16, 1880, and by section number to the Revised Statutes of the United States.

(The remainder of page 9, all of pages 10 through 16 and most of page 17 are deleted. They contain the pertinent Revised Statutes, and forms of contracts.)

SYSTEM OF RECTANGULAR SURVEYING.

[See Plates I, III, and IV.]

1. Existing law requires that in general the public lands of the United States "shall be divided by north and south lines run according to the true meridian, and by others crossing them at right angles so as to form townships six miles square," and that the corners of the townships thus surveyed "must be marked with progressive numbers from the beginning."

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Also, that the townships shall be subdivided into thirty-six sections, each of which shall contain six hundred and forty acres, as nearly as may be, by a system of two sets of parallel lines, one governed by true meridians and the other by parallels of latitude, the latter intersecting the former at right angles, at intervals of a mile.

2. In the execution of the public surveys under existing law, it is apparent that the requirements that the lines of survey shall conform to true meridians, and that the townships shall be 6 miles square, taken together, involve a mathematical impossibility due to the converg of the meridians.

Therefore, to conform the meridional township lines to the true meridians produces townships of a trapezoidal form which do not contain the precise area of 23,040 acres required by law, and which discrepancy increases with the increase in the convergency of the meridians, as the surveys attain the higher latitudes.

In view of these facts, and under the provisions of section 2 of the act of May 18, 1796, that sections of a mile square shall contain 640 acres, *as nearly as may be,* and also under those of section 3 of the act of May 10, 1800, that "in all cases where the exterior lines of the townships, thus to be subdivided into sections and half sections, shall exceed, or shall not extend 6 miles, the excess or deficiency shall be specially noted, and added to or deducted from the western or northern ranges of sections or half sections in such township, according as the error may be in running lines from east to west, or from south to north; the sections and half sections bounded on the northern and western lines of such townships shall be sold as containing only the quantity expressed in the returns and plats, respectively, and all others as containing the complete legal quantity," the public lands of the United States shall be surveyed under the methods of the system of rectangular surveying, which harmonizes the incompatibilities of the requirements of law and practice, as follows:

First. The establishment of a principal meridian conforming to the true meridian, and, at right angles to it, a base line conforming to a parallel of latitude.

Second. The establishment of standard parallels conforming to parallels of latitude, initiated from the principal meridian at intervals of 24 miles and extended east and west of the same.

Third. The establishment of guide meridians conforming to true meridians, initiated upon the base line and successive standard parallels at intervals of 24 miles, resulting in tracts of land 24 miles square, *as nearly as may be,* which shall be

subsequently divided into tracts of land 6 miles square by two sets of lines, one conforming to true meridians, crossed by others conforming to parallels of latitude at intervals of 6 miles, containing 23,040 acres, *as nearly as may be,* and designated *townships.*

Such townships shall be subdivided into thirty-six tracts, called sections, each of which shall contain 640 acres, as nearly as may be, by two sets of parallel lines, one set *parallel to a true meridian* and the other *conforming to parallels of latitude,* mutually intersecting at intervals of 1 mile and at right angles, *as nearly as may be.*

Any series of contiguous townships situated north and south of each other constitutes a *range,* while such a series situated in an east and west direction constitutes a *tier.*

The accompanying diagram (Plate III), and the specimen field notes (page 142), pertaining to the same, will serve to illustrate the method of running lines to form tracts of land 24 miles square, as well as the

method of running out the exterior lines of townships, and the order and mode of subdividing townships will be found illustrated in the accompanying specimen field notes (page 172), conforming with the township plat (Plate IV). The method here presented is designed to insure as full a compliance with all the requirements, meaning, and intent of the surveying laws as practicable.

The section lines are surveyed from *south* to north[1] and from *east* to west, in order to throw the excessor deficiency in measurement on the north and west sides of the township, as required by law. In case where a township has been partially surveyed, and it is necessary to complete the survey of the same, or where the character of the land is such that only the north or west portions of the township can be surveyed, this rule can not be strictly adhered to, but, in such cases, it will be departed from only so far as is absolutely necessary. It will also be necessary to depart from this rule where surveys close upon State or Territorial boundaries, or upon surveys extending from different meridians.

3. The tiers of townships will be numbered, to the north or south, commencing with No. 1, at the base line; and the ranges of the townships, to the east or west, beginning with No. 1, at the principal meridian of the system.

4. The thirty-six sections into which a township is subdivided are numbered, commencing with number *one* at the *northeast* angle of the township, and proeeding west to number six, and thence proceeding east to number twelve, and so on, alternately, to number thirty-six in the southeast angle. In all cases of surveys of fractional townships, the sections will bear the same numbers they would have if the township was full.

5. Standard parallels shall be established at intervals of every 24 miles, north and south of the base line, and guide meridians at intervals of every 24 miles, east and west of the principal meridian; thus confining the errors resulting from convergence of meridians and inaccuracies in measurement within comparatively small areas.

INSTRUMENTS.

6. The surveys of the public lands of the United States, embracing the establishment of base lines, principal meridians, standard parallels, meander lines, and the subdivisions of townships, will be made with instruments provided with the accessories necessary to determine a direction with reference to the true meridian, independently of the magnetic needle.

Burt's improved solar compass, or a transit of approved construction, with or without solar attachment, will be used in *all cases.* When a transit *without* solar attachment is employed, *Polaris observations* and the *retracements* necessary to execute the work in accordance with existing law and the requirements of these instructions will be insisted upon.

7. Deputies using instruments with solar apparatus will be required to make observations on the star Polaris at the beginning of every survey, and, *whenever necessary, to test the accuracy of the solar apparatus.*

The observations required to test the adjustments of the solar apparatus will be made at the corner where the survey begins, or at the

camp of the deputy surveyor nearest said corner; and in all cases the deputy willfully state in the field notes the exact location of the observing station.

Deputy surveyors will examine the adjustments of their instruments, and take the *latitude*[2] *daily*, weather permitting, while runing *all lines of the public surveys.* They will make complete records in their field notes, under proper dates, of the making of all observations in compliance with these instructions, showing the character and condition of the instrument in use, and the precision attained in the survey, by comparing the direction of the line run with the meridian determined by observation.

On every survey executed with solar instruments, the deputy will, *at least once on each working day,* record in his field notes the proper reading of the latitude arc; the declination of the sun, corrected for refraction, set off on the declination arc; and note the correct *local mean time* of his observation, which, for the record, will be taken *at least two hours from apparent noon.*

8. The construction and adjustments of all surveying instruments used in surveying the public lands of the United States will be tested at least once a year, and oftener, if necessary, on the true meridian, established under the direction of the surveyor general of the district; and if found defective, the instruments shall undergo such repairs or modifications as may be found necessary to secure the closest possible approximation to accuracy and uniformity in all field work controlled by such instruments.

A record will be made of such examinations, showing the number and character of the instrument, name of the maker, the quantity of instrumental error discovered by comparison, in either solar or magnetic apparatus, or both, and means taken to correct the same. The surveyor general will allow no

1. See "Method of Subdividing," p. 53.

2. The adjustments should be verified daily when the instrument is in use.

surveys to be made until the instruments to be used therefor have been approved by him.

9. The township and subdivision lines will usually be measured by a two-pole chain of 33 feet in length,[3] consisting of 50 links, each link being seven and ninety-two hundredths inches long. On uniform and level ground, however, the four-pole chain may be used. The measurements will, however, always be expressed in terms of the four-pole chain of 100 links. The deputy surveyor shall provide himself with a measure of the standard chain kept at the office of the surveyor general, to be used by him as a field standard. The chain in use will be compared and adjusted with this field standard each working day, and such field standard will be returned to the surveyor general's office for examination when the work is completed.

Deputy surveyors will use eleven tally pins made of steel, not exceeding 14 inches in length, weighty enough toward the point to make them drop perpendicularly, and having a ring at the top, in which will be fixed a piece of red cloth, or something else of conspicuous color, to make them readily seen when stuck in the ground.

PROCESS OF CHAINING.

In measuring lines with a two-pole chain, *five* chains are called a *"tally;"* and in measuring lines with a four-pole chain, *ten* chains are called a *"tally,"* because at that distance the last of the ten

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tally pins with which the forward chainman sets out will have been stuck. He then cries "tally," which cry is repeated by the other chainman, and each registers the distance by slipping a thimble, button, or ring of leather, or something of the kind, on a belt worn for that purpose, or by some other convenient method. The hind chainman then comes up, and having counted in the presence of his fellow the tally pins which he has taken up, so that both may be assured that none of the pins have been lost, he then takes the forward end of the chain, and proceeds to set the pins. Thus the chainmen alternately change places, each setting the pins that he has taken up, so that one is forward in all the odd, and the other in all the even tallies. Such procedure, it is believed, tends to insure accuracy in measurement, facilitates the recollection of the distances to objects on the line, and renders a mistally almost impossible.

LEVELING THE CHAIN AND PLUMBING THE PINS.

1. The length of every surveyed line will be ascertained by precise horizontal measurement, as nearly approximating to an air line as is possible in practice on the earth's surface. This all-important object can only be attained by a rigid adherence to the three following observances:

First. Ever keeping the chain drawn to its utmost degree of tension on even ground.

Second. On uneven ground, keeping the chain not only stretched as aforesaid, but *leveled.* And when ascending and descending steep ground, hills or mountains, the chain will have to be *shortened* to one-half or one-fourth its length (and sometimes more), in order accurately to obtain the true horizontal measure.

Third. The careful plumbing of the tally pins, so as to attain precisely the *spot* where they should be stuck. The more uneven the surface, the greater the caution needed to set the pins.

MARKING LINES.

1. All lines on which are to b established the legal corner boundaries will be marked after this method, viz: Those trees which may be intersected by the line will have two chops or notches cut on the sides facing the line, without any other marks whatever. These are called *"sight trees"* or *"line trees."* A sufficient number of other trees standing within 50 links of the line, on either side of it, will be *blazed* on two sides diagonally or quartering toward the line, in order to render the line conspicuous, and readily to be traced, the blazes to be opposite each other, coinciding in direction with the line where the trees stand very near it, and to approach nearer each other toward the line, the farther the line passes from the blazed trees. Due care will ever be taken to have the lines so well marked as to be readily followed, and to cut the blazes deep enough to leave recognizable scars as long as the trees stand.

Where trees 2 inches or more in diameter are found, the required blazes will not be omitted.

Bushes on or near the line should be bent at right angles therewith, and receive a blow of the ax at about the usual height of blazes from the ground sufficient to leave them in a bent position, but not to prevent their growth.

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2. On trial or random lines, the trees will not be blazed, unless occasionally, from indispensable necessity, and then it will be done so guardedly as to prevent the possibility of confounding the marks of the trial line with the *true.* But bushes and limbs of trees may be lopped, and *stakes set* on the trial or random line, at every ten chains, to enable the surveyor on his return to follow and correct the trial line and establish therefrom the *true line.* To prevent confusion, the temporary stakes set on the trial or random line will be *pulled up* when the surveyor returns to establish the true line.

INSUPERABLE OBJECTS ON LINE—WITNESS POINTS.

1. Under circumstances where the survey of a township or section line is obstructed by an impassable obstacle, such as a pond, swamp, or marsh (not meanderable), the line will be prolonged across such obstruction by making the necessary right-angle offsets (Plate IV, sec. 22); or, if such proceeding is impracticable, a traverse line will be run, or some proper trigonometical operation will be employed to locate the line on the opposite side of the obstruction; and in case the line, either *meridional* or *latitudinal,* thus regained, is recovered beyond the intervening obstacle, said line will be surveyed back to the margin of the obstruction and *all the particulars,*

3. See R. S. 2395, sec. 99, par. 6 (page 11).

in relation to the field operations, will be fully stated in the field notes.

2. As a guide in alinement and measurement, at each point where the line intersects the margin of an obstacle, a *witness point*[4] will be established, *except* when such point is less than 20 *chains* distant from the true point for a legal corner which falls in the obstruction, in which case a *witness corner*[5] will be established at the intersection. (See Plate IV, section 22.)

3. In a case where all the points of intersection with the obstacle to measurement fall *more than 20 chains* from the proper place for a legal corner in the obstruction, and a witness corner can be placed on the offset line *within 20 chains* of the inaccessible corner point, such "witness corner" will be established. (See Plate IV, south boundary of section 16.)

ESTABLISHING CORNERS.

1. To procure the faithful execution of this part of a surveyor's duty, is a matter of the utmost importance. After true coursing and most exact measurements, the establishment of corners is the consummation of the field work. Therefore, if the corners be not perpetuated in a permanent and workmanlike manner, the *principal object* of surveying operations will not have been attained.

2. The points at which corners will be established are fully stated in the several articles: "Base Lines," "Principal Meridians," "Standard Parallels," etc., following the title "Initial Points," page 50.

3. The best marking tools adapted to the purpose will be provided for marking *neatly, distinctly,* and *durably,* all the letters and figures required to be made at corners, *arabic* figures being used exclusively; and the deputy will always have at hand the necessary implements for keeping his marking irons in perfect order.

DESCRIPTIONS OF CORNERS.

1. The form and language used in the following articles, in describing, for each one of the thirteen classes of corners, eight specific construc-

tions and markings, with the stated modifications in certain cases, will be carefully followed by deputy surveyors in their *field notes;* and their *field work* will strictly comply with the requirements of the descriptions.

2. When pits and mounds of earth are made accessories to corners, the pits will always have a *rectangular* plan; while the mounds will have a *conical* form, with *circular* base; and in all cases both pits and mounds will have dimensions *at least* as great as those specified in the descriptions. Deputy surveyors will strictly adhere to these provisions, and no departure from the stated requirements will be permitted, either in *instructions or practice in the field.* (See Plates V and VI).

4. See "Witness Points," page 48.

5. See "Witness Corners," page 47.

6. The direction of the mound, from the corner, will be stated whenever a mound is built. See "Miscellaneous," par. 2, page 48.

3. Referring to the numbered paragraphs, the corners described in "3" will be preferred to those described in either "1" or "2", when corners are established in loose, sandy soil, and good bearing trees are available; under similar conditions, the corners described in "5" and "8" will be preferred to those described in "4" and "7", respectively.

4. The selection of the particular construction to be adopted in any case will be left, as a matter of course, to the judgment and discretion of the deputy, who will assign the greatest weight to the *durability* of the corner materials and permanency of the finished corners.

5. The following abbreviations and contractions will be used in the descriptions of corners, viz:

A. M. C.	for auxiliary meander corner.	N.	for north.
bdy.	for boundary.	¼ sec. cor.	for quarter section corner.
bdrs.	for boundaries.	R.	for range.
bet.	for between.	Rs.	for ranges.
C. C.	for closing corner.	sec., secs.	for section, sections.
cor. cors.	for corner, corners.	S. M. C.	for special meander corner.
dist.	for distance.	s. c.	for standard corner.
E.	for east.	sq.	for square.
ft.	for foot or feet.	S.	for south.
fracl.	for fractional.	T. or Tp.	for township.
ins.	for inches.	Ts. or Tps.	for townships.
diam.	for diameter.	W.	for west.
lks.	for links.	W. C.	for witness corner.
M. C.	for meander corner.	W. P.	for witness point.

For "18 inches long, 7 inches wide, 6 inches thick," in describing a corner stone, write "18 x 7 x 6 ins.," being particular to always preserve the same order of length, width, and thickness (or depth), and use a similar form when describing *pits.*

STANDARD TOWNSHIP CORNERS.

[See Plates III and V.]

When more than one-half of all the standard township and section corners on any 6 miles of a base line or standard parallel are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described are established, will be modified as follows: Strike out "S. C., on N." After "marked", insert the words:

"S. C., 13 N. on N.,
22 E. on E., and
21 E. on W. faces;"

When under the conditions above specified the corner described in paragraph 1 is established, a stake may be driven in the east pit and marked instead of the stone, and described as exemplified in the last clause of paragraph 6, page 00.

(See Specimen Field Notes, pages 145 and 149.)

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for standard cor. of (e. g.) Tps. 13 N., Rs. 21 and 22 E., marked S. C. on N.; with 6 grooves on N., E., and W. faces; dug pits 30 x 24 x 12 ins., crosswise on each line, E. and W., 4 ft., and N. of stone, 8 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, N.[6] of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for standard cor. of (e. g.) Tps. 13 N., Rs. 21 and 22 E., marked S. C., on N.; with 6 grooves on N., E., and W. faces; and raised amound of stone[7], 2 ft. base, 1½ ft. high, N. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for standard cor. of (e. g.) Tps. 13 N., Rs. 21 and 22 E., marked S. C., on N.; with 6 grooves on N., E., and W. faces; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked[8]

T. 13 N., R. 22 E., S. 31, B. T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T. 13 N., R. 21 E., S. 36, B. T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for standard cor. of (e. g.) Tps. 13 N., Rs. 22 and 23 E., marked

S. C. , T. 13 N. on N.,

R. 23 E., S. 31 on E., and

R. 22 E., S. 36 on W. faces; with 6 grooves on N., E., and W. faces; dug pits, 30 x 24 x 12 ins., crosswise on each line, E. and W., 4 ft., and N. of post, 8 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, N. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for standard cor. of (e. g.) Tps. 13 N., Rs. 22 and 23 E., marked

S. C., T. 13 N. on N.,

R. 23 E., S. 31 on E., and

R. 22 E., S. 36 on W. faces; with 6 grooves on N., E., and W. faces, from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

T. 13 N., R. 23 E., S. 31, B. T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T. 13 N., R. 22 E., S. 36, B. T.

6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for standard cor. of (e. g.) Tps. 13 N., Rs. 22 and 23 E.; dug pits, 30 x 24 x 12 ins., crosswise on each line, N., E., and W. of cor., 5 ft. dist.; and raised a mound of earth, 5 ft base, 2½ ft. high, over deposit.

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In E. pit drove a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked

S. C., T. 13 N. on N.,

R. 23 E., S. 31 on E., and

R. 22 E., S. 36 on W. faces; with 6 grooves on N., E., and W. faces.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for standard cor. of (e. g.) Tps. 13 N., Rs. 22 and 23 E., I marked

S. C., T. 13 N. on N.,

R. 23 E., S. 31 on E., and

R. 22 E., S. 36 on W. sides; with 6 notches on N., E., and W. sides; dug pits, 24 x 18 x 12 ins., crosswise on each line, N., E., and W. of cor., 5 ft. dist.; and raised a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for standard cor. of (e. g.) Tps. 13 N. , Rs. 22 and 23 E., I marked

S. C., T. 13 N. on N.,

R. 23 E., S. 31 on E., and

R. 22 E., S. 36 on W. sides; with 6 notches on N., E., and W. sides; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

T. 13 N., R. 23 E.,S. 31, B. T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T. 13 N., R. 22 E., S. 36, B. T.

CLOSING TOWNSHIP CORNERS.

[See Plates V and VI.]

When more than one-half of all the township corners are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described are established, will be modified, as follows: Strike out "C. C., on S.;". After "marked", insert the words

"C. C., 3 N. on S.,

2 W. on E., and

3 W. on W. faces."

When, under the conditions above specified, the corner described in paragraph 1 is established, a stake may be driven in the east pit, and marked instead of the stone, and described as exemplified in the last clause of paragraph 6, page 26.

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for closing cor. of (e. g.) Tps. 4 N., Rs. 2 and 3 W., marked C. C., on S.; with 6 grooves on S., E., and W. faces; dug pits, 30 x 24 x 12 ins., crosswise on each line, E. and W., 4 ft., and S. of stone, 8 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, S. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for closing cor. of (e. g.) Tps. 4 N., Rs. 2 and 3 W., marked C. C., on S.; with 6 grooves on S., E., and W. faces; and raised a mound of stone, 2 ft. base, 1½ ft. high, S. of cor. Pits impracticable.

7. Mound of stone will consist of not less than four stones, and will be at least 1½ ft. high, with 2 ft. base.

8. All bearing trees, except those referring to quarter section corners, will be marked with the township, range, and section in which they stand.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for closing cor. of (e. g.) Tps. 4 N., Rs. 2 and 3 W., marked C. C., on S.; with 6 grooves on S., E., and W. faces; from which:

A _____, _____ ins. diam. bears S. _____° E., _____ lks. dist., marked

T. 4 N., R. 2 W., S. 6, B. T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T. 4 N., R. 3 W., S. 1, B. T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for closing cor. of (e. g.) Tps. 4N., Rs. 2 and 3 W., marked

C. C., T. 4 N. on S.,

R. 2 W., S. 6 on E., and

R. 3 W., S. 1 on W. faces; with 6 grooves on S., E., and W. faces; dug pits, 30 x 24 x 12 ins., crosswise on each line, E. and W., 4 ft., and S. of post 8 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ feet high, S. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for closing cor. of (e. g.) Tps. 4 N., Rs. 2 and 3 W., marked

C. C., T. 4 N. on S.,

R. 2 W., S. 6 on E., and

R. 3 W., S. 1 on W. faces; with 6 grooves on S., E., and W. faces; from which

A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

T. 4 N., R. 2 W., S. 6, B. T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T. 4 N., R. 3 W., S. 1, B. T.

6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposited a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for standard cor. of (e. g.) Tps 4 N., Rs. 2 and 3 W.; dug pits, 30 x 24 x 12 ins., crosswise on each line, S., E., and W. of cor., 5 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, over deposit.

In E. pit, drove a _____ stake 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked

C. C., T. 4 N. on S.,

R. 2 W., S. 6 on E., and

R. 3 W., S. 1 on W. faces; with 6 grooves on S., E., and W. faces.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for closing cor. of (e. g.) Tps. 4 N., Rs. 2 and 3 W., I marked

C. C., T. 4 N. on S.,

R. 2 W., S. 6 on E., and

R. 3 W., S. 1 on W. sides; with 6 notches on S., E., and W. sides; dug pits, 24 x 18 x 12 ins., crosswise on each line, S., E., and W. of cor., 5 ft. dist.; and raised a mound of earth, around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for closing cor. of (e. g.) Tps. 4 N., Rs. 2 and 3 W., I marked

C. C., T. 4 N. on S.,

R. 2 W., S. 6 on E., and

R. 3 W., S. 1 on W. sides; with 6 notches on S., E., and W. sides; from which

A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

T. 4 N., R. 2 W., S. 6, B. T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T. 4 N., R. 3 W., S. 1, B. T.

9. *Connecting lines.*

All closing township corners on base lines or standard parallels, will be connected, by course and distance, with the *nearest* standard corner thereon; closing corners *on all other lines,* will be connected, in a similar manner, with the *nearest* township, section, or quarter section corner, or mile or half-mile monument, as existing conditions may require.

10. *Relative positions of Closing Corners, Pits, Mounds, and Bearing Trees.*

Any line, which by intersection with another *surveyed* line, determines the place for a closing corner, will be called a *closing line;* then in general, the mound and one pit of a closing corner will be placed *on* such "closing line," N., S., E., or W. of the closing corner, as prevailing conditions may require; while said mound and pit, with the two bearing trees (if used), will always be located on the same side of the *line closed upon,* and *on* which the other pits will be established, as directed in the foregoing descriptions, and illustrated on Plate VI.

11. *Positions and dimensions of Pits of Closing Corners on irregular boundaries.*

When a closing line intersects an irregular boundary at an angle less than 75°, and stone or post closing corners are established, the pit on the boundary adjoining the acute angle will be omitted, and the pit on the opposite side of the closing corner wil have its dimensions increased, as follows: For a closing township corner, the enlarged pit will measure 42 x 36 x 12 ins.; for a closing section corner it will be 30 x 24 x 12 ins. (See Plate VI, figs. 2 and 3.)

12. *Township or Section interfering Closing Corners.*

When two closing lines, at right angle to each other, intersect an irregular boundary at points *less than 8 feet apart,* and stone or post corners are established, the pits, that under ordinary circumstances would be placed on the boundary,

will be omitted, and the pits *on the closing lines* will have their dimensions increased to 36 x 36 x 12 ins. (See Plate VI, fig. 4, at a and b.)

13. *Positions and dimensions of Pits and Mounds of interfering Closing Corners.*

When, under the conditions stated in paragraphs 11 and 12, the corners *"Mound of Earth, with Deposits and Stake in Pit"* are established, the pits on the boundary line will be omitted when the distance between the closing corners is *less than 10 feet and greater than 4 feet,* and the dimensions of the pits on the closing lines will be increased as directed in said paragraphs.

In case the distance between the closing corners is *less than 4 feet,* one mound, 5 ft. base, 2½ ft. high, will cover the deposits of both closing corners. (See Plate VI, fig. 4, at c, d, and e.)

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CORNERS COMMON TO FOUR TOWNSHIPS.

[See Plate V.]

When more than one-half of all the corners of a township are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described are established, will be modified, as follows: After "marked", insert the words

"3 N. on N. E.,
2 E. on S. E.,
2 N. on S. W., and
3 E. on N. W. faces;"

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for cor. of (e. g.) Tps. 2 and 3 N., Rs. 2 and 3 W., marked with 6 notches on each edge; dug pits, 24 x 24 x 12 ins., on each line, N., E., and W., 4 ft., and S. of stone, 8 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, S. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for cor. of (e. g.) Tps. 2 and 3 N., Rs. 2 and 3 W., marked with 6 notches on each edge, and raised a mound of stone, 2 ft. base, 1½ ft. high, S. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for cor. of (e. g.) Tps. 2 and 3 N., Rs. 2 and 3 W., marked with 6 notches on each edge; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

T. 3 N., R. 2 W., S. 31, B. T.

A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

T. 2 N., R. 2 W., S. 6, B. T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T. 2 N., R. 3 W., S. 1, B. T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T. 3 N., R. 3 W., S. 36, B. T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for cor. of (e. g.) Tps. 2 and 3 N., Rs. 2 and 3 W., marked

T. 3 N., S. 31 on N E.,
R. 2 W., S. 6 on S. E.,
T. 2 N., S. 1 on S. W., and
R. 3 W., S. 36 on N. W. faces; with 6 notches on each edge; dug pits, 24 x 24 x 12 ins., on each line, N., E., and W., 4 ft., and S. of post, 8 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ feet high, S. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for cor. of (e. g.) Tps. 2 and 3 N., Rs. 2 and 3 W., marked

T. 3 N., S. 31 on N. E.,
R. 2 W., S. 6 on S. E.,
T. 2 N., S. 1 on S. W., and

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R. 3 W., S. 36 on N. W., faces; with 6 notches on each edge; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

T. 3 N., R. 2 W., S. 31, B. T.

A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

T. 2 N., R. 2 W., S. 6, B. T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T. 2 N., R . 3 W., S. 1, B. T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T. 3 N., R. 3 W., S. 36, B. T.

6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposited a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for cor. of (e. g.) Tps. 2 and 3 N., Rs. 2 and 3 W.; dug pits 24 x 24 x 12 ins., on each line, N., S., E., and W. of cor., 5 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, over deposit.

In E. pit drove a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked

T. 3 N., S. 31 on N. E.,
R. 2 W., S. 6 on S. E.,
T. 2 N., S. 1 on S. W., and
R. 3 W., S. 36 on N. W. faces; with 6 notches on each edge.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for cor. of (e. g.) Tps. 2 and 3 N., Rs. 2 and 3 W., I marked

T. 3 N., S. 31 on N. E.,
R. 2 W., S. 6 on S. E.,

T. 2 N., S. 1 on S. W., and
R. 3 W., S. 36 on N. W. sides; with 6 notches facing each cardinal point; dug pits, 24 x18 x 12 ins., on each line, N., S., E., and W. of cor., 5 ft. dist.; and raised a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for cor. of (e. g.) Tps. 2 and 3 N., Rs. 2 and 3 W., I marked
T. 3 N., S. 31 on N. E.,
R. 2 W., S. 6 on S. E.,
T. 2 N., S. 1 on S. W., and
R. 3 W., S. 36 on N. W. sides; with 6 notches facing each cardinal point; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T. 3 N., R. 2 W., S. 31, B. T.
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked
T. 2 N., R. 2 W., S. 6, B. T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T. 2 N., R. 3 W., S. 1, B. T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T. 3 N., R. 3 W., S. 36, B. T.

CORNERS COMMON TO TWO TOWNSHIPS ONLY.

[See Plates V and IX.]

When more than one-half of all the corners of a township are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described are established, will be modified as follows:
After "marked", insert the words:
"2 N. on S. W., and
7 W. on N. W. faces."

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When, under the conditions above specified, the corner described in paragraph 1 is established, a stake may be driven in the south pit and marked instead of the stone, and described as exemplified in the last clause of paragraph 6, below.

1. *Stone, with Pits and Mounds of Earth.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for cor. of (e. g.) Tps. 2 and 3 N., R. 7 W., on W. bdy. Tp. 3 N., R. 6 W., marked with 6 notches on N., and W. edges; dug pits 30 x 24 x 12 ins., on each line, N. and S., 4 ft., and W. of stone, 8 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, W. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for cor. of (e. g.) Tps. 2 and 3 N., R. 7 W., on W. bdy. Tp. 3 N., R. 6 W., marked with 6 notches on N., and W. edges; and raised a mound of stone, 2 ft. base, 1½ ft. high, W. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for cor. of (e. g.) Tps. 2 and 3 N., Rs. 5 and 6 W., on N. bdy. Tp. 2 N., R. 6 W., marked with 6 notches on N. and W. edges; from which
A _____, ins. diam., bears N. _____° E., _____ lks. dist., marked
T. 2 N., R. 5. W., S. 6, B. T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T. 3 N., R. 6 W., S. 36, B. T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for cor. of (e. g.) Tps. 2 and 3 N., Rs. 5 and 6W., on N. bdy. Tp. 2 N., R. 6 W., marked
T. 2 N., R. 5 W., S. 6 on N. E., and
T. 3 N., R. 6 W., S. 36 on N. W. faces; with 6 notches on N. and W. edges; dug pits, 30 x 24 x 12 ins., on each line, E. and W., 4 ft., and N. of post, 8 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, N. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for cor. of (e. g.) Tps. 2 and 3 N., R. 7 W., on W. bdy. Tp. 3 N., R. 6 W., marked
T. 2 N., R. 7 W., S. 1 on S. W., and
T. 3 N., R. 7 W., S. 36 on N. W. faces; with 6 notches on N. and W. edges; from which
A _____, _____ ins. diam., bears S. _____° W., lks. dist., marked
T. 2 N., R. 7 W., S. 1, B. T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T. 3 N., R. 7 W., S. 36, B. T.

6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposited a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for cor. of (e. g.) Tps. 2 and 3 N., R. 7 W., on W. bdy. Tp. 3 N., R. 6 W.; dug pits, 30 x 24 x 12 ins., on each line, N., E., and W. of cor., 5 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, over deposit.
In S. pit drove a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
T. 2 N., R. 7 W., S. 1 on S. W., and
T. 2 N., R. 7 W., S. 36 on N. W. faces; with 6 notches on N. and W. edges.

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7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for cor. of (e. g.) Tps. 2 and 3 N., Rs. 5 and 6 W., on N. bdy. Tp. 2 N., R. 6 W., I marked
T. 2 N., R. 5 W. on N. E., and
T. 3 N., R. 6 W. on N. W. sides; with 6 notches facing N. and W.; dug pits 24 x 18 x 12 ins., crosswise on each line, N., E., and W. of cor., 5 ft. dist.; and raised a mound of earth, around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for cor. of (e. g.) Tps. 2 and 3 N., R. 7 W., on W. bdy. Tp. 3 N., R. 6 W., I marked
T. 2 N., R. 7 W., S. 1 on S. W., and
T. 3 N., R. 7 W., S. 36 on N. W., sides; with 6 notches facing N. and W.; from which
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T. 2 N., R. 7 W., S. 1, B. T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T. 3 N., R. 7 W., S. 36, B. T.

CORNERS REFERRING TO ONE TOWNSHIP ONLY.

[See Plates V and IX.]

When more than one-half of all corners of a township are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described are established, will be modified, as follows: After "marked", insert the words:
"2 N., 6 W. on S. W. face."
When, under the conditions above specified, the corner described in paragraph 1 is established, a stake may be driven in the south pit, and marked instead of the stone, and described as exemplified in the last clause of paragraph 6, page 32.

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for N. E. cor. of (e. g.) Tp. 2 N., R. 6 W., marked with 6 notches on S. and W. edges; dug pits, 36 x 36 x 12 ins., on each line, S. and W. of stone, 8 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, S. W. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for N. E. cor. of (e. g.) Tp. 2 N., R. 6 W., marked with 6 notches on S. and W. edges; and raised a mound of stone, 2 ft. base, 1½ ft. high, S. W. of cor. Pits impracticable.

3. *Stone, with Bearing Tree.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground for N. E. cor. of (e. g.) Tp. 2 N., R. 6 W., marked with 6 notches on S. and W. edges; from which

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T. 2 N., R. 6 W., S. 1, B. T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for N. E. cor. of (e. g.) Tp. 2 N., R. 6 W., marked
T. 2 N., R. 5 W., S. 6 on N. E.,
S. 6 on S. E.,

T. 2 N., R. 6 W., S. 1 on S. W., and
S. 6 on N. W. faces; with 6 notches on S. and W. edges; dug pits, 36 x 36 x 12 ins., on each line, S. and W. of post, 8 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, S. W. of cor.

5. *Post, with Bearing Tree.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for S. W. cor. of (e. g.) Tp. 3 N., R. 6 W., marked
T. 3 N., R. 6 W., S. 31 on N. E.,
S. 1 on S. E.,
T. 2 N., R. 7 W., S. 1 on S. W., and
S. 1 on N. W., faces; with 6 notches on N. and E. edges; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T. 3 N., R. 6 W., S. 31, B. T.

6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposited a marked st one (charred stake or quart of charcoal), 12 ins. in the ground, for S. W. cor. of (e. g.) T. 3 N., R. 6 W.; dug pits, 36 x 36 x 12 ins., on each line, N. and E. of cor., 5 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, over deposit.
In E. pit drove a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
T. 3 N., R. 6 W., S. 31 on N. E.,
S. 1 on S. E.,
T. 2 N., R. 7 W., S. 1 on S. W., and
S. 1 on N. W. faces; with 6 notches on N. and E. edges.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for S. W. cor. of (e. g.) Tp. 3 N., R. 6 W., I marked
T. 2 N., R. 6 W., S. 31 on N. E.,
S. 1 on S. E.,
T. 2 N., R. 7 W., S 1 on S. W., and
S. 1 on N. W. sides; with 6 notches facing N. and E.; dug pits, 30 x 24 x 12 ins., crosswise on each line, N. and E. of cor., 5 ft. dist.; and raised a mound of earth, around tree.

8. *Tree Corner, with Bearing Tree.*

A _____, _____ ins. diam., for S. E. cor. of (e. g.) Tp. 4 N., R. 6 W., I marked
S. 6 on N. E.,
T. 3 N., R. 5 W. S. 6 on S. E.,
S. 6 on S. W., and
T. 4 N., R. 6 W., S. 36 on N. W. sides; with 6 notches facing N. and W.; from which
A _____, _____ ins. diam., bears N. _____° W., lks. dist., marked
T. 2 N., R. 6 W., S. 36, B. T.

STANDARD SECTION CORNERS.

[See Plates III and V.]

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ x _____ x _____ ins. in the ground, for standard cor. of (e. g.) secs. 31 and 32, marked S. C., on N.; with 5 grooves on E., and 1 groove on W. faces; dug pits, 24 x 18 x 12 ins., crosswise on

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each line, E. and W., 3 ft., and N. of stone, 7 ft. dist.; and raised a mound of earth, 4 ft. base, 2 ft. high, N. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for stand. cor. of (e. g.) secs. 35 and 36, marked S. C., on N.; with 1 groove on, E., and 5 grooves on W. faces; and raised a mound of stone, 2 ft. base, 1½ ft. high, N. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for standard cor. of (e. g.) secs. 33 and 34, marked S. C., on N.; with 3 grooves on E. and W. faces; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

T. 13 N., R. 21 E., S. 34, B. T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T. 13 N., R. 21 E., S. 33, B. T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for standard cor. of (e. g.) secs. 32 and 33, marked

S. C., T. 13 N., R. 21 E. on N.,
S. 33 on E., and
S. 32 on W. faces; with 4 grooves on E., and 2 grooves on W. faces; dug pits, 24 x 18 x 12 ins., crosswise on each line, E. and W., 3 ft., and N. of post, 7 ft. dist.; and raised a mound of earth, 4 ft. base, 2 ft. high, N. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for standard cor. of (e. g.) secs. 34 and 35, marked

S. C., T. 13 N., R. 21 on N.,
S. 35 on E., and
S. 34 on W. faces; with two grooves on E., and 4 grooves on W. faces; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

T. 13 N., R. 21 E., S. 35, B. T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T. 13 N., R. 21 E., S. 34, B. T.

6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposited a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for standard cor. of (e. g.) secs. 33 and 34; dug pits, 24 x 18 x 12 ins., crosswise on each line, N., E., and W. of cor., 5 ft. dist.; and raised a mound of earth, 4 ft. base, 2 ft. high, over deposit.

In E. pit drove a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked

S. C., T. 13 N., R. 22 E. on N.,
S. 34 on E., and
S. 33 on W. faces; with 3 grooves on E. and W. faces.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for standard cor. of (e. g.) secs. 31 and 32, I marked

S. C., T. 13 N., R. 22 E. on N.,
S. 32 on E., and
S. 31 on W. sides; with 5 notches on E., and 1 notch on W. sides;

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dug pits, 18 x 18 x 12 ins., N., E., and W. of Cor., 4 ft. dist.; and raised a mound of earth, around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for standard cor. of (e. g.) secs. 35 and 36, I marked

S. C., T. 13 N., R. 22 E. on N.,
S. 36 on E., and
S. 35 on W. sides; with 1 notch on E., and 5 notches on W. sides; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

T. 13 N., R. 22 E., S. 36, B. T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T. 13 N., R. 22 E., S. 35, B. T.

CLOSING SECTION CORNERS.

[See Plates V and VI.]

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for closing cor. of (e. g.) secs. 1 and 2, marked C. C., on S.; with 1 groove on E., and 5 grooves on W. faces; dug pits, 24 x 18 x 12 ins. crosswise on each line, E. and W., 3 ft., and S. of stone, 7 ft. dist.; and raised a mound of earth, 4 ft. base, 2 ft. high, S. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for closing cor. of (e. g.) secs. 3 and 4, marked C. C., on S.; with 3 grooves on E. and W. faces; and raised a mound of stone, 2 ft. base, 1½ ft. high, S. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ x _____ x _____ ins. _____ ins. in the ground, for closing cor. of (e. g.) secs. 1 and 2, marked C. C., on S.; with 1 groove on E., and 5 grooves on and W. faces; from which

A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

T. 4 N., R. 3 W., S. 1, B. T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T. 4 N., R. 3 W., S. 2, B. T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for closing cor. of (e. g.) secs. 1 and 2, marked

C. C., T. 4 N., R. 3 W. on S.,

S. 1 on E., and

S. 2 on W. faces; with 1 groove on E., and 5 grooves on W. faces; dug pits, 24 x 18 x 12 ins., crosswise on each line, E. and W., 3 ft., and S. of post, 7 ft. dist.; and raised a mound of earth, 4 ft. base, 2 ft. high, S. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for closing cor. of (e. g.) secs. 1 and 2, marked

C. C., T. 4 N., R. 3 W. on S.,

S. 1 on E., and

S. 2 on W. faces; with 1 groove on E., and 5 grooves on W. faces; from which

A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

T. 4 N., R. 3 W., S. 1, B. T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T. 4 N., R. 3 W., S. 2, B. T.

6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposited a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for closing cor. of (e. g.) secs. 3 and 4; dug pits, 24 x 18 x 12 ins., crosswise on each line, S., E., and W. of cor., 4 ft. dist.; and raised a mound of earth, 4 ft. base, 2 ft. high, over deposit.

In E. pit drove a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked

C. C., T. 4 N., R. 3 W. on S.,

S. 3. on E., and

S. 4. on W. faces; with 3 grooves on E. and W. faces.

7. *Tree Corner, with Pits and Mound of Earth*

A _____, _____ ins. diam., for closing cor. of (e. g.) secs. 1 and 2, I marked

C. C., T. 4 N., R. 3 W. on S.,

S. 1 on E., and S. 2 on W. sides; with 1 notch on E., and 5 notches on W. sides; dug pits, 18 x 18 x 12 ins., S., E., and W. of cor., 5 ft. dist.; and raised a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for closing cor. (e. g.) secs. 1 and 2, I marked

C. C., T. 4 N., R. 3 W. on S.,

S. 1 on E., and

S. 2 on W. sides; with 1 notch on E., and 5 notches on W. sides; from which

A _____, _____ ins., diam., bears S. _____° E., _____ lks. dist., marked

T. 4 N., R. 3 W., S. 1, B. T.

A _____, _____ ins. diam., bears S._____° W., _____lks. dist., marked

T. 4 N., R. 3 W., S. 2, B. T.

9. All closing section corners, or base lines or standard parallels, will be connected by course and distant with the *nearest* standard corner thereon. (See paragraphs 5 and 9, page 55.)

CORNERS COMMON TO FOUR SECTIONS.

[See Plates V and IX.]

When more than one-half of all the corners in a township are stone corners, the descriptions in paragraphs 1 and corners therein described are established for cor. of secs. 15, 16, 21 and 22, will be modified as follows: after "marked," insert the words

"4 N. on N.E., and

3 W. on S.E. face."

When, under the conditions above specified, the corner described in paragraph 1 is established a stake may be driven in the southeast pit, and marked instead of the stone, and described as exemplified in the last clause of paragraph 6, page 37.

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for cor. of (e. g.) secs. 14, 15, 22, and 23 [Tp. 4 N., R. 3 W.][9], marked with 3 notches on S.

and E. edges; dug pits, 18 x 18 x 12 ins., in each sec. 5½ ft. dist.; and raised a mound of earth, 4 ft. base, 2 ft. high, W. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for cor. of (e. g.) secs. 14, 15, 22, and 23 [Tp. 4 N., R. 3 W.][9], marked with 3 notches on S. and E. edges; and raised a mound of stone, 2 ft. base, 1½ ft. high, W. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

9. When writing these descriptions in the field notes, the angular brackets and the enclosed letters and figures will be omitted.

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for cor. of (e. g.) secs. 9, 10, 15, and 16, marked with 4 notches on S., and 3 notches on E. edges; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

T. 2 N., R. 2 W., S. 10, B. T.

A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

T. 2 N., R. 2 W., S. 15, B. T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T. 2 N., R. 2 W., S. 16, B. T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T. 2 N.,R. 2 W., S. 9, B. T.

4. *Post, with Pit and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for cor. of (e. g.) secs. 15, 16, 21, and 22, marked

T. 2 N., S. 15 on N. E.,
R. 2 W., S. 22 on S. E.,
S. 21 on S. W., and
S. 16 on N. W. faces with 3 notches on S. and E. edges; dug pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raised a mound of earth, 4 ft. base, 2 ft. high, W. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground for cor. of (e. g.) secs. 25, 26, 35 and 36, marked

T. 2 N., S. 25 on N. E.,
R. 2 W., S. 36 on S. E.,
S. 35 on S. W., and
S. 26 on N. W. faces; with 1 notch on S. and E. edges; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

T. 2 N., R. 2 W., S. 25, B. T.

A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

T. 2 N., R. 2 W., S. 36, B. T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T. 2 N., R. 2 W., S. 35, B. T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T. 2 N., R. 2 W., S. 26, B. T.

6. *Mound, with Deposit, and Stake in Pit.*

Deposited a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for cor. of (e. g.) secs. 25, 26, 35 and 36; dug pits, 18 x 18 x 12 ins., in each sec., 4 ft. dist.; and raised a mound of earth, 4 ft. base, 2 ft. high, over deposit.

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In S. E. pit drove a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked

T. 2 N., S. 25 on N. E.,
R. 2 W., S. 36 on S. E.,
S. 35 on S. W., and
S. 26 on N. W. faces; with 1 notch on S. and E. edges.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for cor. of (e. g.) secs. 29, 30, 31, and 32, I marked

T. 2 N., S. 29 on N. E.,
R. 2 W., S. 32 on S. E.,
S. 31 on S. W., and
S. 30 on N. W. sides; with 1 notch on S., and 5 notches on E. sides; dug pits, 18 x 18 x 12 ins., in each sec., 5 ft. dist.; and raised a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for cor. of (e. g.) secs. 5, 6, 7, and 8, I marked

T. 2 N., S. 5 on N. E.,
R. 2 W., S. 8 on S. E.,
S. 7 on S. W., and S. 6 on N. W. sides; with 5 notches on S. and E. sides; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

T. 2 N., R. 2 W., S. 5, B. T.

A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

T. 2 N., R. 2 W., S. 8, B. T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T. 2 N., R. 2 W., S. 7, B. T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T. 2 N., R. 2 W., S. 6, B. T.

SECTION CORNERS COMMON TO TWO SECTIONS ONLY.

[See Plates V and VI.]

When more than one-half of all the corners in a township are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described are established near cor. of secs. 15, 16, 21, and 22, will be modified, as follows:

After "marked", insert the words
"3 N. on S. W., and
7 W. on N. W. faces;".

When, under the conditions above specified, the corner described in paragraph 1 is established, a stake may be driven in the southwest pit, and marked instead of the stone, and described as exemplified in the last clause of paragraph 6, page 38.

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for cor. of (e. g.)[10] secs. 25 and 36 [Tp. 3 N., R. 7 W.],[11] marked with 5 notches on N., and 1 notch on S. edges; dug pits, 24 x 24 x 12 ins. in each sec., 6 ft. dist.; and raised a mound of earth, 4 ft. base, 2 ft. high, W. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for cor. of (e.g.)[12] secs. 15 and 22 [Tp. 3 N., R. 7 W.],[11] marked with 3 notches on N., and S. edges; and raised a mound of stone, 2 ft. base, 1½ ft. high, W. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for cor. of (e.g.)[13] secs. 28 and 29, marked with 4 notches on E. edge; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

T. 3 N., R. 7 W., S. 28, B. T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T. 3 N., R. 7 W., S. 29, B. T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for cor. of (e. g.) 33 and 34,[14] marked

T. 2 N., S. 34 on N. E., and

R. 6 W., S. 33 on N. W. faces; with three notches on E. and W. edges; dug pits, 24 x 24 x 12 ins., in each sec., 6 ft. dist, and raised a mound of earth, 4 ft. base, 2 ft. high, N. of cor.

5. *Post, with Bearing Trees:*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for cor. of (e. g.) secs. 24 and 25,[15] marked

T. 3 N., S. 25 on S. W., and

R. 5 W., S. 24 on N. W. faces; with 4 notches on N., and 2 notches on S. edges; from which

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T. 3 N., R. 5 W., S. 25, B. T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T. 3 N., R. 5 W., S. 24, B. T.

6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposited a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for cor. of (e. g.) secs. 13 and 24;[16] dug pits 24 x 24 x 12 ins., in each sec., 4 ft. dist.; and raised a mound of earth, 4 ft. base, 2 ft. high, over deposit.

In S. W. pit drove a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked

T. 2 N., S. 24 on S. W., and

R. 6 W., S. 13 on N. W. faces, with 3 notches on N. and S. edges.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for cor. of (e. g.) secs. 24 and 25,[17] I marked

T. 3 N., S. 25 on S. W. and

R. 6 W., S. 24 on N. W. sides; with 4 notches on N. and S. sides; dug pits, 18 x 18 x 12 ins., in each sec., 5 ft. dist.; and raised a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for cor. of (e. g.) secs. 22 and 27,[18] I marked

T. 3 N., S. 27 on S. W., and

R. 7 W., S. 22 on N. W. sides; with 4 notches on N., and 2 notches on S. sides; from which

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T. 3 N., R. 7 W., S. 27, B. T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T. 3 N., R. 7 W., S. 22, B. T.

SECTION CORNERS REFERRING TO ONE SECTION ONLY.

[See Plates V and IX.]

When more than one-half of all corners in a township are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described, are established near the place for cor. of secs. 15, 16, 21, and 22, will be modified, as follows: After "marked", insert the words:
"2 N., 5 W. on N. E. face;"

When, under the conditions above specified, the corner described in paragraph 1 is established, a stake may be driven in the pit, and marked instead of the stone, and described as exemplified in the last clause of paragraph 6, page 40.

1. *Stone, with Pit and Mound of Earth.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for S. W. cor. of (e. g.) sec. 12 [Tp. 2 N., R. 5 W.],[18] marked with 1 notch on E. edge; dug a pit, 36 x 36 x 12 ins., in the sec., 8 ft. dist.; and raised a mound of earth, 4 ft. base, 2 ft. high, N. E. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for S. W. cor. of (e. g.) sec. 12 [Tp. 2

10. The corner established on the range line and described in paragraph 1, will have notches to indicate the distances to the N. E. and S. E. corners of the township. See plate V, fig. 18; and Plate IX, Tp. 3 N., R. 7 W.

11. When writing descriptions of corners similar to those described in paragraphs 1 and 2, the angular brackets and the inclosed letters and figures, will be omitted.

12. The corner established on a sectional guide meridian and described in paragraph 2, will have notches like the corresponding corner on a range line. See Plate IX, Tp. 3 N., R. 7 W.

13. See Plate IX, N. bdy., sec. 32, Tp. 3 N., R. 7 W.

14. See Plate IX, Tp. 2 N., R. 6 W.

15. Tp. 3 N., R. 5 W.

16. Tp. 2 N., R. 6 W.

17. On range line; see Plate IX; Tp. 3 N., R. 6 W.

18. On sectional guide meridian; see Plate IX, Tp. 3 N., R. 7 W.

N., R. 5 W.],[19] marked with 1 notch on E. edge; and raised a mound of stone, 2 ft. base, 1½ ft. high, N. E. of cor.

3. *Stone, with Bearing Tree.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for S. W. cor. of (e. g.) sec. 12, marked with 1 notch on E. edge; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T. 2 N., R. 5 W., S. 12, B. T.

4. *Post, with Pit and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for N. W. cor. of (e. g.) sec. 10;[20] marked
T. 3 N., S. 9 on N. E.
R. 5 W., S. 10 on S. E.
S. 9 on S. W., and
S. 9 on N. W. faces; with 5 notches on S. and 3 notches on E. edges; dug a pit, 36 x 36 x 12 ins., in the sec., 8 ft. dist.; and raised a mound of earth, 4 ft. base, 2 ft. high, S. E. of cor.

5. *Post, with Bearing Tree.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for S. W. cor. of (e. g.) sec. 12;[21] marked
T. 2 N., S. 12 on N. E.,
R. 5 W., S. 13 on S. E.,
S. 13 on S. W., and
S. 13 on N. W. faces; with 1 notch on E. edge; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T. 2 N., R. 5 W., S. 12, B. T.

6. *Mound of Earth, with Deposit and Stake in pit.*

Deposited a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for N. W. cor. of (e. g.) sec. 10;[15] dug a pit, 36 x 36 x 12 ins. in the sec., 5 ft. dist.; and raised a mound of earth, 4 ft. base, 2 ft. high, over deposit.
In the pit drove a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
T. 3 N., S. 9 on N. E.,
R. 5 W., S. 10 on S. E.,
S. 9 on S. W., and
S. 9 on N. W. faces; with 5 notches on S., and 3 notches on E. edges.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for S. W. cor. of (e. g.) sec. 12,[21] I marked
T. 2 N., S. 12 on N. E.,
R. 5 W., S. 13 on S. E.,
S. 13 on S. W., and
S. 13 on N. W. sides, with 1 notch on E. side; dug a pit, 24 x 24 x 12 ins., in the sec., 5 ft. dist.; and raised a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for N. W. cor. of (e. g.) sec. 10, I marked
T. 3 N., S. 9 on N. E.,
R. 5 W., S, 10 on S. E.,
S. 9 on S. W., and
S. 9 on N. W., sides; with 5 notches on S., and 3 notches on E. sides; from which
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked
T. 3 N., R. 5 W., S. 10, B. T.

QUARTER SECTION CORNERS.

[See Plates V and VI.]

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for ¼ sec. cor. [(e. g.) bet. secs. 14 and 23],[22] marked ¼, on N. face; dug pits, 18 x 18 x 12 ins., E. and W. of stone, 3 ft. dist.; and raised a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for ¼ sec. cor. [(e. g.) bet. secs. 14 and 15],[22] marked ¼ on W. face; and raised a mound of stone, 2 ft. base, 1½ ft. high, W. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for ½ sec. cor. [(e. g.) bet. secs. 16 and 17],[22] marked ½, on W. face; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
¼ S., B. T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
¼ S., B. T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 3 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for ¼ sec. cor. [(e. g.) bet. secs. 4 and 9],[22] marked ¼ S., on N. face; dug pits 18 x 18 x 12 ins., E. and W. of post, 3 ft. dist.; and raised a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.

5. *Post, with Bearing Trees.*

15. Tp. 3 N., R. 5 W.

19. When writing descriptions of corners similar to those described in paragraphs 1 and 2, the angular brackets and the included letters and figures will be omitted. See Plate IX.

20. See Plate IX; Tp. 3 N., R. 5 W.

21. See Plate IX; Tp. 2 N., R. 5 W.

22. When writing descriptions of ¼ section corners, the angular brackets and the letters and figures they inclose, will be omitted. See paragraphs 9, 10, and 11, pages 41, 42.

Set a _____ post, 3 ft. long, 3 ins. sq., 24 ins. in the ground, for ¼ sec. cor. [(e. g.) bet. secs. 21 and 22],[22] marked ¼ S., on W. face; from which

A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

¼ S., B. T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

¼ S., B. T.

6. *Mound, with Deposit and Stake in Pit.*

Deposited a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for ¼ sec. cor. [(e. g.) bet. secs. 21 and 28];[22] dug pits, 18 x 18 x 12 ins., E. and W. of cor., 4 ft. dist.; and raised a mound of earth, 3½ ft. base, 1½ ft. high, over deposit.

In E. pit drove a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked

¼ S. on N. face.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for ¼ sec. cor. [(e. g.) bet. secs. 7 and 8],[22] I marked ¼ S., on W. side; dug pits, 18 x 18 x 12 ins., N. and S. of cor., 4 ft. dist.; and raised a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for ¼ sec. cor. [(e. g.) bet. secs. 20 and 29],[22] I marked ¼ S., on N. side; from which

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

¼ S., B. T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

¼ S., B. T.

9. *Pits and Mounds of Quarter Section Corners.*

On *meridional* lines, the pits will be dug N. and S., and the mound will be placed on the *west* side of the corner; on *latitudinal* lines, the pits will be located E. and W., and the mound will be built on the *north* side of the corner. See Plate VI.

10. *Markings on Quarter Section Corners.*

On *meridional* lines, the markings will be placed on the *west* side and on *latitudinal* lines, on the *north* side of the stone, post, or other corner.

11. *Stakes in Pits of Quarter Section Corners.*

On *meridional* lines the stakes will be driven in the S. pit, and on *latitudinal* lines, in the E. pit.

STANDARD QUARTER SECTION CORNERS.

[See Plate V and VI.]

All standard quarter section corners, on base lines or standard parallels, will have the letters S. C. (for standard corner), precede the marking "¼" or "¼ S.", as the case may be; such corners will be established in all other respects like other quarter section corners.

When bearing trees are described for standard quarter section corners, each tree will be marked, S. C., ¼ S., B. T.

QUARTER SECTION CORNERS COMMON TO TWO QUARTERS OF ONE SECTION.

These corners will be similar in all respects to those that are common to four quarters of two sections. See notes on Plates VII and VIII.

MEANDER CORNERS.

[See Plates V and VI.]

1. *Stone, with Pit and Mound of Earth.*

Set a _____ stone, _____ x _____ x _____ ins. _____ ins. in the ground for meander cor. of (e. g.) fracl. secs. 26 and 35,[23] marked

M. C. on E. face; with 1 groove on S. face; dug a pit,[23] 36 x 36 x 12 ins., 8 ft. W. of stone; and raised a mound of earth, 4 ft. base, 2 ft. high, W. of cor.[23]

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ x _____ x _____ ins., _____ ins. in the ground, for meander cor. of (e. g.) fracl. secs. 17 and 18,[24] marked

M. C. on S. face; with 5 grooves on E. face; and raised a mound of stone, 2 ft. base, 1½ ft. high, N. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone _____ x _____ x _____ ins., _____ ins. in the ground, for meander cor. of (e. g.) fracl. secs. 26 and 35, with 1 groove on S. face;[24] marked:

M. C. on W. face; from which

A _____, _____ ins., diam., bears N. _____° E., _____ lks. dist., marked

T. 15 N., R. 20 E., S. 26, M. C. B. T.

A _____, _____ ins., diam., bears S. _____° C. _____ lks., dist., marked

T. 15 M., R. 20 E., S. 35, M. C. B. T.

4. *Post, with Pit and Mound of Earth.*

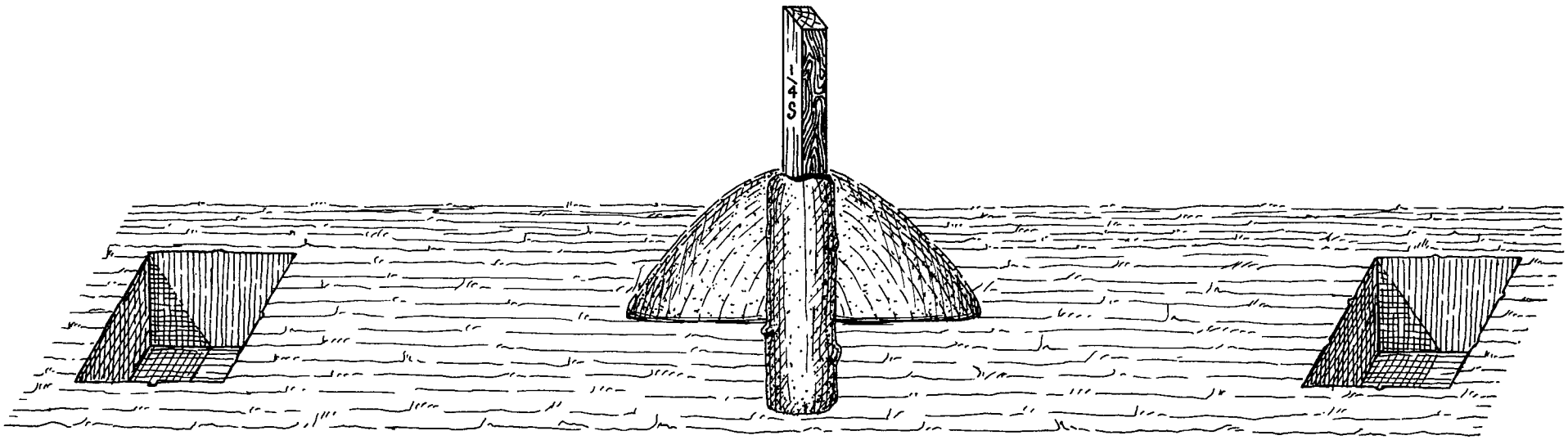
Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for meander cor. of (e. g.) fracl. secs. 19 and 20,[24] marked

M. C. on N.,

22. When writing descriptions of ¼ section corners, the angular brackets and the letters and figures they inclose, will be omitted. See paragraphs 9, 10, and 11, pages 41, 42.

23. See page 56, and paragraphs 9 and 10, pages 43, 44.

24. See Plate IV, and pages 192, 209 and 210.



Quarter Section Corner Post with mound of earth

T. 15 N. on S.,
R. 20 E., S. 20 on E., and
S. 19 on W. faces; dug a pit, 36 x 36 x 12 ins., 8 ft. S. of post; and raised a mound of earth, 4 ft. base, 2 ft. high, S. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for meander cor. of (e. g.) fracl. secs. 25 and 26,[25] marked
M. C. on N.,
T. 15 N. on S.,
R. 20 E., S. 25 on E., and
S. 26 on W. faces; from which
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked
T. 15 N., R. 20 E., S. 25, M. C. B. T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T. 15 N., R. 20 E., S. 26, M. C. B. T.

6. *Mound with Deposit, and Stake in Pit.*

Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for meander cor. of (e. g.) fracl. secs. 25 and 26;[25] dug a pit, 36 x 36 x 12 ins., 5 ft. N. of cor.; and raised a mound of earth, 4 ft. base, 2 ft. high, over deposit.
In the pit drove a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
M. C. on S.,
T. 15 N. on N.,
R. 20 E., S. 26 on W., and
S. 25 on E. faces.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for meander cor. of (e. g.) fracl. secs. 17 and 20,[25] I marked
M. C. on W.,
T. 15 N. on E.,
R. 20 E., S. 17 on N., and
S. 20 on S. sides dug a pit, 36 x 36 x 12 ins., 8 ft. E. of tree; and raised a mound of earth, 4 ft. base, 2 ft. high, E. of cor.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for a special meander cor. of (e. g.) fracl. E. and W. halves of sec. 33,[26] I marked
S. M. C. on N.,
T. 15 N. on S.,
R. 20 E., S. 33 on E., and
S. 33 on W. sides; from which
A _____, _____ ins. diam., bears S. _____° E. _____ lks. dist., marked
T. 15 N., R. 20 E., S. 33, S. M. C. B. T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T. 15 N., R. 20 E., S. 33, S. M. C. B. T.

9. *Pits and Mounds of Meander Corners.*

When a pit is dug as an accessory to a meander corner, it will be located 8 feet from such corner (except as otherwise provided for in paragraph 6), on the side opposite the stream or lake meandered;

while the mound will be placed midway between the corner and nearest side of the pit.

10. *Markings on Meander Corners.*

On all meander corners, the letters "M. C." (for meander corner) will be cut into the side facing the stream or lake to be meandered. On post or tree meander corners, *within township exteriors,* additional marks will be placed, as follows: the *township* number will be marked on the side opposite "M. C."; the proper *range* and *section* number will be placed on the *right-hand side* (when looking along line toward the stream or lake), and the appropriate *section* number on the opposite side.
All meander corners on base lines or standard parallels will be marked S. C. on the *north* side or face.
On principal or guide meridians, and on *meridional* township lines, the letters "M. C." will be placed as above directed; the *township* number will be marked on the opposite side; while the proper *range* and *section* numbers will be marked on the sides facing the east and west cardinal points.
On base lines or standard parallels and on *latitudinal* township lines, the *township* numbers will be marked on the sides facing the north and south cardinal points; while the *range* and *section* numbers will be placed on the side opposite the marking "M. C."
In all the markings provided for in this paragraph, the *numbers* indicating townships, ranges, and sections, will be preceded by the initial letters "T." "R." and "S.", respectively.

11. *Descriptions will be modified in certain cases.*

When a tree is marked for a *regular* meander corner, the descriptions in paragraphs 8 will be modified, as follows: strike out *"special"*; in place of "E. and W. halves of sec. 33," write "secs. _____ and _____,"; and omit the letter "S.", preceding "M. C.", in the marking on corner and bearing trees.
The descriptions in paragraphs 1 to 7, inclusive, will be modified to describe *special* meander corners, as illustrated in paragraph 8, by writing "special" before meander cor. and "S." before "M. C.," when conditions require the change.

12. *Special Meander Corners and Auxiliary Meander Corners.*

Regular meander corners are those established on standard, township, or section lines. See Plate V, for plans of meander corners, and the specimen plat, Plate IV, sections 17, 18, 19, 20, 25, 26, and 35, for locations of the meander corners described in Specimen Field Notes, pages 208 to 210.
The meander corners, on lines of legal subdivisions, other

25. See Plate IV and page 188.

26. See Plate IV, and page 201. See paragraphs 11 and 12, page 44, and footnote, page 57.

than standard, township, or section lines, will be designated *special meander corners,* (e. g.) those located on the Specimen Plat, Plate IV, in section 33.

Meander corners, *not* on a line belonging to the system of rectangular surveying, will be called *auxiliary meander corners,* (e. g.) the meander corner on Diamond Rock, in section 18.

13. *Meander Corners on unsafe ground will be witnessed.*

When a Meander Corner falls at a point where prevailing conditions would insure its destruction by natural causes, a *witness corner* to such meander corner will be established, as provided for in the article "Witness Corners", page 47.

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CORNERS ON RESERVATION OR OTHER BOUNDARIES NOT CONFORMING TO THE SYSTEM OF RECTANGULAR SURVEYING.

[See Plate VI.]

1. *Stone, with Mound of Earth.*

Set a _____ stone, _____ x _____ x _____ ins.,[27] _____ ins. in the ground, for the (e. g.) 17 mile cor., marked
17 M. on S.,
N. P. on E., and
P. L. on W. faces; dug pits, 36 x 36 x 12 ins., E. and W. of stone, 4 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, S. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ x _____ x _____ ins.,[27] _____ ins. in the ground, for the (e. g.) 38 mile cor., marked
38 M. on N. E.,
N. P. on N. W., and
P. L. on S. E. faces; and raised a mound of stone, 3 ft. base, 2 ft. high,[28] N. E. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ x _____ x _____ ins.,[27] _____ ins. in the ground, for the (e. g.) 35 mile cor., marked
35 M. on E.,
N. P. on N., and
8 W on S. faces; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
N. P. I. R., 35 M. B. T.
A _____, _____ ins. diam., bears S. _____° E.,[29] _____ lks. dist., marked
T. 6 N., R. 8 W., S. 9, 35 M. B. T.
A _____, _____ ins. diam., bears S. _____° W.,[29] _____ lks. dist., marked
T. 6 N., R. 8 W., S. 8, 35 M. B. T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
N. P. I. R., 35 M. B. T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 5 ins. sq.,[30] with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for the (e. g.) 17 mile cor., marked
17 M. on S.,
N. P. I. R. on E., and
P. L. on W. faces; dug pits, 36 x 36 x 12 ins., E. and W. of post, 4 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, S. of cor.

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5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 5 ins. sq.,[30] 24 ins. in the ground, for the (e. g.) 35 mile cor., marked
35 M. on E.,
N. P. I. R. on N., and
T. 6 N., R. 8 W., S. 9, on S.; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
N. P. I. R., 35 M. B. T.
A _____, _____ ins. diam., bears S. _____° E.,[29] _____ lks. dist., marked
T. 6 N., R. 8 W., S. 9, 35 M. B. T.
A _____, _____ ins. diam., bears S. _____° W.,[29] _____ lks. dist., marked
T. 6 N., R. 8 W., S. 8, 35 M. B. T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
N. P. I. R., 35 M. B. T.

6. *Mound, with Deposit and Stake in Pit.*

Deposited a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for the (e. g.) 33 mile cor.; dug pits, 36 x 36 x 12 ins., N. E. and S. W. of cor., 5 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, over deposit.

In N. E. pit drove a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
33 M. on S. E.,
N. P. I. R. on N. E., and
T. 6 N., R. 8 W., S. 15 on S. W. faces.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for the (e. g.) 29 mile cor., I mark
29 M. on E.,
N. P. I. R. on N., and
T. 5 N., R. 7 W., S. 8 on S. sides; dug pits, 36 x 36 x 12 ins., N.

27. Stones for corners on Indian Reservation or other boundaries will not be less than 20 ins. long, or less than 6 ins. thick, and will measure at least one cubic foot in volume; consequently, a stone 20 x 14½ x 6 ins., will be about minimum size, and 3 x 9 x 6 ins., represents satisfactory proportions. "N. P." for "Nez Perces" (Indian Reservation), on the east, and "P. L." for "Public Land" (unsurveyed), on the west, applies to paragraph 1 only.

28. The above are minimum dimensions for mounds of stone on reservation boundaries.

29. The bearing trees, "S. _____° E." and "S. _____° W." from the corner, are supposed to stand on surveyed land, near the line between sections 8 and 9.

30. The stated dimensions of posts are minimum; if posts are longer than 3 feet, the extra length will be placed in the ground; the posts will in no case project more than 12 ins. above the natural surface of the earth.

and S. of tree, 5 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, E. of cor.

8. *Tree Corner, with Bearing Trees.*[29]

A _____, _____ ins. diam., for the (e. g.) 35 mile cor., I mark
35 M. on E.,
N. P. I. R. on N., and
T. 6 N., R. 8 W., S. 9 on S. sides; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
N. P. I. R., 35 M., B. T.
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked
T. 6 N., R. 8 W., S. 9, 35 M., B. T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T. 6 N., R. 8 W., S. 8, 35 M., B. T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
N. P. I. R., 35 M., B. T.

9. *Corner Monument of Stone, with Deposit.*

Deposited a marked stone (charred stake, quart of charcoal, or vial with record[31] inclosed), 12 ins. in the ground, for the S. W. cor. of

(e. g.) the Nez Perces Indian Reservation; and built a monument of stone, 3 ft. sq. at base, 2 ft. sq. on top, 3 ft. high, over deposit; marked
S. W. cor., N. P. I. R. on N. E.,[32]
P. L., _____[33] M. _____[33] chs. on S. E.,
P. L., _____[34] on S. W., and
P. L. on N. W. faces.

10. *A Post for Corner Monument, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 5 ins. sq., 24 ins. in the ground, for the N. W. cor. of (e. g.) the Nez Perces Indian Reservation, marked
P. L. on S. E.,
N. W. cor. N. P. I. R. on S. E.,
P. L. _____[33] M. [33] chs. on S. W., and
P. L. _____[34] on N. W. faces; dug pits, 36 x 36 x 12 ins., S. and N. E. of post, 8 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, S. E. of cor.

11. *A Stone for Corner Monument, with Pits and Mound of Earth.*

Set a _____ stone, 36 x 10 x 7 ins., 27 ins. in the ground, for the N. E. cor. of (e. g.) the Nez Perces Indian Reservation; marked
P. L. on N. E.,
P. L. on S. E.,
N. E. cor., N. P. I. R. on S. W., and
P. L. on N. W. faces; dug pits 36 x 36 x 12 ins., S. and W. of stone, 8 ft. dist.; and raised a mound of earth, 5 ft. base, 2½ ft. high, S. W. of cor.

12. *Modifications of descriptions.*

When a stone or post is established for a corner monument (i. e.) at a *corner of a reservation,* and four (4) bearing trees are available, the descriptions in paragraph 10 and 11 will be modified, as follows: Replace all that refers to pits and mound of earth, by correct descriptions of four properly marked bearing trees, for each corner. (See paragraphs 3 and 5, pages 47, 48.)

The dimensions and arrangement of pits and mounds, described in the last two paragraphs, are similar to those described for "Corners referring to one township only." (See paragraphs 1 and 4, page 31.)

WITNESS CORNERS.[35]

1. *Witness Corners will be established in certain cases.*

When the true point for any corner described in these instructions falls where prevailing conditions would insure its destruction by natural causes, a witness corner will be established in a secure position, *on a surveyed line if possible,* and *within twenty chains* of the corner point thus witnessed.

2. *Markings on Witness Corners.*

A witness corner will bear the same marks that would be placed upon the corner for which it is a witness, and in addition, will have the letters "W. C." (for witness corner), *conspicuously* displayed above the

regular markings; such witness corners will be established, *in all other respects,* like a regular corner.

3. *Markings on Bearing Trees of Witness Corners.*

When bearing trees are described as accessories to a witness corner, the prescribed markings on each tree will be preceded by the letters "W. C.," *distinctly* cut into the wood.

The true bearing and distance of witness corners, from the true point for the corner, will always be clearly stated in the field notes.

4. *Witness Corners to corner points falling in roads, etc.*

The point for a corner falling on a railroad, street, or wagon road, will be perpetuated by a marked stone (charred stake or quart of charcoal), deposited 24 inches in the ground,[36] and

29. The bearing trees, "S._____° E." and "S. _____° W." from the corner, are supposed to stand on surveyed land, near the line between sections 8 and 9.

31. The "record" will consist of a brief description of the corner, with the date of its construction.

32. The markings will be cut into large stones, inserted in the middle of the lowest course on each side of the monument.

33. The proper number of miles and chains, from the initial point, will be stated.

34. The year in which the monument is established will be placed in the blank.

35. See page 56.

36. The deposit will not be practicable in the case of railroads; but the witness corners will be established on the lines limiting the right of way. See pages 198, 209, and Plate IV.

witnessed by two witness corners, one of which will be established on each limiting line of the highway.

In case the point for any regular corner falls at the *intersection* of two or more streets or roads, it will be perpetuated by a marked stone (charred stake or quart of charcoal), deposited 24 inches in the ground, and *witnessed by two witness corners* established on opposite sides of the corner point, and at the mutual intersections of the lines limiting the roads or streets, as the case may be.

WITNESS POINTS.

Witness points will be perpetuated by corners similar to those described for quarter section corners, with the marking "W. P." (for witness point), in place of "¼," or "¼ s.", as the case may be.

If bearing trees are available as accessories to *witness points,* each tree will be marked W. P. B. T. (See "Insuperable objects on line—Witness Points," page 22.)

MISCELLANEOUS.

1. *Corners on Rockin place, or on Boulders.*[37]

When a corner falls on rock *in place,* or on a *boulder,* a cross (x), will be made at the exact corner point, and witnessed by the proper number of bearing trees, if they are available; in the absence of suitable trees, a mound of earth will be raised, if size of the boulder or form of the rock in place permits the excavation of pits. As a last resort, a mound of stone will be built to attract attention to the point, if loose rock can be obtained in the vicinity

2. *Location of Mounds.*

When mounds of earth or other material are raised as accessories to corners, they will be placed as specified in the foregoing Description of Corners, and in every case the *direction* of the mound from the corner will be carefully stated. The use of the indefinite description "alongside" will be discontinued.

In case the character of the land is such that the mound can not be placed as hereinbefore described, the deputy will state in his notes, by bearing and distance, exactly where the mound is located with reference to the corner, and will give his reasons for placing it as described.

3. *Mounds of Stone, covered with Earth.*

In a case where pits are practicable and the deputy prefers raising a mound of stone, or a mound of stone covered with earth,[38] he will use the form given for *"Stone with mound of stone,"* when the corner thus described is established; but when the corner *"Stone with mound of stone covered with earth,"* is constructed, the description will be modified as follows: Strike out the words "Pits impracticable"; in place of "mound of stone, 2 ft. base, 1½ ft. high," write "mound of stone covered with earth, _____ ft. base, _____ ft. high," inserting in the blank spaces the dimensions of the mound given in paragraph 1, following the designation of each class of corners, pages 24 to 45.

4. *Bearing Trees.*

Bearing trees marked as accessories to standard corners, either township, section, or quarter section, will be selected on the *north* side of base lines or standard parallels, and bearing trees referring to the closing corners on said lines, will be located on the *south* side; in general, the bearing trees referring to any particular closing corner, together with one pit and the mound belonging to such corner, will be located on *the same side of the line closed upon,* and on the side *from which the surveys have been closed.*

When the requisite number of trees can be found within 300 links of the corner point, two (2) bearing trees will be marked and described for every standard or closing township or section corner, or corner common to two townships or sections, only; four (4) for every corner common to four townships or four sections; one (1) for a corner referring to one township or one section, only; two (2) for every quarter section corner or meander corner, and four (4) for each mile or half mile corner, or corner monument on a reservation or other boundary, not conforming to the system of rectangular surveying.

In case the prescribed number of trees can not be found within limits, the deputy will state in his field notes, after describing those marked, "no other trees within limits," and add "dug pits _____ x _____ x _____ ins.," etc., or "raised a mound of stone, _____ ft. base, _____ ft. high, _____ of cor.," as prevailing conditions may require.

Bearing trees, being the most important accessories to the corners, will have their exact bearings from the true meridian taken with the instrument used in running lines of survey; and the distance *from the middle of each bearing tree to the middle point of the corner* will be carefully measured, and recorded in the field notes.

A *plain blaze* will be made at the usual or most convenient height, on each bearing tree, on the side facing the corner. The height of all other markings on the tree will in no case exceed the limit of *two* and *one-half* feet above the ground.

5. *Stones for corners.*

Stones 18 ins. long, or less, will be set with two-thirds of their length in the ground, and those more than 18 ins. long will have three-fourths of their length in the ground.

No stones measuring less than 504 cubic inches, or less than 12 ins. in length, will be used for corners.

6. *Objects to be noted.*

Particular attention is directed to the "Summary of objects and data required to be noted." See page 58 of these instructions; and the deputy will thoroughly comply with the same in his work and field notes.

37. See pages 146, 157, and 164.

38. The base and height of a "mound of stone, covered with earth," will be the same as prescribed for mound of earth. The dimensions of "mound of stone" on reservation boundaries will conform to those prescribed in paragraph 2, page 45, The direction of the mound from the corner will be stated.

7. *Lines discontinued at Legal Corners.*

No mountainous lands, or lands not classed as surveyable, will be meandered, and all lines approaching such lands will be discontinued at the section or quarter-section corner nearest the unsurveyed land.

8. *Marks to be cut.*

All letters and figures on posts, trees, or stones, etc., will be *cut into* the object upon which they are placed. Arabic figures and plain letters will be used for all markings.

9. *Orientation of Corners.*

Corners referring to one, two, or four townships or sections, not identical with standard or closing corners, will be set with their faces *directed* NE. and SW., and NW. and SE., while all other corners will be set with their sides *facing the cardinal points;* except corners on boundaries of reservations and private land claims, which will be set squarely on line.

10. *Size of Posts, Mounds, etc.*

The sizes of wooden posts, mounds, and pits, noted in the foregoing descriptions, will be regarded as *minimum,* and their dimensions will be increased whenever practicable.

11. *Corner Materials.*

In establishing corners, *durable* stones will be used when obtainable; then, posts; and lastly, mounds, with stake in pit.

Wood of a perishable nature will not be used for posts or stakes.

12. *Instructions will be examined.*

Deputy surveyors will carefully read, study, and familiarize themselves with all instructions contained in this volume, and will instruct their assistants as to their duties before commencing work. An extra copy of this Manual may be furnished each deputy, for the use of his assistants.

INITIAL POINTS.

Initial points from which the lines of the public surveys are to be extended will be established whenever necessary, under such special instructions as may be prescribed in each case by the Commissioner of the General Land Office. The locus of such initial points will be selected with great care and due consideration for their prominence and easy identification, and must be established astronomically.

qu01The lines of the public surveys are classified as follows:

Class 1. Base lines and standard parallels.

Class 2. Principal and guide meridians.

Class 3. Township exteriors (or meridional and latitudinal township boundaries).

Class 4. Subdivision and meander lines.

The initial point having been established, the line of the public surveys will be extended therefrom, as follows:

BASE LINE.

1. From the initial point the base line will be extended east and west on a parallel of latitude, by the use of transit or solar instruments, as may be directed by the surveyor general in his written special instructions. The *transit* should be designated for the alinement of all important lines.

2. The direction of base lines will conform to parallels of latitude and will be controlled by true meridians; consequently the correct determination of true meridians by *observations on Polaris at elongation*[39] is a matter of prime importance.

3. When transits are employed, certain reference lines[40] having a known position and relation to the required parallel of latitude will be prolonged as straight lines, by two back and two fore sights at each setting of the instrument, the horizontal limb being revolved 180° in azimuth between the observations.

4. Where solar apparatus is used, the deputy will test the instrument, whenever practicable, by comparing its indications with a meridian determined by Polaris observations;[41] and in all cases where error is discovered he will make the necessary corrections of his line before proceeding with the survey.[41] All operations will be fully described in the field notes.

5. The proper township, section, and quarter section corners will be established at lawful intervals, and meander corners at the intersection of the line with all meanderable streams, lakes, or bayous.

6. In order to detect errors and insure accuracy in measurement, two sets of chainmen will be employed; one to note distances to intermediate points and to locate topographical features, the other to act as a check. Each will measure 40 chains, and the proper corner will be placed midway between the ending points of the two measurements.

The deputy will be present when said corner is thus established, and will record in the body of his field notes the distances to the same, according to the measurement by each set of chainmen.[42]

To obviate collusion between the sets of chainmen, the second set should commence at a point in advance of the beginning corner of the first set, the initial difference in measurement thus obtained being known only to the deputy.

PRINCIPAL MERIDIAN.

1. This line shall *conform to a true meridian* and will be extended from the initial point, either north or south, or in both directions, as the conditions may require, by the use of transit or solar instruments, as may be directed by the surveyor general in his special written instructions.

2. The methods used for determination of directions, and the precautions to be observed to secure accuracy in measurement, are fully stated above under the title "Base Line", and will be complied with in every particular.

39. See page 105.

40. For details see pages 120 to 127.

41. See specimen field notes, page 172. of the range line, if the same is west of north, but subtract when it bears east of north.

42. See pages 142 to 167.

3. In addition to the above general instructions, it is required that

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in all cases where the establishment of a new principal meridian seems to be necessary to the surveyor general, he shall submit the matter, together with his reasons therefor, to the Commissioner of the General Land Office, and the survey of such principal meridian shall not be commenced until written authority, together with such special instructions as he may deem necessary, shall have been received from the Commissioner.

STANDARD PARALLELS.

1. Standard parallels, which are also called correction lines, shall be extended east and west from the principal meridian, at intervals of every 24 miles north and south of the base line, in the manner prescribed for running said line, and all requirements under the title "Base Line" will be carefully observed. (See page 51.)

2. Where standard parallels have been placed at intervals of 30 or 36 miles, regardless of existing instructions, and where gross irregularities require additional standard lines, from which to initiate new, or upon which to close old surveys, an intermediate correction line should be established to which a *local* name may be given, (e. g.) "Cedar Creek Correction Line;" and the same will be run, in all respects, like the regular standard parallels.

GUIDE MERIDIANS.

1. Guide meridians shall be extended north from the base line, or standard parallels, at intervals of every 24 miles east and west from the principal meridian, in the manner prescribed for running the principal meridian, and all the provisions for securing accuracy of alinement and measurement found, or referred to under the title "Principal Meridian," will apply to the survey of said guide meridians. (See page 51.)

2. When existing conditions require that such guide meridians shall be run *south* from the base or correction lines, they will be initiated at properly established closing corners on such lines.

3. Where guide meridians have been improperly placed at intervals greatly exceeding the authorized distance of 24 miles, and standard lines are required to limit errors of old, or govern new surveys, a new guide meridian may be run from a standard, or properly established closing corner, and a local name may be assigned to the same, (e. g.) "Grass Valley Guide Meridian". These additional guide meridians will be surveyed in all respects like the regular guide meridians.

TOWNSHIP EXTERIORS.

1. Whenever practicable, the township exteriors in a tract of land 24 miles square, bounded by standard lines, will be surveyed successively through the block, beginning with those of the *southwestern* township.

2. The *meridional* boundaries of townships will have precedence in the *order* of survey and will be run from south to north on *true meridians,* with permanent corners at lawful distances; the latitudinal boundaries will be run *from east to west on random* or trial lines, and corrected back on true lines.

The falling of a *random,* north or south of the township corner to be closed upon, will be carefully measured, and, with the resulting true return course, will be duly recorded in the field notes.

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Should it happen, however, that such *random* intersects the meridian of the objective corner, north or south of said corner, or falls short of, or overruns the length of the south boundary of the township by more than *three chains* (due allowance being made for convergency), said random, and, if necessary, all the exterior boundaries of the township, will be retraced and remeasured to discover and correct the error.

When running random lines from east to west, temporary corners will be set at intervals of 40.00 chains, and proper *permanent* corners will be established upon the true line, corrected back in accordance with these instructions, thereby throwing the excess or deficiency against the west boundary of the township, as required by law.

3. Whenever practicable, the exterior boundaries of townships belonging to the *west* range, in a tract or block 24 miles square, will first be surveyed in succession, through the range, from south to north; and in a similar manner, the other three ranges will be surveyed in regular sequence.

4. In cases *where impassable objects occur* and the foregoing rules *can not be complied with,* township corners will be established as follows:

In extending the *south* or *north* boundaries of a township to the *west,* where the *southwest* or *northwest* corners can not be established in the regular way by running a north and south line, such boundaries will be run *west on a true* line, allowing for convergency on the west half mile; and from the township corner established at the end of such boundary, the west boundary will be run *north* or *south,* as the case may be. In extending *south* or *north* boundaries of a township to the *east,* where the *southeast* or *northeast* corner can not be established in the regular way, the same rule will be observed, except that such boundaries will be run *east on a true line,* and the *east* boundary run *north* or *south,* as the case may be.

5. Allowance for the convergency of meridians will be made whenever necessary.

METHOD OF SUBDIVIDING.

1. The exterior boundaries of a full township having been properly established, the subdivision thereof will be made as follows:

At or near the *southeast* corner of the township, a *true meridian* will be determined by Polaris or solar observations, and the deputy's instrument will be tested thereon; then from said corner the first mile of the east and south boundaries will be retraced, if subdivisions and survey of the exteriors have been provided for in *separate* contracts; but, if the survey of the exterior and subdivisional lines are included in the *same* contract, the retracements referred to will be omitted. All discrepancies resulting from disagreement of bearings or measurements will be carefully stated in the field notes.

2. After testing his instrument on the true meridian thus determined, the deputy will commenceat the corner to sections 35 and 36, on the south boundary, and run a line *parallel to the range line,*[43] establishing at 40.00 chains, the quarter section corner between sections 35 and 36, and at 80.00 chains the corner for sections 25, 26, 35, and 36.

3. From the last-named corner, a random line will be run eastward, without blazing, parallel to the *south boundary of section* 36, to its inter-

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section with the east boundary of the township, placing at 40.00 chains from the point of beginning, a post for temporary quarter section corner. If the random line intersects said township boundary exactly at the corner for sections 25 and 36, it will be blazed back and established as the true line, the permanent quarter section corner being established thereon, *midway* between the initial and terminal section corners.

If, however, the random intersects said township boundary to the north or south of said corner, the falling[44] will be carefully measured, and from the data thus obtained, the true return course will be calculated,[45] and the true line blazed and established and the position of the quarter section corner determined, as directed above.

The details of the entire operation will be recorded in the field notes.

4. Having thus established the line between sections 25 and 36; from the corner for sections 25, 26, 35, and 36, the *west* and *north* boundaries of sections 25, 24, 13, and 12, will be established as directed for those of section 36; with the exception that the random lines of said north boundaries will be run *parallel to the established south boundaries of the sections to which they belong,* instead of the south boundary of section 36; e. g. the random line between sections 24 and 25 will be run parallel to the established south boundary of section 25, etc.

5. Then, from the last established section corner, i. e. the corner for sections 1, 2, 11, and 12, the line between sections 1 and 2, will be projected northward, on a random line, *parallel* to the *east* boundary of the township, setting a post for temporary quarter section corner at 40.00 chains, to its intersection with the north boundary of the township. If the random intersects said north boundary exactly at corner for sections 1 and 2, it will be blazed back and established as the true line, the temporary quarter section corner being established permanently in its original position, and the fractional measurement thrown

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into that portion of the line between said corner and the north boundary of the township.

If however, said random intersects the north boundary of the township, to the east or west of the corner for sections 1 and 2, the consequent falling will be carefully measured, and from the data thus obtained the true return course will be calculated[46] and the true line established, the permanent quarter section corner being placed upon the same at 40.00 chains from the initial corner of the random line, thereby throwing the fractional measurement in that portion lying

TABLE A.—Corrections for Convergency, within a Township.

Latitude.	Correction to be applied to bearing of range lines at a distance of—				
	1 mile.	2 miles.	3 miles.	4 miles.	5 miles.
° °	′	′	′	′	′
30 to 35	1	1	2	2	3
35 to 40	1	1	2	3	3
40 to 45	1	2	2	3	4
45 to 50	1	2	3	4	5

Example.—Latitude, 47. Range line bears N. 0° 2′ E.; then parallel meridional section lines will be run as follows:

From the corner for sections—
35 and 36, N. 0° 1′ E.
34 and 35, north.
33 and 34, N. 0° 1′ W.
32 and 33, N. 0° 2′ W.
31 and 32, N. 0° 3′ W.

between the quarter section corner and the north boundary of the township.

When the north boundary of a township is a base line or standard parallel, the line between sections 1 and 2 will be run *parallel to the range line as a true* line, the quarter section corner will be placed at 40.00 chains, and a *closing corner* will be established at the point of intersection with such base or standard line; and in such case, the distance from said closing corner, to the nearest standard corner on such base or standard line, will be carefully measured and noted as a *connection line.*

6. Each successive range of sections progressing to the west, until the fifth range is attained, will be surveyed in a similar manner; then, from the section corners established on the west boundary of said range of sections, random lines will be projected to their intersection with the west boundary of the township, and the true return lines established as prescribed for the survey of the first or most eastern range of sections, with the exception that on the true lines thus established the quarter section corners will be established at 40.00 chains from the the initial corners of the randoms, the frac-

43. The meridional section lines will be made parallel to the range line or east boundary of the township, by applying to the bearing of the latter a small correction, dependent on the latitude, taken from the following table, which gives, to the nearest whole minute, the convergency of two meridians 6 miles long and from 1 to 5 miles apart; and supplies directly the deviation of meridional section lines west of north, when the range line is a true meridian. Add the correction to the bearing of the range line, if the same is west of north, but subtract when it bears east of north.

44. See "Prescribed Limits," page 59.

45. See Table VII, and rules, page 128. Random bearings, determined as directed above, are actually the true bearings of fractional true lines and are so used for running them. Any deviation from random bearings, derived from the application of the falling [Table VII], changes the random bearing by an amount due to unavoidable errors, and should give for a final result a bearing as near the true bearing as the field work will permit. A true bearing means the angular deviation from the true meridian in contradistinction to the magnetic bearing, or angle made with the magnetic meridian. A true line will be understood to refer to the line upon which the corners are established.

46. See Table VII and rules, page 128.

tional measurements being thereby thrown into those portions of the lines situated between said quarter section corners and the west boundary of the township.

7. The following general requirements are reiterated for emphasis:

The *random* of a latitudinal section line will always be run *parallel to the south boundary of the section to which it belongs, and with the true bearing of said boundary; and when a section has no linear south boundary, the random will be run parallel to the south boundary of the range of sections in which it is situated, and fractional true lines will be run in a similar manner.*[47]

8. The deputy is not required to complete the survey of the first range of sections from south to north before commencing the survey of the second or any subsequent range of sections, but the corner on which any random line closes shall have been previously established by running the line which determines its position, except as follows: Where it is impracticable to establish such section corner in the regular manner, it will be established by running the latitudinal section line as a *true line*, with a *true bearing*, determined as above directed for *random* lines, setting the quarter section corner at 40.00 chains and the section corner at 80.00 chains.[48]

9. Quarter section corners, both upon meridional and latitudinal section lines, will be established at points *equidistant* from the corresponding section corners, *except* upon the lines closing on the north and west boundaries of the township, and in those situations the quarter section corners will always be established at precisely *forty chains* to the north or west (as the case may be) of the respective section corners from which those lines respectively *start*, by which procedure the

excess or deficiency in the measurements will be thrown, according to law, on the extreme tier or range of quarter sections, as the case may be.

10. Where by reason of impassable objects only a portion of the south boundary of a township can be established, an auxiliary base line (or lines,[49] as the case may require) will be run through the portion which has no linear south boundary, first random, then corrected, connecting properly established corresponding section corners (either interior or exterior) and as far south as possible, and from such line or lines, the section lines will be extended northwardly in the usual manner, and any *fraction south* of said line will be surveyed in the opposite direction from the section corners on the auxiliary base thus established. (See Plate I, figs. 3, 4, and 5.)

11. Where by reason of impassable objects *no portion of the south boundary* of a township can be regularly established, the subdivision thereof will proceed from *north* to *south* and from east to west, thereby throwing all fractional measurements and areas against the west boundary, and the meanderable stream or other boundary limiting the township on the south.

If the *east* boundary is without regular section corners and the north boundary has been run eastwardly as a true line, with section corners at regular intervals of 80.00 chains, the subdivision of the township will be made from *west* to *east*, and fractional measurements and areas will be thrown against the irregular east boundary.

12. When the proper point for the establishment of a township or section corner is inaccessible, and a witness corner can be erected upon each of the two lines which approach the same, at distances not exceeding twenty chains therefrom, said witness corners[5] will be properly established, and the half miles upon which they stand will be recognized as *surveyed lines*.

The witness corner will be marked as conspicuously as a section corner, and bearing trees will be used wherever possible.

The deputy will be required to furnish good evidence that the section corner is actually inaccessible.

MEANDERING.

1. Proceeding *down* stream, the bank on the *left* hand is termed the *left bank* and that on the *right* hand the *right bank*. These terms will be universally used to distinguish the two banks of a river or stream.

2. Navigable rivers, as well as all rivers not embraced in the class denominated "navigable," the right-angle width of which is three chains and upwards, will be meandered on both banks, at the ordinary *mean high water mark*, by taking the general courses and distances of their sinuosities, and the same will be entered in the field book. Rivers not classed as navigable will not be meandered above the point where the average right-angle width is less than three chains. Shallow streams, without any well-defined channel or permanent banks, *will not be meandered;* except tide-water streams, whether more or less than three chains wide, which should be meandered at ordinary high-water mark, as far as tide-water extends.

At every point where either standard, township, or section lines intersect the bank of a navigable stream, or any meanderable line, corners will be established at the time of running these lines. Such corners

are called meander corners,[50] and the deputy will commence at one of these corners, follow the bank or boundary line, and measure the length of each course from the beginning corner to the next "meander corner." Compass courses, by the needle or solar, will be used in meanders. Transit angles are not allowed.

The crossing distance between meander corners on same line and the true bearing and distance between corresponding meander corners will be ascertained by triangulation, or direct measurement, in order that the river may be protracted with entire accuracy. The particulars will be given in the field notes.

5. See "Witness Corners," page 47.

47. See Plate IV, between sections 7 and 18, and 17 and 20.

48. See Plate IV, between sections 8 and 17.

49. Section corners will be established by correct alinement and measurement of meridional sectional lines whenever practicable.

50. These corners are the regular meander corners, and designated "meander corners;" they are distinguished from special and auxiliary meander corners; see paragraphs 11 and 12, page 44, and pages 42 and 43.

In meandering water courses or lakes, where a distance is more than ten chains between successive stations, whole chains only should be taken; but if the distance is less than *ten chains,* and it is found convenient to employ chains and links, the number of links should be a *multiple of ten,* thereby saving time and labor in testing the closings, both in the field and office.

3. The meanders of all lakes, navigable bayous, and deep ponds, of the area of twenty-five acres and upwards, will be commenced at a meander corner and continued, as above directed for navigable streams; from said corner, the courses and distances of the entire margin of the same, and the intersections with all meander corners established thereon, will be note.

All streams falling into the river, lake, or bayou will be noted, and the width at their mouths stated; also, the position, size, and depth of springs, whether the water be pure or mineral; also, the heads and mouths of all bayous; all islands, rapids, and bars will be noted, with intersections, to their upper and lower ends, to establish their exact situation. The elevation of the banks of lakes, bayous, and streams, the height of falls and cascades, and the length and fall of rapids will be recorded in the field notes.

To meander a lake or deep pond lying entirely within the boundaries of a section, two lines will be run from the two nearest corners on different sides of such lake or pond, the courses and length of which will be recorded, and if coincident with unsurveyed lines of legal subdivisions, that fact will also be stated in the field notes, and at each of the points where said lines intersect the margin of the pond or lake, a *special*[51] meander corner will be established as above directed. (See example, page 201.)

The relative position of these points being thus definitely fixed in the section, the meandering will commence at one of them and be continued to the other, noting the intersection, and thence to the beginning. The proceedings are to be fully entered in the field notes.

4. Meander lines will not be established at the segregation line between dry and swamp or overflowed land, but at the *ordinary high-water mark* of the actual margin of the rivers or lakes on which such swamp or overflowed lands border.

5. The precise relative position of an island, in a township made fractional by a river or lake in which the island is situated, will be determined by triangulation from a special and carefully measured base line, initiated upon the surveyed lines, on or near the lake or river bank on the main land, so as to connect by course and distance on a direct

line, the meander corner on the mainland with the corresponding point on the island, where the proper meander corner will be established.

6. In making the connection of an island lying entirely within a section, with the mainland, a special base will be measured from the most convenient meander corner, and from such base, the location of an *auxiliary*[52] meander corner will be determined by triangulation, at which the meanders of the island will be initiated.

7. In the survey of lands bordering on *tide water,* "meander corners" will be established at the points where surveyed lines intersect *high-water mark,* and the meanders will follow the *high-water line.*

8. The field notes of meanders will show the dates on which the work was performed, as illustrated in the specimen notes, page 216. The field notes of meanders will state and describe the corner from which the meanders commenced, and upon which they closed, and will exhibit the meanders of each fractional section separately; following, and composing a part of such notes, will be given a description of the land, timber, depth of inundation to which the bottom is subject, and the banks, current, and bottom of the stream or body of water meandered. The utmost care will be taken to pass no object of topography, *or change therein,* without giving a particular description thereof in its proper place in the notes of the meanders.

SUMMARY OF OBJECTS AND DATA REQUIRED TO BE NOTED.

1. The precise length of every line run, noting all necessary offsets therefrom, with the reason for making them, and method employed.

2. The kind and diameter of all bearing trees, with the course and distance of the same from their respective corners; and the precise relative position of witness corners to the true corners.

3. The kind of materials of which corners are constructed.

4. *Trees on line.* The name, diameter, and distance on line to all trees which it intersects.

5. Intersections by line of *land objects.* The distance at which the line intersects the *boundary lines* of every reservation, settler's claim, improvement, or rancho; prairie, bottom land, swamp, marsh, grove, and windfall, with the course of the same at all points of intersection; also, the distances at which the line begins to ascend, arrives at the top, begins to descend, and reaches the foot of all *remarkable* hills and ridges, with their courses, and *estimated height in feet,* above the level land of the surrounding country, or above the bottom lands, ravines, or waters near which they are situated. Also, distance to and across *large* ravines, their depth and course.

6. Intersections by line of *water objects.* All rivers, creeks, and smaller streams of water which the line crosses; the distances measured on the *true* line to the bank *first arrived at,* the course *down* stream at *points of intersection,* and their *widths on line.* In cases of *navigable* streams, their width will be ascertained between the *meander corners,* as set forth under the proper head.[53]

7. The land's *surface*—whether level, rolling, broken, hilly, or mountainous.

8. The *soil*—whether first, second, third, or fourth rate.

9. *Timber*—the several kinds of timber and undergrowth, in the order in which they predominate.

51. A "Special Meander Corner" is one established on a line of legal subdivision, not a standard, township, or section line. See pages 201 and 202.

52. An "auxiliary meander corner" is one not on a line belonging to the system of rectangular surveying. See page 212.

53. See "Meandering," third clause of paragraph 2, page 57.

10. *Bottom lands*—to be described as wet or dry, and if subject to inundation, state to what depth.

11. *Springs of water*—whether fresh, saline, or mineral, with the course of the streams flowing from them.

12. *Lakes and ponds*—describing their banks and giving their height, and also depth of water, and whether it be pure or stagnant.

13. *Improvements.* Towns and villages; houses or cabins, fields, or other improvements with owners' names; mill sites, forges, and factories, mineral monuments, and all corners not belonging to the system of rectangular surveying; will be located by bearing and distance, or by intersecting bearings from given points.

14. *Coal* banks or beds; *peat* or turf grounds; *minerals* and ores; with particular description of the same as to quality and extent, and all *diggings* therefor; also *salt* springs and licks. All reliable information that can be obtained respecting these objects, whether they be on the line or not, will appear in the general description.

15. *Roads and trails,* with their directions, whence and whither.

16. Rapids, cataracts, cascades, or falls of water, with the estimated height of their fall in feet.

17. Precipices, caves, sink holes, ravines, stone quarries, ledges of rocks, with the kind of stone they afford.

18. *Natural curiosities,* interesting fossils, petrifactions, organic remains, etc.; also all ancient works of art, such as mounds, fortifications, embankments, ditches, or objects of like nature.

19. The *magnetic declination* will be *incidentally* noted at all points of the lines being surveyed, where any *material change* in the same indicates the probable presence of iron ores; and the position of such points will be perfectly identified in the field notes.

PRESCRIBED LIMITS FOR CLOSINGS AND LENGTHS OF LINES.

1. If in running a *random* township exterior, such random falls short of or exceeds its proper length by more than *three chains*, or falls more than *three chains* north or south of its objective corner, it will be re-run, and if found correct, so much of the remaining boundaries of the township will be retraced or resurveyed,[54] as may be found *necessary* to locate the error.

2. Every meridional section line, except those terminating in the north boundary of the township, shall be *eighty chains* in length.[55]

3. The *random* meridional section lines through the north tier of sections shall fall within *fifty links* east or west of the section corners established on the north boundary of the township, *except* when closing on a base line or standard parallel.

4. The actual length of meridional section lines through the north tier of sections shall be within *one hundred and fifty links* of their theoretical length. The latter will be determined from the meridional boundaries of the north tier of sections.

5. All *random* latitudinal section lines shall fall within *fifty links* north or south of their objective section corners.

In any range of sections, the difference between the true bearing of a latitudinal section line and that of the south boundary of the range, shall not exceed 21 minutes of arc.

The *latitudinal* section lines, except those terminating in the west boundary of the township, shall be within *fifty links* of the actual distance established on the south boundary line of the township for the width of the range of sections to which they belong.

6. The north boundary and the south boundary of *any one section,*

except in the extreme western range of sections, shall be within *fifty links* of equal length.

7. The meanders within each fractional section, or between any two successive meander corners, or of an island in the interior of a section, should close within a limit to be determined by allowing *five-eighths of a link for each chain* of said meander line. Where the meander corners marking the ends of a meander line in a fractional section are located on standard, township, or section lines, the above limit, increased by *one fourth of the regular perimeter of the fractional section, expressed in miles, multiplied by 71 links, will be allowed.*[56]

The extreme limit, however, will in no case be permitted to exceed *one hundred and fifty links.*

FIELD NOTES.

1. The proper blank books for *original field notes* will be furnished by the surveyor general, and in such books the deputy surveyor will make a faithful, distinct, and minute record of everything done and observed by himself and his assistants, pursuant to instructions, in relation to running, measuring, and marking lines, establishing corners, etc., and present, as far as possible, full and complete topographical sketches of all standard and exterior lines, drawn to the usual scale for township exteriors. These "original field notes" are not necessarily the entries made in the field, in the deputy's pocket notebooks called tablets; but they are to be fully and correctly written out in ink, from such tablets, for the permanent record of the work. Tablets should be so fully written as to verify the "original field notes" whenever the surveyor general requires them for inspection.

2. A full description of all corners belonging to old surveys, from which the lines of *new* surveys *start*, or upon which they *close*, will in all cases be furnished the deputy from the surveyor general's office, when authority is given for commencing work; then, if the old corners are found to agree with said descriptions, the deputy will describe any one of them in this form, "which is a stone firmly set, marked, and witnessed, as described by the surveyor general"; but, should a corner *not* answer the description supplied, the deputy will give a *full description* of such corner and its accessories, following the proper approved form given in these instructions.

54. See "Explanations," p. 71 to 78.

55. See exception on p. 76.

56. See Plate I, figs. 8, 9, 10, 11, and 12.

A full description of each corner established under any one contract will be given *once* only; subsequent reference to such corner will be made in the form, "heretofore described", or (e. g.) "the corner for sections 2, 3, 10, and 11," as the case may require.

In all cases where a corner is *reëstablished, the original field notes* will describe fully the manner in which it is done.

3. The *original field notes* of the survey of base, standard, and meridian lines will describe all corners established thereon, how established, the crossings of streams, ravines, hills, and mountains; character of soil, timber, minerals, etc.; and after the description of each township corner established in running such lines, the deputy will note particularly in the "general description" the character of townships on each side of the lines run.

4. The *original field notes* of the survey of exterior boundaries of townships will describe the corners and topography, as above required, and the "general description" at the end of such notes will describe the townships as fully as possible, and also state whether or not they should be subdivided.

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5. The *original field notes* of the subdivisional survey of townships will describe the corners and topography as above required, and the "general description" at the end of such notes will state minutely the character of the land, soil, timber, etc., found in such townships.

The topography will be given on the *true line* in all cases, and will be taken correctly, not estimated or approximated.

6. With the *original field notes* of the survey of base lines and standard parallels, and principal and guide meridians forming a tract 24 miles square,[57] including those of the township exteriors therein, the deputy will submit a diagram of the lines surveyed, drawn to a scale of half an inch to one mile, upon which will be written the *true bearings and lengths of all surveyed lines,* except the lengths of those which are actually 40.00 or 80.00 chains. These diagrams will exhibit all water courses, with the direction of each indicated by an arrow head pointing *down stream*; also, the intersection of the lines with all prairies, marshes, swamps, ravines, lakes, ponds, mountains, hills, and all other natural or artificial topographical features mentioned in the *original field notes*, to the fullest extent possible.

7. With the *special instructions* for making subdivisional surveys of townships into sections, the deputy will be furnished by the surveyor general with *blank township diagrams* drawn to a scale of *one inch to forty chains*, upon which the *true bearings and lengths of the township and section lines, from which the surveys are to be projected, or upon which they are to close, will be carefully marked;* and on such diagrams the deputy who subdivides will make appropriate sketches of the various objects of topography as they occur on his lines, so as to exhibit not only the points of intersection therewith, but also the directions and relative positions of such objects between the lines, or within each section, as far as practicable, so that every topographical feature may be properly completed and connected in the showing.

8. Triangulations, offsets, or traverses, made to determine distances that can not be directly measured, such as those over (e. g.) deep streams, lakes, impassable swamps, canons, etc., will be made on the *random lines*,[58] when random lines are run. All particulars will be fully stated in the field notes.

The exhibition of every mile of surveying, whether on standard, township, or subdivision lines, and the meanders in each section, will be complete in itself, and will be separated from other records by a black line drawn across that part of the page containing the body of notes. The description of the surface, soil, minerals, timber, undergrowth, etc., on *each mile* of line will follow the notes of survey of such line, and *not be mingled with them.*

Particular care will be taken to record at the end of each mile the number of chains of *mountainous* land, *heavily timbered* land, or land covered with *dense undergrowth.* (See page 224.)

The date of each day's work will immediately follow the notes thereof.

9. Near the end of the *original field notes* and immediately before the "general description", the deputy surveyor will add, in the form shown in specimen field notes (page 177), a tabular statement of the latitude and departure of all boundary lines of the township, derived from a traverse table, and will give the *totals*, and the *errors* in latitude and departure; said errors shall in no case exceed *three chains,* the prescribed limit for the falling of the *random* north boundary of a township. If a part or the whole of one or more boundaries is made up of meander lines, the northings, southings, eastings, and westings of the

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full section lines, nearest said meanders, will replace the missing N., S., E., or W. township lines, as the case may require, thereby presenting the *errors* of said boundaries of a closed survey.

If all the exterior lines have been surveyed by the deputy, the bearings and distances for the table will be taken from his own notes. In a case where some of the boundaries have been surveyed under another contract, the deputy will use the bearings and distances supplied by the surveyor general, in connection with those of his own lines; and, if errors exceed the allowance of *three chains*, specified in paragraph 1 of the "Prescribed Limits",[59] the deputy will determine *where the error occurs, correct the same before he leaves the field, and place the table in his original field notes.*

Besides the ordinary notes taken on line (and which will always be written down on the spot, leaving nothing to be supplied by memory), the deputy will subjoin, at the conclusion of his book, such further description or information touching any matter or thing connected with the township (or other) survey which he may be able to afford, and may deem useful or necessary to be known—with a *general description* of the township in the *aggregate*, as respects the face of the country, its soil and geological features, timber, minerals, waters, etc.

10. Following the general description of the township will be placed "A list of the names of the individuals employed to assist in running, measuring, and marking the lines and

57. See page 52 and Plate III.

58. See pages 136 and 188.

59. See page 59, and retracement article, page 72.

corners described in the foregoing field notes of township No. _____ of the base line of range No. _____ of the _____ meridian, showing the respective capacities in which they acted."

AFFIDAVITS TO FIELD NOTES.

The following are the forms of official oaths to be taken by deputy surveyors and their assistants. The original oaths will be affixed to the *original field notes* forwarded to the surveyor general by the deputy surveyor; the preliminary oaths being placed on the page following the index of the first book, and the final oaths at the end of the last book of field notes of the survey of *each class of lines*[60] to which they refer:

PRELIMINARY OATHS OF ASSISTANTS.

We, _____ _____ and _____ _____, do solemnly swear that we will well and faithfully execute the duties of chainmen; that we will level the chain upon even and uneven ground and plumb the tally pins, either by sticking or dropping the same; that we will report the true distance to all notable objects, and the true length of all lines that we assist in measuring, to the best of our skill and ability, and in accordance with instructions given us, in the survey of the _____ _____.

_____ _____, *Chainman.*
_____ _____, *Chainman.*

Subscribed and sworn to before me this _____ day of _____, 189____.
[SEAL.] _____ _____,
_____.

We, _____ _____ and _____ _____, do solemnly swear that we will well and truly perform the duties of moundmen in the establishment of corners, according to the instructions given us, to the best of our skill and ability, in the survey of _____ _____.

_____ _____, *Moundman.*
_____ _____, *Moundman.*

Subscribed and sworn to before me this _____ day of _____, 189____.
[SEAL.] _____ _____,
_____.

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We, _____ _____ and _____ _____, do solemnly swear that we will well and truly perform the duties of axmen, in the establishment of corners and other duties, according to instructions given us, to the best of our skill and ability, in the survey of _____ _____.

_____ _____, *Axman.*
_____ _____, *Axman.*

Subscribed and sworn to before me this_____ day of _____, 189____.
[SEAL.] _____ _____,
_____.

I,_____ _____, do solemnly swear that I will well and truly perform the duties of flagman, according to instructions given me, to the best of my skill and ability, in the survey of _____ _____.

_____ _____, *Flagman.*

Subscribed and sworn to before me this _____ day of _____, 189____.
[SEAL.] _____ _____,
_____.

FINAL OATHS OF DEPUTY SURVEYORS AND THEIR ASSISTANTS.

List of names.

A list of the names of the individuals employed by _____ _____, United States deputy surveyor, to assist in running, measuring, and marking the lines and corners described in the foregoing field notes of the survey of _____ _____, showing the respective capacities in which they acted.

_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Moundman.*
_____ _____, *Moundman.*
_____ _____, *Axman.*
_____ _____, *Axman.*
_____ _____, *Flagman.*

FINAL OATHS OF ASSISTANTS.

We hereby certify that we assisted _____ _____, United States deputy surveyor, in surveying all those parts or portions of the _____ of the _____ base and _____ meridian, _____ of _____, which are represented in the foregoing field notes as having been surveyed by him and under his direction; and that said survey has been in all respects, to the best of our knowledge and belief, well and faithfully surveyed, and the corner monuments established according to the instructions furnished by the United States surveyor general for _____.

_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Chainman.*
_____ _____, *Moundman.*
_____ _____, *Moundman.*
_____ _____, *Axman.*
_____ _____, *Axman.*
_____ _____, *Flagman.*

60. See page 50, and par. 13 (a) page 64.

Subscribed and sworn to before me this _____ day of _____, 189____.
[SEAL.] _____ _____,
_____.

FINAL OATH OF UNITED STATES DEPUTY SURVEYOR.

I, _____ _____, United States deputy surveyor, do solemnly swear that in pursuance of instructions received from _____ _____, United States surveyor general for _____, bearing date of the _____ day of _____, 189____, I have well, faithfully, and truly, in my own proper person, and in strict conformity with the instruction furnished by the United States surveyor general for _____, the Manual of Surveying Instructions, and the laws of the United States, surveyed all those parts or portions of _____

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_____ of the _____ base and _____ meridian in the _____ of _____, which are represented in the foregoing field notes as having been surveyed by me and under my directions; and I do further solemnly swear that all the corners of said survey have been established and perpetuated in strict accordance with the Manual of Surveying Instructions, and the special written instructions of the United States surveyor general for _____, and in the specific manner described in the field notes, and that the foregoing are the true field notes of such survey; and should any fraud be detected, I will suffer the penalty of perjury, under the provisions of an act of Congress approved August 8, 1846.

_____ _____,
United States Deputy Surveyor.

Subscribed by said _____ _____, U. S. deputy surveyor, and sworn to before me this _____ day of _____, 189____.
[SEAL.] _____ _____,
_____.

11. The *final oath of the deputy surveyor* will be taken before the *U. S. Surveyor General* for the State or Territory in which the survey is executed, or before any other officer authorized by the laws of the United States or by the municipal authorities, to administer land oaths, except notaries public.

It is preferable that *both* preliminary and final oaths of *assistants* should be taken before some officer duly authorized to administer oaths other than the deputy surveyor. In cases, however, where great delay, expense, or inconvenience would result from a strict compliance with this rule, the deputy surveyor is authorized to administer the necessary oaths to his assistants, but in each case where this is done, he will submit to the proper surveyor general, a full written report of the circumstances which required his stated action.

12. The deputy will transmit the *original field notes* and the required sketches to the survey or general at the earliest practicable date after completion of his work in the field. *Said original field notes will be filed in the office of the surveyor general as a part of its permanent records, subject only to the direction of the Commissioner of the General Land Office; and no changes whatever will be made in said original field notes, after they have been filed in the surveyor general's office.*

13. The *original field notes*, each bearing the *written approval* of the surveyor general, will be substantially bound in volumes of suitable size and retained in the surveyor general's office. *Certified transcripts* of said *original field notes* will be prepared at the earliest practicable date, as follows:

(a) The field notes of the survey of base lines and standard parallels, of principal and guide meridians, of township exteriors, and of subdivision and meander lines will be written in *separate books*. A *complete set* of preliminary and final oaths will be attached to the field notes of *each class of lines*.[61] No adhesive material of any kind will be used to fasten leaves or covers. Cut or mutilated leaves, or slips, will not be inserted.

(b) The field notes of *subdivisions* will be written in a *separate book for each township;* the preliminary oaths of the assistants employed in making said *subdivisions* will be prefixed to the first book, and their final oaths will be attached to the *last* book of the series, arranged in the order of dates.

(c) The *first* or title page of *each book of field notes* will describe the subject matter of the same, the locus of the survey, by whom surveyed, number and date of contract, and the dates of commencement and completion of the work.

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(d) The *second* page of *each book of field notes* will contain the names and duties of the *assistants employed on the surveys recorded therein;* the index will be placed on the same or following page.

(e) Whenever a new assistant is employed, or the duties of any one of them changed, such fact will be stated in an appropriate entry immediately preceding the notes taken under such changed arrangements.

(f) No abbreviations or contractions of words are allowable, except such words as are *constantly* occurring, and a few others, additional to those enumerated on page 23, as follows:

astron.	for astronomical.	l. m. t.	for local mean time.
chs.	for chains.	long.	for longitude.
corr.	for correction.	m.	for minutes.
decl.	for declination.	mag. decl.	for magnetic declination.
diff. lat.	for difference of latitude.	red.	for reduce or reduction.
dep.	for departure.	temp.	for temporary.
h.	for hours.	U. C.	for upper culmination.
lat.	for latitude.	w. corr.	for watch correction.
L. C.	for lower culmination.	w. t.	for watch time.

Proper names will never be abbreviated, however often they recur.

(g) All transcripts of field notes, made out as herein directed, will be written on official field-note paper, foolscap size (pages 13½ x 8½ inches), in a bold, legible hand, or type-written, and as nearly as possible without erasures or interlineations; such transcripts of any series of surveys, included in one account forwarded to the General Land Office, will be securely put up in *one package*, at the office of the surveyor general, prior to transmission.

61. See classification of lines, page 50.

SPECIAL INSTRUCTIONS ISSUED BY UNITED STATES SURVEYORS GENERAL TO UNITED STATES DEPUTY SURVEYORS.

One of the most important duties to be performed by the surveyor general is to provide the deputy surveyor with *Special Instructions*, in connection with the contract, prepared in accordance with law, which instructions will not consist of directing attention to certain paragraphs in this Manual, reiteration of its requirements, and printed directions of a general nature; but they will in all cases be *specific* in character, with all necessary *detailed statements* setting forth *what* the deputy is to do and *how* the work is to be performed. Before making out special instructions, the surveyor general will cause a thorough examination to be made of the field notes and plats of older surveys of standard and township lines upon which the deputy is to base his work, and give him *full* information—both *written* and *graphic*—of the exact condition of adjoining surveys, with all *irregularities* that may be found, carefully and clearly noted; with all necessary instructions for his guidance if he finds everything *as it should be,* and, in addition, full advice as far as practicable what to do in case the surveys on the ground are *not as represented* in the old notes.

If the contract includes exterior lines, the surveyor general will specify in detail where the deputy is to commence, in what *order* and in what *direction* he is to run the lines, and provide for his use a *diagram*, drawn to a scale of one inch to one mile, giving full and accurate information in regard to lengths and bearings of all lines of old surveys, *from* which he is to work, or *upon* which he is to close. The diagrams will be made in triplicate, one copy for the General Land Office, one for the deputy, and one to be retained; they may be either original drawings, or blue prints or tracings therefrom. *In no case must the deputy be sent*

into the field without full and accurate information in regards to all irregularities on the records which will affect the extent or accuracy of his survey.

SPECIMEN FIELD NOTES.

[See Plates III and IV.]

Specimen field notes Nos. 1, 2, 3, 4, and 5, illustrate, respectively, the method and order to be followed in the survey of standard parallels, guide meridians, and township exteriors; *resurvey* of township exteriors; and the subdivision of a township into sections and quarter sections.

The attention of every deputy surveyor is particularly directed to these specimens, as indicating not only the method by which his work will be conducted, but also the form, order, language, etc., in which his field notes will be prepared for the office of the surveyor general, and such specimens will be deemed a part of these instructions; and any *departure from their details*, in cases where the circumstances are analogous in practice, *will be regarded as a violation of his contract and oath.*

DIAGRAM OF TOWNSHIP EXTERIORS.

[See Plate III.]

The title, certificate, and remarks on Plate III, with the specimen field notes Nos. 1, 2, and 3, will fully explain the drawing designated "Township Exteriors."

In all cases the *true bearing and length* of each township boundary will be clearly stated on the diagram; and, when any township boundary entered on the diagram, surveyed under the current contract, or a prior contract, departs from the true meridian, or proper latitude curve (as the case may be), or falls short of or overruns its proper length, by an amount in excess of the prescribed limits of *three chains* (page 59, paragraph 1), *the actual position and extent* of said township boundary will be *graphically* exhibited on the diagram, as well as by bearing and length recorded in the field notes.

SPECIMEN TOWNSHIP PLAT.

[See Plate IV.]

Plate IV illustrates the subdivision of a town ship into sections and quarter sections; the record of said subdivision being given in detail in specimen field notes No. 5.

The subdivision of fractional sections into forty-acre lots (as near as may be) will be so laid down on the official township plat in broken black lines as to admit of giving to each a *specific designation by word description,* if possible, according to its relative position in the fractional section, as per examples on Plate IV; or by a number, in all cases where the lot can not properly be designated as a quarter quarter. Those fractional lots which are not susceptible of being described according to relative local position will be numbered in a regular series; those bordering on the north boundary of a township to be numbered progressively from east to west, and those bordering on the west boundary of a township to be numbered progressively from north to south, in each regular section. As section 6 borders on both the north and west boundaries of the township, the fractional lots in the

same will be numbered as follows: commencing with No. 1 in the northeast, thence progressively west to No. 4 in the northwest, and south to No. 7 in the southwest corner of the section.

To secure a uniform system for numbering lots of fractional sections, including those above specified, imagine the section divided by three equidistant parallel latitudinal lines into four strips or tiers, 1 numbered from north to south; then, beginning with the *eastern lot* of the north tier, call it No. 1, and continue the numbering *west* through the tier, then *east* in the second, *west* in the third, and *east* in the fourth tier. A lot extending north and south through two, or part of two tiers, will be numbered in the tier containing it s greater area. In case any tier is *without* numbered lots, the numbering will be continued in the next tier to the south. (Plate IV, section 18.)

This method of numbering will apply to any part of a section, regardless of the relative situation of a part or parts

surveyed and lotted under a prior contract; in this case the lot numbers will be a continuation of the series already initiated.

Interior lots will be, as nearly as possible, 20.00 chains long by 20.00 chains wide; and the excess or deficiency of measurement will always be thrown against the northern or western boundary of the section, or meander line, or irregular boundary, as the case may be.

When, by reason of irregular surveys or from other causes, the length of a township from south to north exceeds the lawful length of 480.00 chains, or the width from east to west exceeds 480.00 chains *minus* the proper convergency, to such extent as to require two or more tiers of lots along the north boundary, or two or more ranges of lots along the west boundary, as the case may be, the entire north or west halves of said sections will be properly lotted, and to each lot will be assigned its proper number; and in such cases the area of each lot will be stated on the plat.

In case the length or width of the township falls so far short of legal dimensions as to *eliminate* the north or west half of any section situated as above specified, that part of the section remaining will be treated in a similar manner.

In a regular township (Plate IV) the southeast quarter of the northwest quarter of section 6 will have its proper area in acres (40) inserted in all cases. The half quarter sections in north tier and west range of sections will exhibit their proper areas in acres (80); while the areas of *quarter sections* will be omitted, except as follows:

When two lines of legal subdivision of either 160, 80, or 40 acre tracts intersect each other on or so near a meander or boundary line that the ordinary inaccuracies of drawing would leave the areas of said tracts in doubt, the plats will, for the sake of clearness and a full showing of the facts, exhibit the proper areas of such quarter, half quarter, and quarter quarter sections. See examples, Plate IV, in sections 13, 17, 25, and 35.

Plats shall not be trimmed. A margin of *three inches for binding* will be preserved on the left-hand side of each plat. Each plat will be certified by the surveyor general, with table annexed, according to the form on Plate IV, and will exhibit the area of public land, water surface, townsite, private land claims, and mineral claims, with the total area of the township.

Each township plat will be prepared in *triplicate:* one for the General Land Office, one for the United States district land office, and the third will be retained as the record in the office of the surveyor general.

The plat for the local land office will not be forwarded until notice is

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received by the surveyor general from the Commissioner of the General Land Office that the survey represented on said plat has been accepted, and that he is authorized to file the triplicate plat.

The plats will be prepared as nearly as possible in accordance with the specimen plat designated "Plate IV." The use of all fluids, except a preparation of India ink of good quality, must be avoided by the draughtsman in delineations relating to the public surveys. All lines, figures, etc., will be sharply defined. All lettering on the plats must be clear and sharp in outline and design, and *black*; ornamentation of any kind is prohibited. These requirements are necessary in order that everything shown upon original plats may be fairly reproduced in making photolithographic copies of the same.

All towns, settlements, permanent buildings, private claims, reservations, water courses, ditches, lakes, islands, mountains, buttes, canons, roads, railroads, telegraph lines, canals, etc., will be shown upon the plats and designated by proper names where such are known.

All township plats are to be drawn to a uniform scale of 1 inch to 40 chains, United States standard, and diagrams of exteriors to a scale of 1 inch to 160 chains.

Surveyors general will require that the specimen plat shall be closely followed, in order that uniformity of appearance and expression of drawing representing the public land surveys may be attained.

With the copy of each township plat furnished to a district land office, the surveyor general is required by law to furnish *descriptive notes* of the character and quality of the soil and timber found on and in the vicinity of each surveyed line, and to give a description of each corner.

Printed blank forms of such notes are furnished by the General Land Office. The forms provide eighteen spaces for *meander corners,* which, in most cases, will be sufficient; but when the number shall exceed eighteen, the residue will have to be inserted on the supplemental blank form.

A series of meander corners are shown on Plate IV, viz: From No. 1 to No. 8, on Yellowstone River; No. 9 to No. 10, on Clear Lake; No. 11 to No. 15, on Lin's Lake; No. 16 to No. 17, on Ivy Island; and No. 18, on Diamond Rock.

COMPUTATION OF THE AREAS OF LOTS ADJOINING THE NORTH AND WEST BOUNDARIES OF REGULAR TOWNSHIPS.

1. In regular townships, the tracts of land in each section adjoining the north and west boundaries of such townships, in excess of the regularly subdivided 480 acres (except in section 6), will, in general, be in the form of trapezoids, 80.00 chains in length by about 20 chains in width.

On the plats of such townships, each of said tracts will be divided into four lots, by drawing broken lines at intervals of 20.00 chains, parallel to the ends of the tracts, which will be regarded as parallel to each other.

With the exception of section 6, the south boundaries of sections of the north tier, when within prescribed limits, will be called 80.00 chains

When the above-named conditions obtain, the areas of the lots in any one tract (exept in section 6) may be determined, as follows:

Divide the *difference* between the widths of the ends of the tract by 4; if 3 remains, increase the hundredth figure of the quotient by a unit; in *all other cases* disregard the fraction; call the quotient thus obtained,

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"d"; then, taking the end widths of the tract in *chains and decimals of a chain,* the areas of the lots, in *acres*, will be:

Of the *smallest* lot: twice the width of the *lesser* end, *plus* "d";

Of the *largest* lot: *twice* the width of the *greater* end, *minus* "d";

Of the *smaller middle* lot: *sum* of the widths of the ends, *minus* "d";

Of the *larger middle* lot: *sum* of the widths of the ends, *plus* "d".

A check on the computation may be had by multiplying the *sum* of the widths, of the ends of the tract by 4; the product should agree *exactly* with the total area of the four lots.

The proper application of the above rules will always give areas correct *to the nearest hundredth of an acre;* and, as the use of fractions is entirely avoided, the method is recommended for its simplicity and accuracy.

Example 1. (See Plate IV, section 31.)

The ¼ difference of latitudinal boundaries is 0.03¾ chains; consequently, "d" is .04 chains; then,

18.35	×2	+.04 =	36.74 acres, the area of lot 1;
18.50	×2	−.04 =	36.96 acres, the area of lot 4;
18.50	+18.35	−.04 =	36.81 acres, the area of lot 2;
18.50	+18.35	+.04 =	36.89 acres, the area of lot 3;
Check: [18.35	+18.50]	× 4 =	147.40 acres, the area of the four lots.

The arithmetical operations are here written in detail, for the purpose of illustration; but the practical computer will perform all the work mentally.

2. Section 6. (See Plate I, figs. 6 and 7; and Plate IV.) The areas of lots 5, 6, and 7 may be obtained by the foregoing rules in all cases, *except* when the township closes on a base line or standard parallel; also, the area of lot 4, *provided* both meridional boundaries are 80.00 chains in length; when the last condition obtains, the areas of lots 1, 2, and 3 will be equal, and each will contain 40.00 acres.

In any case where the west boundary of sec. 6, is 80.00 chains, and the *east* boundary either *greater or less than* 80.00 chains, the areas of lots 1, 2, 3, and 4 will be computed as follows:

Refer to figures 6 and 7 and determine the difference, "q", between the *east* boundaries of lots 1 and 4 by the following proportion:

N. bdy. sec. 6. : diff. of meridional bdrs. sec. 6: :60 chs. : q; then will E. bdy. lot 4 = E. bdy. lot 1 ± q; in which "q" will be *added* when the *east* boundary of sec. 6 is *less than 80.00 chains* (fig. 7.); but *subtracted* when said east boundary is *greater than 80.00 chains* (fig. 6).

Now take *one third* of "q", and add it to the *shorter east boundary* of lots 1 or 4, as conditions may require, and thereby determine the length of one of the *meridional* boundaries of lot 2; to which, again add "one third of q", and thus obtain the length of the opposite side of lot 2. The areas of lots 1, 2, and 3, in acres, will be found by taking the sum of their respective *meridional boundaries, expressed in chains and decimals of a chain.*

The area of lot 4 may be had by multiplying its *mean width* by its *mean length.*

Finally, to test the entire work, multiply the sum of the *latitudinal* boundaries by 4, and to the product *add* the area of the small triangle C A B, if the east boundary is *greater* than 80.00 chains (fig. 6); but subtract the area of said small triangle if the east boundary is *less* than 80.00 chains (fig. 7). These operations, correctly performed, will give *the true area of the section,* which should agree *exactly* with the total area of its legal subdivisions, obtained as directed in the preceding paragraphs.

Example 2. (See Plate I, figs. 6 and 7, and Plate IV.)

Compute areas of lots 5, 6, and 7 of sec. 6, as directed in paragraph 1, and illustrated by the example; then write:

chs.		chs.		chs.		chs.		chs.
77.75	:	0.05	: :	60.00	:	0.0386	= q; ⅛ q =	0.0129

chs.		chs.		chs.	
20.0500	−	0.0386	=	20.01,[62]	the E. bdy. of lot 4;
20.0114	+	0.0129	=	20.02,	the E. bdy. of lot 3;
20.0243	+	0.0129	=	20.04,	the E. bdy. of lot 2.

Then, for the areas of lots 1, 2, 3, and 4, we have:

chs.	chs.		acres.	
20.05 +	20.04	=	40.09,	the area of lot 1;
20.04 +	20.02	=	40.06,	the area of lot 2;
20.02 +	20.01	=	40.03,	the area of lot 3;
$\frac{20.00 + 20.01}{2}$ ×	$\frac{17.75 + 17.78}{2}$	=	35.54,	the area of lot 4.
Also [17.78 + 17.87] × 3		=	106.95,	the area of lots 5, 6, and 7.
Area of regular subdivisions		=	360.00	
Total		=	622.67,	The area of Sec. 6.

	chs.	chs.			
Check:	[77.87	+ 77.75] × 4	=	622.48	
	77.75	× 0.025	=	0.19,	the area of triangle C A B (fig. 6)
Total			=	622.67,	which agrees with the area of section 6, before determined.

3. The area in acres of a tract 40.00 chains long, adjoining north or west township boundaries (except in N. W. ¼ sec. 6), is equal to the sum of its *parallel boundaries* (expressed in chains and decimals thereof) multiplied by 2; (e. g.) the area of lots 6 and 7 (Plate I, fig. 6), is [17.87 + 17.81] × 2 = 71.36 acres.

The area in acres of a tract 60.00 chains long, situated as above described (excluding lot 4, of sec. 6), may be found by multiplying the sum of its *parallel boundaries* (expressed in chains and decimals of a chain) by 3; (e. g.) fig. 6; south boundary lot 4 = 17.78 chs.; area of lots 5, 6, and 7 is [17.78 + 17.87] × 3 = 106.95 acres. (See example 2.)

The area in acres of quarter sections adjoining north and west township boundaries (excluding N. W. ¼ sec. 6), may be obtained by multiplying the sum of their *parallel boundaries* (taken in chains and decimals of a chain), by 2; (e. g.) the area of S. W. ¼ sec. 6 (fig. 6), is [37.87 + 37.81] × 2 = 151.36 acres.

The area in acres of any section along the north and west boundaries of regular townships (except sec. 6) may be had by multiplying the sum of its *parallel boundaries* (expresed in chains and decimals of a chain) by 4; (e. g.) the area of sec. 1 (Plate IV) is [80.00 + 79.77] × 4 = 639.08 acres.

The area in acres of a *theoretical* township may be obtained

62. These measures are taken to the nearest hundreth only.

by multiplying the sum of its *latitudinal* boundaries (expressed in chains and

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decimals of a chain) by 24; (e. g.) the area of the township represented by Plate I, fig. 1 is [480.00 + 479.34] × 24 = 23,024.16 acres.

EXPLANATIONS OF ARTICLES ON PAGES 72 to 78, WITH GENERAL DEFINITIONS OF A "RETRACEMENT" AND A "RESURVEY."

When new surveys are to be initiated from, or closed upon the lines of old surveys, which although reported to have been executed correctly, are found to be actually defective in alinement, measurement, or position, it is manifest that the employment of the regular methods prescribed for surveying normal township exteriors and subdivisions would result in extending the imperfections of the old surveys into the new, thereby producing irregular townships bounded by exterior lines not in conformity with true meridians or parallels of latitude, and containing trapezium-shaped sections which may or may not contain 640 acres each, as required by law.

Therefore, in order to extend such new surveys without incorporating therein the defects of prior erroneous work, special methods, in harmony as far as practicable with the following requirements, should be employed, viz:

The establishment of township boundaries conformable to true meridian and latitude lines.

The establishment of section boundaries by running two sets of parallel lines governed respectively by true meridians and parallels of latitude, and intersecting each other approximately at right angles at such intervals as to produce tracts of square form containing 640 acres each.

The reduction to a minimum of the number of fractional lots in a township, and consequently of the amount of field and office work.

Such special methods are based upon certain limits of allowable error in the alinement, measurement, and position of old township boundaries, as prescribed in the following article entitled "DEFINITIONS OF DEFECTIVE TOWNSHIP BOUNDARIES," page 72, which will be determined and rectifications made, if necessary, under the provisions of the article entitled "RETRACEMENT OR RESURVEY OF TOWNSHIP LINES AND LINEAR BOUNDARIES NOT ESTABLISHED IN CONFORMITY WITH THE RECTANGULAR SYSTEM OF SURVEYING," page 72, prior to the execution of new surveys under the methods prescribed by the article entitled "METHODS OF EXECUTING NEW SURVEYS, WHEN INITIATED FROM OR CLOSED UPON DEFECTIVE OLD SURVEYS," page 75, and illustrated on Plate VII, by figures 1 to 15; on Plate VIII, figures 1 to 7, and on Plate IX.

In order to prevent any misunderstanding relative to the *modus operandi* indicated by the terms "retracement" and "resurvey," the following definitions of the same are here presented:

The *retracement* of a township boundary, or other line of survey, consists in the determination of the true bearings and distances between the successive corners along the entire length of such a line; and the data thus obtained will be embodied in the field notes together with detailed particulars of the methods employed.

The *resurvey* of a township boundary or other line of survey consists of a retracement of such a line accompanied by the reconstruction of defective original corners and the establishment thereon of all the necessary new corners, and the detailed particulars of the entire operation will be embodied in the field notes.

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DEFINITIONS OF DEFECTIVE TOWNSHIP BOUNDARIES.

1. Upon retracement thereof, an old township boundary may be found to be defective in one or all of three qualifications, viz: *alinement, measurement*, and position, as follows:

2. In *alinement*; when any portion thereof deviates more than twenty-one minutes of arc from a true meridian or latitude line.

3. In *measurement*; in the case of a meridional line, or a *latitudinal* line which is identical with a standard parallel; when its length is greater or less than six miles by more than three chains; or when the length of any portion thereof between two successive corners, is greater or less than forty chains; excepting that portion between the last established corner and the limiting line, which may be greater or less than forty chains, when such a boundary has been closed upon the bank of a meanderable body of water, a military or Indian reservation, or State boundary, etc., as the case may be.

4. In *measurement*; in the case of a *latitudinal* line *not* identical with a portion of a standard parallel; when its length is greater or less than *six miles minus the proper correction for convergency,* by more than three chains; or when the length of any portion thereof between two successive corners is greater or less than forty chains; except, when such a boundary has been run as a true line to an intersection with any line of limitation, that portion thereof, between the last established subdivisional corner and the limiting line, may be greater or less than forty chains; and also, when it has been established in the regular manner, i. e. by random and true lines, that portion thereof in which the fractional measurement was originally allowed for may be greater or less than forty chains.

5. In *position*; when the corners originally established on such a boundary can not be connected with the corners on the opposite regularly established boundary, by lines which *do not* deviate more than twenty-one minutes of arc from true meridian or latitude lines.

6. The limits prescribed in the foregoing paragraphs are to be considered only in determining the necessity of *resurveying* old township boundaries when new surveys are to be initiated from or closed upon the same, *and will not be construed in any way as establishing limits of allowable error in the execution of new surveys.*

RETRACEMENT OR RESURVEY OF TOWNSHIP LINES AND LINEAR BOUNDARIES NOT ESTABLISHED IN CONFORMITY WITH THE RECTANGULAR SYSTEM OF SURVEYING.[63]

If in subdividing a township, it is found that any boundary thereof is defective in excess of the limits of allowable error prescribed in the article entitled "Definitions of Defective Township Boundaries," above, or that the corners originally established thereon had been incorrectly marked, or have been obliterated, the deputy surveyor will resurvey so much of said boundaries as may be necessary, as follows:

1. When subdivisional lines have not been closed upon either side of, or mineral claims tied to, a township boundary, it will be corrected (if necessary), in point of alinement, as well as measurement, by establishing regular new corners at lawful distances *(minus the northing or plus the southing of the south boundary; or minus the westing or plus the easting of the east boundary),* from said boundaries respectively (as the case may be), upon a right line connecting the proper township corners,

provided said line *does not* deviate more than twenty-one minutes of arc from a true meridian or latitude line (as the case may be). (See Plate VII, figs. 1, 2, 3.)

But, if the bearing of said line exceeds the limit prescribed above, the new corners will be placed on a line run *due north* or *west*, from the southeast corner of the township, to intersection with the township or range line (as the case may be), where a closing corner will be established, and the old township corner properly changed to a corner common to two townships.

The old corners on all township boundaries rectified under the provisions of this paragraph will be destroyed. (See Plate VII, figs. 4 and 5.)

2. Where subdivisional lines *have* been closed upon one side of, or mineral claims tied to, a township boundary prior to the subdivision of the township on the other side, *its alinement will not be changed;* all obliterated old corners will be *reëstablished* in their original places; new regular corners common to two townships, sections, or quarter sections, will be established upon it at lawful distances, *minus the northing or plus the southing of the south boundary; or minus the westing or plus the easting of the east boundary,* from said boundaries respectively (as the case may be), marked with reference to the township being subdivided, and the marks on the old corners upon such boundary which refer to the new work will be effaced.

Marks on bearing trees will be corrected (if necessary) to indicate the township, range, and section in which they stand, but the pits and mounds will remain as originally established. (See Plate VII, figs. 6 and 7.)

3. Where subdivisional lines *have* been closed upon one side of, or mineral claims tied to, the northern portion of a range line prior to the subdivision of the township on the other side (see paragraph 2), while upon the southern portion of the same such attachments have not been made on either side (see paragraph 1), said southern portion will be resurveyed and proper new corners established thereon, at lawful distances from the south boundary, as follows:

If the bearing of said *southern* portion *does not* deviate more than twenty-one minutes of arc from a true meridian line, it will be rectified under the provisions of the first clause of paragraph 1, and the rectifications will be continued on the *northern* portion under the provisions of paragraph 2. (See Plate VII, fig. 8.)

If, however, said bearing exceeds the specified limit, from the northern terminal corner of said southern portion, the range line will be extended *due south on a random* to its intersection with the south boundary where a corner common to two townships will be established, all the necessary changes made in the markings on the original corner common to four townships situated in its immediate vicinity, and regular new corners placed upon the respective portions of the entire range line as specified in the foregoing clause. (See Plate VII, fig. 9.)

Similar cases involving the rectification of the northern portion of a range line when the southern portion of the same can not be rectified in bearing, will be treated in conformity with the rules prescribed in the foregoing clauses, with the exception, that where such northern portion deviates more than twenty-one minutes of arc from a true meridian line, its alinement will be rectified by extending the same from its southern terminal corner, due north on a true line to its intersection with the north boundary, where a proper closing corner will be

established and the necessary corrections applied to the old corner common to four townships in its immediate vicinity, so as to change it to a corner common to two townships. (See Plate VII, figs. 10, 11, and 12.)

In the treatment of *latitudinal* township lines the rule prescribed in the foregoing clauses will be applied, observing, however, that the stated designations *north* or *south* will correspond in such cases to *west* or *east*, respectively.

4. When subdivisional lines have been closed upon one or both sides of, or mineral claims tied to, the northern and southern portions of a range line, while the middle portion thereof is free from such attachments, said portion will be resurveyed and new regular corners will be established thereon at intervals of forty chains from its southern terminal corner, upon a right line connecting the original terminal corners thereof, the fractional measurement being thrown against the northern terminal corner. (See Plate VII, figs. 13, 14, and 15.)

In such cases all the original corners, excepting the terminal corners, of the portion of the lines thus resurveyed, will be destroyed.

The rectification of the middle portions of latitudinal township lines, on which the conditions specified above obtain, will be executed in a similar manner, observing, however, that the designations *north* or *south* in the foregoing clauses will in such cases correspond to *west* or *east*, respectively.

5. Under the foregoing paragraphs, the fact that mineral claims have been tied to a defective township boundary as

63. Regarding permission to resurvey, see page 224.

therein specified, will act as a bar to the rectification of such a boundary in alinement, only when the number of claims involved is great; while in cases where a few such claims have been connected with a few of the corners on such a boundary, said boundary will be rectified in alinement and new corners placed thereon, care being taken, however, to perpetuate in a proper manner such old corners as are found to be connected with the claims; and the methods employed to accomplish the same, together with the bearings and distances of such old corner from the new, will be briefly and accurately recorded in the field notes.

New corners on defective township boundaries must be established by an actual survey of such lines, and in no case will such corners be established from data acquired in running lines closing upon the same.

In the retracement or resurvey of base lines, standard parallels, principal meridians and guide meridians, two sets of chainmen will be employed, while for similar work on township lines, not of the character specified above, only one set of chainmen is required, and in cases where conditions such as specified in paragraph 2 obtain, the bearings and distances between successive old corners and the connections of all new corners with the nearest old corners will be carefully determined and recorded in the field notes.

When township or subdivisional lines intersect the boundaries of confirmed private land claims, or any other linear boundaries established at variance with the rectangular system of surveying, as much of said boundaries will be retraced as may be necessary, temporary stakes being set at intervals of *ten chains* thereon, and also at each angle formed by a change in the direction of the same.

All obliterated boundary corners will be reëstablished in their original places, and the regular surveys will be closed upon the retraced line as prescribed for "closings" in the last clause of par. 5, page 55.

NOTE.—Regarding restoration of lost corners, by private and county surveyors, see page 224.

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METHODS OF EXECUTING NEW SURVEYS, WHEN INITIATED FROM OR CLOSED UPON OLD SURVEYS, AND EXPLANATION OF FIGURES ON PLATE VII.

Such methods are illustrated by the several figures on Plate VII, the rectification of the lines of old surveys, and the establishment of *new* township exterior and subdivisional lines connected with such old lines, being based upon the rules prescribed in the article entitled "Retracement or Resurvey of Township Lines," &c., page 72.

In considering the several cases, the probable obtaining conditions relative to a *range line* have been adopted in order to reduce the number of figures on said plate, and, to curtail also as much as practicable, the amount of reiterative verbal explanations; it being definitely understood, however, that whatever conditions may obtain relative to a *latitudinal* line similar to those illustrated and explained *in extenso* in the cases relative to the *range line,* the necessary rectifications will be made by the application of similar methods, subject, however, to the proper modifications due to the difference in the direction of the respective lines.

The character of such modifications, when not obvious, are expressed in detail under the various clauses of the several paragraphs of the article on retracements referred to above.

It will also be clearly understood that, in order to avoid unnecessary structural complications, the figures on Plate VII exhibit only the positions of township and section corners after rectification, while in actual practice the quarter section corners will also be properly affected.

Fig. 1. The *east* boundary is assumed as *irregular in bearing* and *defective in measurement*; the township corners on the same, however, being susceptible of connection by a line *not* deviating more than twenty-one minutes of arc from a true meridian line.

It will be rectified under the rules prescribed by clause 1, paragraph 1, while from the proper corners the *west* and *north* boundaries will be established in the regular manner, as well as the subdivisions within the exteriors thus rectified and established.

Fig. 2. The *east* boundary *defective in measurement.* It will be rectified under clause 1, paragraph 1, while the *west* and north boundaries will be established, and the subdivisions executed in the regular manner.

Fig. 3. The *east* boundary *defective in position.* Since the south boundary deviates from a true east and west line by *more* than twenty-one minutes of arc, said *east* boundary will be rectified under clause 1, paragraph 1; the *west* and *north* boundaries will be established in the regular manner; and the subdivisions will be executed from *north to south,* and from *east to west,* commencing at the corner to sections 1, 2, 35, and 36, and closing the fractional measurements on the *south* and *west* boundaries, as such closings are made in regular subdivisions on the north and west boundaries.

Fig. 4. The *east* boundary *defective in alinement.* It will be rectified under clause 2, paragraph 1; while the *west* and *north* boundaries will be established, and the subdivisions executed, in the regular manner.

Fig. 5. The *east* boundary *defective in alinement* and *measurement.* It will be rectified under clause 2, paragraph 1; the *west* boundary will be rectified in the regular manner, while from the corner common to two townships on the rectified east boundary, the *north* boundary will be run west on random and east on true line, permanent corners

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common to sections and quarter sections of the township to be subdivided being established on the same.

The subdivisions will be executed in the regular manner.

Fig. 6. The *south* and *east* boundaries being *defective in alinement, measurement,* and *position,* will be rectified under clause 1, paragraph 2; the *west* boundary will be established in the regular manner, and the *north* boundary by *east on random,* and west on true line, throwing the fractional measurement against the old east boundary; while the subdivisions will be executed from *north* to *south,* and from *west* to *east,* commencing at the corner to sections 5, 6, 31, and 32, and closing the fractional measurements on the old *south* and *east* boundaries, as such closings are made in regular subdivisions on the north and west boundaries.

Fig. 7. The *north, south, east* and *west* boundaries being *defective in alinement, measurement,* and *position.* The *south*

and *east* boundaries will be rectified under clause 1, paragraph 2; while the west and north boundaries will be retraced for length and bearing, any obliterated old corners being reëstablished in their original places.

The subdivisions will be executed as follows:

From the corners to sections 35 and 36, and 25 and 36, the lines between said sections will be extended due north and west, respectively, to their mutual intersection, where the corner to sections 25, 26, 35 and 36, will be established.

From said corner, the line between sections 26 and 35, 27 and 34, 28 and 33, 29 and 32, and 30 and 31 will be projected due west on a true line to its intersection with the west boundary of the township, where a closing corner will be established.

A line thus established is termed a Sectional Correction Line; and when such an auxiliary line, thus projected, intersects its objective limiting line in such proximity to its objective corner that the accessories of the two corners would interfere, that portion of the auxiliary line situated between the last established section corner and the limiting line will be changed in alinement to close upon the corner found, thus avoiding placing two corners in close proximity.

From the intial point of the *sectional correction line*, which, in this case, is the corner to sections 25, 26, 35, and 36, the line between sections 25 and 26, 23 and 24, 13 and 14, 11 and 12, and 1 and 2, will be projected *north on a true line* to its intersection with the north boundary, where a closing corner will be established. A line thus established is termed a SECTIONAL GUIDE MERIDIAN.

South of the sectional correction line, and east of the sectional guide meridian, the subdivisions will be closed upon the south and east boundaries by random and true lines, throwing the fractional measurements against the same, as such closings are made in regular surveys on the north and west boundaries; while that portion of the township situated to the north and west respectively, of said auxiliary lines, will be subdivided in the regular manner, the parallelism of the latitudinal section lines being referred to the sectional correction line, and that of the meridional section lines to the sectional guide meridian.

Closings on the west and north boundaries will be made by random and true lines, when the fallings are less than 50 links per mile, and by true lines run to closing corners when the fallings exceed said limit.

Fig. 8. The *east* boundary *defective in measurement*, the *northern portion* of the same being unchangeable, while the southern portion admits of rectification.

The east boundary will be rectified under clause 2, paragraph 2, the

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west and *north* boundaries will be established, and the subdivisions executed, in the regular manner

Fig. 9. The *east* boundary defective in *alinement* and *measurement*, the *northern portion* thereof being unchangeable, while the *southern portion* of the same admits of rectification.

The *east* boundary will be rectified under clause 3, paragraph 3, the *south* boundary, under clause 1, paragraph 2; the *west* boundary will be established in the regular manner; while the north boundary will be run *east* on random, and west on true line, throwing the fractional measurement against the *east* boundary.

The subdivisions will be executed from *south* to *north,* and from *west* to *east*, closing the fractional measurements on the *north* and *east* boundaries, as such closings are made in regular surveys, on the north and west boundaries.

Fig. 10. The *east* boundary *defective in measurement*, the *southern portion* thereof being unchangeable, while the northern portion admits of rectification.

The *east* boundary will be rectified under clause 4, paragraph 3; while the *west* and *north* boundaries will be established, and the subdivisions executed in the regular manner.

Fig. 11. The *east* boundary defective in *alinement* and *measurement*, the *southern portion* thereof being unchangeable, while the *northern portion* admits of rectfication.

The east boundary will be rectified under clause 4, paragraph 3; the *west* boundary will be established in the regular manner; the *north* boundary by east on true line to closing corner, the fractional measurement being thrown against the old east boundary; while the subdivisions will be executed from *north* to *south*, and from *west* to *east*, the fractional measurements being thrown against the old *south* and *east* boundaries, as such closings are made in regular surveys against the north and west boundaries.

Fig. 12. The *east* boundary defective in *measurement*; the *northern* and *southern portions* thereof being unchangeable, while the middle portion admits of rectification.

The *east* boundary will be rectified under clause 1, paragraph 4, the *west* and *north* boundaries will be established, and the subdivisions executed in the regular manner.

Fig. 13. The *east* boundary defective in *alinement* and *measurement*; the *northern and southern portions* thereof being unchangeable; while the middle portion admits of rectification.

The *east* boundary will be rectified under clause 1, paragraph 4; the *west* boundary will be established in the regular manner; the *north* boundary by *east on random* and west on true line, the fractional measurement being thrown against the old east boundary; while the subdivisions will be executed from *north* to *south* and from *west* to *east*, closing the fractional measurements against the old south and *east* boundaries, as such closings are made in regular surveys against the *north* and *west* boundaries.

Fig. 14. The *east* boundary defective in *alinement* and *measurement*; the *northern* and *southern* portions thereof not admitting of rectification in any way, since subdivisional surveys have been closed upon *both sides* of the same; while the middle portion admits of rectification in *measurement.*

The *east* boundary will be rectified under clause 1, paragraph 4; the *west* boundary will be established in the regular manner, the township corner at the end of six miles thereon being *temporarily* established.

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From said temporary corner, the *fractional north* boundary will be run *east on random* to the nearest old established corner on the same, at which point if the falling of the random is *within 50 links per mile*, said boundary will be corrected westward on true line, setting corners common to the sections

and quarter sections on the *north*, at regular intervals from the initial point of the true line, and throwing the consequent fractional measurement in its normal place against the *new west* boundary, while the temporary township corner previously established thereon will be made permanent.

If, however, the falling defined above exceeds the stated limit from the last established corner of the old surveys, the fractional north boundary will be projected *due west* to its intersection with the west boundary, at which point the proper township corner will be permanently established, and the temporary corner destroyed.

In establishing the corners on said north boundary under the latter procedure, the requirements prescribed in the former relative to the allowance for fractional measurement will be strictly observed.

In subdividing, the methods prescribed under Fig. 6 will be applied as far as practicable. The details of the case under consideration are clearly exhibited by fig. 14.

Fig. 15. All of the boundaries are assumed to be defective in *alinement, measurement,* and *position;* also portions of each as being closed upon by subdivisional surveys and consequently unchangeable relative to the old surveys, while other portions of the same being free from such attachments, admit of rectification.

This figure is constructed on a larger scale than those explained in the preceding paragraphs, in order to illustrate in detail the *modus operandi* to be pursued in rectification, under the rules of the article on retracements applicable to each of the obtaining conditions, and also in subdividing within the rectified exteriors.

HIATUSES AND OVERLAPS.

[Plate VIII.]

The several figures on Plate VIII illustrate in detail the methods to be employed in connecting the unsurveyed portions of two or more township boundaries, when four of such fractional lines, upon being projected towards each other in the direction of the cardinal points by lines not deviating more than twenty-one minutes of arc from true meridian or latitudinal lines, do not form a common intersection.

Said methods, in addition to the reasons embodied in the article entitled "Explanations of Articles," etc., page 71, are based upon the following desiderata, viz:

1. The adjustment of such township boundaries so as to maintain section 36 in a condition theoretically and practically perfect, according to the requirements of the rectangular system of surveying.

2. That in accomplishing the above, the resultant fractional excess or deficiency (which for brevity of explanation is termed "the rectangular fraction") will be thrown into, or taken out of section 6, whenever practicable.

3. That all incidental fractional measurements developed in the establishment of township boundaries or subdivisional lines by such methods shall be thrown against the old surveys whenever practicable.

In considering said methods it will be observed that the conditions

to be dealt with are either hiatuses or overlaps, the former possessing three characteristic features, which are named as follows:

Simple hiatus. See figures 1 and 2.

Meridional hiatus. See figure 3.

Latitudinal hiatus. See figure 4; while overlaps are shown by figure 5.

As the application of said methods, when the conditions exhibited obtain, gives similar results with but a few exceptions, which will be specifically detailed hereafter, the condition represented by A, figure 3, will be considered and the method of connection described as an example, upon the following asumptions, viz:

That, of the boundaries of townships 1 and 2 north, ranges 3 and 4 west, those portions indicated by broken lines are *unsurveyed*;

That it is required to connect said portions in order to complete the subdivisions in one or more of the townships.

Beginning at the established terminal corners on the *south* and *east* boundaries of T. 2 N., R. 4 W., *blank* lines will be projected due east and due south, respectively, with temporary stakes at intervals of ten chains, to an intersection, which point will be marked by a temporary stake;

Then, from the established terminal corners on the *west* and *north* boundaries of T. 1 N., R. 3 W., *true* lines will be projected due north and due west, respectively, with regular corners for two sections and quarter sections, to an intersection, which point will be marked by a temporary stake;

Then, by proper measurements, the character of the resulting condition will be determined, and by comparison with diagrams A, of the figures on Plate VIII, the particular method of connection will be obtained and applied.

Said condition in the case under consideration, it will be observed, is a *"meridional hiatus"*; therefore, from the temporary stake marking the intersection of the extended south and east boundaries of T. 2 N., R. 4 W., which wil be replaced by a permanent corner (common to two townships) for T. 1 N., R. 3 W., and T. 2 N., R. 4 W., the south boundary of the latter will be extended due east to its intersection with the west boundary of the former, where a corner for (one township only) T. 1 N., R. 4 W., will be permanently established;

Then, from the corner for T. 1 N., R. 3 W., and T. 2 N., R. 4 W., the south and east boundaries of the latter will be corrected back west and north, respectively, on true lines, establishing regular corners common to two quarter sections and sections of said township, to the initial points of the blank lines, against which the resulting fractional measurements will be thrown, while the stakes temporarily established on the blank lines at intervals of ten chains will be destroyed;

Then, from the stake temporarily marking the intersection of the north and west boundaries of T. 1 N., R. 3 W., which will be destroyed, the former boundary will be extended due west to its intersection with the east boundary of T. 2 N., R. 4 W., where a proper closing corner will be established, the resulting fractional measurement thrown against the same, and the distance to the nearest corner on said boundary carefully determined and recorded in the field notes.

Thus section 36 is made *full,* serving as a perfect base from which to initiate the subdivisional work in T. 2 N., R. 4 W.;

the "rectangular fraction," which in this case indirectly represents an excess, is incorporated in section 6, which being lotted on two sides in its normal con-

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dition, absorbs the excess without deranging materially those portions of the same usually defined as regular subdivisions; while the unsurveyed portions of the entire group of townships are arranged in such a manner as to admit of completing the subdivisional work therein on the approved rectangular basis.

Relative to incorporating an excess in, or supplying a deficiency from, section 6, *simple hiatuses* are noted as exceptions to the general rule; therefore, when such hiatuses are square, or longer meridionally (see 1, diagrams A, fig. 1), the "rectangular fraction" will be taken out of section 31, and incorporated in section 1; but if the length thereof (see 1, diag. A. fig. 2) lie in a latitudinal direction, said "rectangular fraction" will be taken out of section 1 and incorporated in section 31.

If the surveys contemplated, within a group of four townships, consist of the completion of the southeast unsurveyed portion of the north-west township only, the method detailed in the foregoing paragraphs will be employed in all particulars, with the exception that the extension of the north and west boundaries of the southeast township will be omitted; but the completion of the unsurveyed portions of any of the other three demands of the deputy surveyor the performance of the whole operation, and the complete connection of all the boundaries.

When, of four township boundaries whose directions tend to an approximate common point, two of the same have been carried to a mutual intersection, and are closed upon by subdivisional and other lines (see paragraph 2, article on "Retracements," etc.,) the unsurveyed portion of the remaining boundaries will be connected with them by the application of these methods, sufficiently modified to preserve intact the prior subdivisional surveys.

FRAGMENTARY SUBDIVISION.

Plate IX illustrates the general methods to be employed in the execution of fragmentary subdivisions withing townships, portions of which have been subdivided from fractional township boundaries extended from various directions and not connected with each other.

These conditions obtain to a large extent in mountainous regions, where in accordance with the existing provisions, relative to the survey of agricultural lands, in the acts of Congress making appropriations for public land surveys, such surveys are extended along the valley and bottom lands, leaving the mountainous areas unsurveyed at the time of the execution of the original work; but which, at a later date, in view of other considerations are placed under contract for survey.

It is obvious that the number and character of such cases would be too great and varied to be considered in detail; therefore, when the deputy surveyor meets with a case which is not covered exactly by these instructions, or the special instructions from the surveyor general, his thorough understanding of the preceding articles on this subject, and of the conditions illustrated on Plates VI and VIII, it is expected will point out to him the proper method to be employed.

It is possible, however, that cases may arise so complex in their character as to produce a feeling of doubt relative to the proper solution of the problem; in which case he will at once communicate with this office through the surveyor general, submitting information, by *letter* and *diagrams*, of the exact condition as found by him, and the necessary instructions will be forwarded as soon as practicable.

NOTE.—A quarter section is held to be surveyed only when three of its corners have been officially established.

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GEOGRAPHICAL POSITIONS OF BASE LINES AND PRINCIPAL MERIDIANS GOVERNING THE PUBLIC SURVEYS.

The system of rectangular surveying, authorized by law May 20, 1785, was first employed in the survey of United States public lands in the State of Ohio.

The boundary line between the States of Pennsylvania and Ohio, known as "Ellicotts line," in longitude 80° 32′ 20″ west from Greenwich, is the meridian to which the first surveys are referred. The *townships* east of the Scioto River, in the State of Ohio, are numbered from south to north, commencing with No. 1 on the Ohio River, while the *ranges* are numbered from east to west, beginning with No. 1 on the east boundary of the State, except in the tract designated "U. S. military land," in which the townships and ranges are numbered, respectively, from the south and east boundaries of said tract.

During the period of one hundred and nine years since the organization of the system of rectangular surveying, numbered and locally named principal meridians and base lines have been established, as follows:

The first principal meridian begins at the junction of the Ohio and Big Miami rivers, extends north on the boundary line between the States of Ohio and Indiana, and roughly approximates to the meridian of longitude 84° 48′ 50″ west from Greenwich. The ranges of the public surveys in the State of Ohio, west of the Scioto River, are, in part, numbered from this meridian. For further information in regard to numbering of townships and ranges of the early surveys in Ohio, the reader is referred to the State map prepared in the General Land Office.

The second principal meridian coincides with 86° 28′ of longitude west from Greenwich, starts from a point two and one half miles west of the confluence of the Little Blue and Ohio rivers, runs north to the northern boundary of Indiana, and, with the base line in latitude 38° 28′ 20″, governs the surveys in Indiana and part of those in Illinois.

The third principal meridian begins at the mouth of the Ohio River and extends north to the northern boundary of the State of Illinois, and with the base line in latitude 38° 28′ 20″, governs the surveys in the State *east* of the third principal meridian, with the exception of those projected from the *second principal meridian,* and the surveys on the *west*, to the Illinois River. This meridian is nearly coincident with 89° 10′ 15″ of west longitude from Greenwich.

The fourth principal meridian begins at a point on the right bank of the Illinois River, in latitude 40° 00′ 30″ north, and longitude 90° 28′ 45″ west from Greenwich, and with the base line running west from the initial point, governs the surveys in Illinois west of the Illinois River and west of that part of the *third* principal meridian which lies north of the river.

The fourth principal meridian also extends north through Wisconsin and northeastern Minnesota, and, with the south boundary of Wisconsin as its base line, governs all the surveys in the former and those in the latter State lying east of the Mississippi River, and the third guide meridian west (of the fifth principal meridian system), north of the river.

The fifth principal meridian starts from the old mouth of the Arkansas River, and with the base line running west from the old mouth of the St. Francis River, governs the surveys in Arkansas, Missouri, Iowa, North Dakota; those in Minnesota, west of the Mississippi River and west of the third guide meridian north of the river; and in South Dakota

all east of the Missouri River, and the surveys on the west side of the river to a limiting line following the third guide meridian (of the sixth principal meridian system), White River, and the west and north boundaries of the Lower Brule Indian Reservation. This meridian is nearly coincident with 91° 03′ 42″ longitude west from Greenwich.

The sixth principal meridian, which is approximately the meridian of 97° 23′ west longitude from Greenwich, extends from the base line coincident with the north boundary of Kansas in latitude 40° north, *south* through the State to its south boundary, in latitude 37° north, and *north* through Nebraska to the Missouri River; and governs the surveys in Kansas and Nebraska; the surveys in Wyoming, except those referred to the *Wind River meridian* and base line, which intersect in latitude 43° 01′ 20″ north, and longitude 108° 48′ 40″ west from Greenwich; the surveys in Colorado, except those projected from the *New Mexico* and *Ute meridians*, the latter intersecting its base line in latitude 39° 06′ 40″ north and longitude 108° 33′ 20″ west from Greenwich; and the surveys in South Dakota extended, or to be extended, over the tract embracing the Pine Ridge and Rosebud Indian reservations.

In addition to the above mentioned *numbered* principal meridians, other principal meridians with *local names* have been established, as follows:

The Michigan meridian, in longitude 84° 22′ 24″ west from Greenwich, with a base line in latitude 42° 26′ 30″ north (eight miles north of Detroit), governs the surveys in Michigan.

The Tallahassee meridian, in longitude 84° 16′ 42″ west from Greenwich, runs north and south from the initial point on the base line at Tallahassee, in latitude 30° 28′ north, and governs the surveys in Florida.

The Saint Stephens meridian, in longitude 88° 02′ west from Greenwich, begins at the initial point (Ellicott's corner), on the base line, in latitude 31° north, extends south to Mobile Bay and north to latitude 33° 06′ 20″, and governs the surveys in the southern district of Alabama, and in Pearl River district lying east of the river and south of the Choctaw base line, in latitude 31° 52′ 40″ north, in the State of Mississippi.

The Huntsville meridian begins on the northern boundary of Alabama, in latitude 34° 59′ north, longitude 86° 34′ 45″ west from Greenwich, extends south to latitude 33° 6′ 20″ north, and governs the surveys in the northern district of Alabama.

The Choctaw meridian begins on the Choctaw base line, latitude 31° 54′ 40″ north, longitude 90° 14′ 45″ west from Greenwich, runs north to the south boundary of the Chickasaw cession, in latitude 34° 19′ 40″ north, and governs the surveys east and west of the meridian, and north of the base line.

The Chickasaw meridian begins on the north boundary of Mississippi in latitude 34° 59′ north, longitude 89° 15′ west from Greenwich, extends south to latitude 33° 48′ 45″ north, and governs the surveys in north Mississippi.

The Washington meridian begins on the base line in latitude 31° north, longitude 91° 9′ 15″ west from Greenwich, extends north to the Mississippi River, and governs the surveys in the southwestern angle of the State of Mississippi.

The Saint Helena meridian begins at the initial point of the *Washington meridian*, in latitude 31° north, and longitude 91° 09′ 15″ west of Greenwich, extends south to the Mississippi River, and governs the sur-

veys in the Greensburg and southeastern districts of Louisiana, east of the Mississippi River.

The Louisiana meridian, in longitude 92° 24′ 15″ west of Greenwich, extends from the Gulf of Mexico to the north boundary of Louisiana, and, with the base line through the initial point, conforming to the parallel of 31° north latitude, governs all the surveys in the state west of the Mississippi River.

The New Mexico meridian, in longitude 106° 53′ 40″ west from Greenwich, extends through the Territory, and with the base line, in latitude 34° 15′ 25″ north, governs the surveys in New Mexico, *except* those in the northwest corner of the territory, referred to *Navajo meridian* and base line, which have their initial point in latitude 35° 45′ north, longitude 108° 32′ 45″ west from Greenwich.

The Salt Lake meridian, in longitude 111° 54′ 00″ west from Greenwich, has its initial point at the corner of Temple Block, in Salt Lake City, Utah, extends north and south through the Territory, and, with the base line, through the initial, and coincident with the parallel of 40° 46′ 04″ north latitude, governs the surveys in the Territory, except those referred to the *Uintah meridian* and base line projected fron an initial point in latitude 40° 26′ 20″ north, longitude 109° 57′ 30″ west from Greenwich.

The Boise meridian, longitude 116° 24′ 15″ west from Greenwich, passes through the initial point established south 29° 30′ west, nineteen miles distant from Boise City, extends north and south through the State, and, with the base line in latitude 43° 46′ north, governs the surveys in the State of Idaho.

The Mount Diablo meridian, California, coincides with the meridian of 121° 554′ 48″ west from Greenwich, intersects the base line on the summit of the mountain from which it takes

its name, in latitude 37° 51′ 30″ north, and governs the surveys in the State of Nevada, and the surveys of all central and northern California, *except* those belonging to the Humboldt meridian system.

The Humboldt meridian, longitude 124° 8′ west from Greenwich, intersects the base line on the summit of Mount Pierce, in latitude 40° 25′ 12″ north, and governs the surveys in the northwestern corner of California, lying west of the Coast range of mountains, and north of township 5 south, of the *Humboldt meridian system.*

The San Bernardino meridian, California, longitude 116° 56′ 15″ west from Greenwich, intersects the base line on Mount San Bernardino, latitude 34° 07′ 10″ north, and governs the surveys in southern California, lying *east* of the meridian, and that part of the surveys situated *west* of it which is *south* of the eighth standard parallel south, of the *Mountain Diablo meridian system.*

The Willamette meridian, which is coincident with the meridian of 122° 44′ 20″ west from Greenwich, extends *south* from the base line, in latitude 45° 31′ north, to the north boundary of California, and *north* to the international boundary, and governs all the public surveys in the States of Oregon and Washington.

The Black Hills meridian, longitude 104° 03′ west from Greenwich, with the base line in latitude 44° north, governs the sruveys in the State of South Dakota, north and west of White River, and west of the Missouri River (between latitudes 45° 55′ 20″ and 44° 17′ 30″), the north and west boundaries of the Lower Brule Indian Reservation, and the west boundary of range 79 west, of the fifth principal meridian system.

The Montana meridian extends north and south from the initial

monument on the summit of a limestone hill, eight hundred feet high, longitude 111° 38′ 50″ west from Greenwich, and with the base line on the parallel of 45° 46′ 48″ north latitude, governs the surveys in the State of Montana.

The Gila and Salt River meridian intersects the base line on the south side of Gila River, opposite the mouth of Salt River, in latitude 33° 22′ 40″ north, longitude 112° 17′ 25″ west from Greenwich, and governs the surveys the Territory of Arizona.

The Indian meridian, in longitude 97° 14′ 30″ west from Greenwich, extends from Red River to the south boundary of Kansas, and with the base line in latitude 34° 30′ north, governs the surveys in the Indian Territory, and in Oklahoma Territory all surveys east of 100° west longitude from Greenwich.

The Cimarron meridian in longitude 103° west from Greenwich, extends from latitude 36° 30′ 37″ north, and with the base line in latitude 36° 30′ north, governs the surveys in Oklahoma Territory west of 100° west longitude from Greenwich.

DECLINATION OF THE MAGNETIC NEEDLE

For the following article, with tables, charts, and their explanation, relating to the use of the compass in surveying, the Commissioner of the General Land Office is indebted to Dr. T. C. Mendenhall, Superintendent of the U. S. Coast and Geodetic Survey. It was furnished at the request of the Commissioner.

The paper, originally written in 1878 by Assistant C. A. Schott, chief of the computing division, has been revised and enlarged by him in order to present the latest information on the subject in possession of the C. and G. Survey, June, 1893. It is also accompanied by three charts taken from the C. and G. Survey report for 1889 and amended to date; they show the distribution of the magnetic declination for the year 1890, and in connection with the tables, for any year within their range.

This paper takes the place of the chapter commencing at the foot of page 25 and ending in the middle of page 29 of the "Manual of Instructions to Surveyors General of the United States" printed in 1871, part of which in the course of time had become obsolete. The present article will be found of great interest and value as an aid in the prosecution of the surveys of the public lands.

AN ACCOUNT OF THE PRESENT GEOGRAPHICAL DISTRIBUTION AND OF THE ANNUAL CHANGE OF THE MAGNETIC DECLINATION[64] WITHIN THE LIMITS OF THE UNITED STATES.

Introductory remarks.—The magnetic declination at any place is the angle contained between two vertical planes, one being that of the astronomical or true meridian of the place and the other the plane in which the axis of a freely suspended horizontal magnetic needle lies at the time. The former is a fixed plane, the latter is variable, as is shown by the regular or irregular, and the greater or less oscillations of a needle when delicately suspended; these fluctuations are subject to different laws depending on geographical position. Since the magnetic

declination is found to vary with respect to place and time, it is necessary on the part of the observer to give with his statement of the declination the geographical position or the latitude and longitude[65] of his station (expressed to the nearest minute of arc will suffice in general), and to accompany the record by the local time when the observation was made; the nearest hour (or quarter of an hour) should be stated, also whether sidereal time, mean time, local, or standard time is used.

The declination is called "west" when the north-seeking end of the magnet or needle points to the westward of the true meridian, and is called "east" when the same end points to the eastward. Roughly speaking, the north end of a needle tends approximately towards the geographical north, or, rather towards a region which surrounds the magnetic pole, situated in the vicinity of King William Land, and supposed to be in about latitude 70½° and longitude 100° W. Here the

64. Commonly known as the variation of the compass; in scientific treatises on terrestrial magnetism the term magnetic declination is always employed, in order to avoid any confusion which would arise when treating of such motions of the needle as the diurnal, annual, and secular variations.

65. Reckoned from Greenwich westward to 180°.

horizontal needle has lost its directive force, and the dip needle will point vertically up and down; in other words, at the pole the magnetic and gravitational forces agree in direction. The magnetic declination presents great extremes in value within the limits of the United States; thus for the year 1893, we have at Eastport, Me., 19° W.; at the north-eastern end of Lake Michigan, at the west end of Lake Erie, and in St. Helena Sound, S.C., 0° (needle pointing due north); at Galveston, Tex., 7⅓° E.; at San Diego, Cal., 13¼° E.; at Cape Flattery, Wash., 23° E.; at Sitka Alaska, 29° E.; the maximum of 43⅓° E. is reached at the mouth of Firth River, near where the meridional boundary line of 141° strikes the Arctic Ocean; at Bering Strait, the declination has diminished to 21° E., and at the extreme western point of our territory, at Attu Island, it is but 8½° E. The general distribution of the declination (for the given epoch, 1890), is shown by the isogonic charts appended to this manual, taken from the Coast and Geodetic Survey Report for 1889, Appendix No. 11; they are reproduced and amended to bring them up to the present state of our knowledge, and appear here transferred to the new base map of 1893 (scale 1/7 000 000). The third chart referred to apears for the first time in the manual, it represents the magnetic meridians, i. e. lines which show directly the direction of the needle, this being a tangent to the curve at any point in it. These curves, therefore, may be said to represent a physical fact, while the isogonic curves are wholly artificial, but better adapted for practical application. The meridional system converges toward the magnetic pole without any special relation to the geographical pole, whereas in the isogonic system all curves must pass through the latter pole as well. It is a matter of great importance for surveyors to recognize the fact of the local deviations from the general trend of the isogonic lines; these local irregularities of the distribution are more conspicuous in regions of igneous rocks, but they appear also in regions of sedimentary deposits, the intensity of the disturbance depending on that of the local cause and its depth below the surface. The disturbing local poles or ridges are in general of the same polarity as that of the north magnetic pole. Disturbed regions may range from a fraction of a square mile to hundreds of square miles, but as yet little has been done in this inviting field for research.

In consequence of the secular variation of the declination the magnetic charts require to be reconstructed from time to time, though for a few years from the date of an isogonic chart the declination for any

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position can readily be assigned by means of our knowledge of the annual change, which is sufficiently constant for a few years to produce no appreciable error. The secular variation is by far the greatest of the great number of changes in the direction of the needle. Thus at Albany, N. Y., the declination changed from 12° W. in the year 1650 to nearly 5½° W. about the year 1795, and is now again about 10¾° W.; at New York the change was similar; at Baltimore, Md., the declination changed from nearly 6° W. about 1680 to nearly ½° W. in 1802, the present value being near 5° W.; at San Diego, Cal., the declination was about 7⅓° E. in 1710, and is now a little over 13° E.; at Chamisso Island, Kotzebue Sound, Alaska, the declination was 33½° E. in 1750, but is now only 26½° E. The results of the latest investigation of this subject published by the Survey are contained in Appendix No. 7, Coast and Geodetic Survey Report for 1888. What is known as the *annual change* of the declination is nothing else than the effect of the secular variation during one year, and must be carefully distinguished from the *annual variation*, which has but a small range and depends on the season of the year.

The *isogonic and magnetic meridian charts*.—Referring to the two isogonic charts appended to this article, the larger comprises the compact area of the United States and the smaller one the territory of Alaska. If for any selected epoch we connect by curves all positions at which the needle was observed to have the same given declination, we trace out an isogonic curve for that value of declination. On the charts they are laid down for the equal difference of 1, with every fifth curve drawn heavier for better distinction, and they answer to the epoch January 1, 1890. For their construction more than 3,200 observed declinations (reduced to epoch) were employed, the latest observation only being used at stations occupied more than once. The isogonic curve of zero declination, also called the agonic line, at which the needle points due north and south, is seen to pass from the island of Michipicoten to the extreme west end of Lake Erie and close to Charleston, S. C., where it leaves the coast and turns toward the Bahama Islands. This curve has been conveniently used as a representative line to markout the changes which in the course of time the magnetic system in its vicinity undergoes.

On the Atlantic coast it reached its highest position[66] near Cape Henry, Va., about the year 1800 and has since been moving southward. All localities to the northeast of this line have *west* declination, indicated by a + sign to the index number; localities to the westward of it and comprising the greater part of the United States have now *east* declination, as marked by a negative index. To take up the declination for any given position on this chart, we resort to simple graphical interpolation; it is best done by dropping a perpendicular (curved) from the position to the nearest isogonic on either side of it and measuring the length of the shorter one, also that of the two together; the proportion of the distance with respect to the whole difference of 60′ is readily ascertained. The result answers to the year 1890 (January), and by applying the effect of the annual change, as tabulated further on, the declination may be had for any time before or after that epoch. This annual change is at present manifested by the apparent movement of the isogonic lines to the southward or downward along the Atlantic coast and to the westward or left on the Gulf coast and in the interior to the north of it; on the Pacific coast this movement has

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either ceased or is very inconspicuous at present. The charts show two shaded bands, one crossing the northern part of Maine where the direction of the needle has reached a limiting *westerly* position and is about ready to reverse its secular motion; the other band skirts the Pacific coast from Washington to Point Conception, Cal., where it passes out to sea. Here

66. See Plate No. 25, Appendix No. 7, Coast and Geodetic Survey Report for 1888.

the needle is about stationary at the easterly limit of its grand secular swing. For intermediate points this same condition was reached at corresponding times during the present century.

It will be seen that the irregularities in the local distribution of magnetism can only be brought out and specially delineated by a large addition to the observations so far accumulated.[67]

The degree of accuracy of the charts depends in the first place on that of the original observation, secondly on that of the change in the interval between observation and epoch, and lastly on the density of observations about the locality or the degree of generalization required in the construction of the curves. The meridional chart has already been sufficiently explained and the additional dip and intensity curves shown on it do not come within the scope of this paper.

The *secular variation of the magnetic declination.*—This variation, as already pointed out, is a matter of great importance to the surveyor who is frequently called upon to recover or re-run old compass lines or to decide between conflicting claims as to position of old boundary lines originally traced out by compass but lost or obliterated in the course of time. As its name implies, this angular motion extends over so long a period and is so utterly unknown as to its origin that the recognition of its law is a matter of much difficulty and uncertainty. To represent it a periodic function is employed; but from this it should not be inferred that the motion is repeated at stated intervals; on the contrary we are fully aware of the complexity of the phenomenon and of the necessity of continually watching year by year the changes resulting from observations and correcting or remodeling our analytical representations accordingly. It should be fully understood that this process is a wholly tentative one and that the mathematical inferences due to the *form* of the function are not meant thereby to represent or become a physical reality. Thus we are forced to reconstruct our secular change tables at suitable intervals. The period found most in accord with observations is about 250 years with variations of about 50 years longer or shorter, at various stations. This holds only for the United States. The earlier setting in of the secular variation phases in the east and spreading westward over the country has already been referred to; for instance the easternmost position or eastern elongation occurred at places in eastern Maine about the year 1760, this phase reached the Hudson River about 1790, the Mississippi River about 1820, Salt Lake about 1870, and the west coast, as at San Francisco Bay, probably next year or not far from it. Whether this phenomenon will be repeated with the present incoming opposite phase in northern Maine remains to be seen. The results from a discussion of 1,062 observations at 94 stations are given in the following table of decennial values, and after 1850 for 5-year intervals. The average number of observations for each station is 11.

Table of the secular variation of the magnetic declination at stations in the United States, computed by means of periodic functions and based

upon all available observations from the earliest to the present time.—The table is subdivided into three groups, viz: Group I comprises the stations located east of the Apalachian Range, and the Atlantic coast from Maine to Florida, inclusive; Group II, the stations situated between the Rocky Mountains and the Apalachian Range, from Canada to the Gulf; Group III contains the stations located between the Rocky Mountains and the Pacific coast, from California to Washington, also those in Alaska. Within each group the stations are arranged in the order of their latitudes.

The tabular values are of various degrees of accuracy, as is indicated by the entry, giving either whole degrees, or degrees and tenths, or degrees, tenths, and hundredths—the latter relatively the most reliable. The results, dating back to the seventeenth century, are in many cases but approximations more or less reliable. *West* declination is indicated by the sign + prefixed, *east* declination by the sign − prefixed. All values for 1900 are mere rough predictions and depend upon the precarious supposition of a continuation of the law implied by the formulae.

(The remainder of page 88 and pages 89 through 137 are deleted. They contain the following Tables and technical information.

Pages 88-95;	*Tables B, C, D; Secular Variation of Magnetic Declination.*
Pages 96 and 97;	*Table E; Latitude and Longitude of places of Magnetic Observation.*
Pages 98-101;	*Table F; Approximate average Annual Change of Magnetic Declination Table G; finding mean Declination; and the use of these tables.*
Pages 102-119;	*Tables H, J, K, I and II; are tables for Polaris observations. Instructions are given for their use in observing the star to determine a true meridian.*
Pages 120-137;	*Table III, Aximuths of the Secant; Table IV, Azimuths of the Tangent; Table V and VI, Offsets from the Tangent to the Parallel; Table VII, Correction of Random Lines; Tables VIII and IX, Length of a Degree of Latitude and Degree of Longitude. Table X, Convergency of Meridians. Instructions for use of these table and related subject matter is discussed.)*

67. The results of any new and satisfactory observation sent to the Superintendent of the Coast and Geodetic Survey will be duly credited in a subsequent publication.

SPECIMEN FIELD NOTES.

NO. 1.

TITLE PAGE.

[See Plate II.]

FIELD NOTES

OF THE SURVEY OF THE

THIRD STANDARD PARALLEL NORTH

THROUGH

Ranges Nos. 21, 22, 23, and 24 East

OF THE

PRINCIPAL BASE AND MERIDIAN

IN THE

STATE OF MONTANA,

AS SURVEYED BY

RICHARD ROODS,

U. S. DEPUTY SURVEYOR,

UNDER HIS CONTRACT NO. 97,
DATED JULY 10, 1890.

Survey commenced August 22, 1890.

Survey completed August 29, 1890.

[Second page.]

NAMES AND DUTIES OF ASSISTANTS.

PETER LONG.....Chainman.
JOHN SHORT.....Chainman.
ELI MARKER.....Chainman.
WILLIAM TALLY.....Chainman.
LEWIS LINK.....Chainman.
HENRY CLAY.....Moundman.
WILLIAM STONE.....Moundman.
ADAM DULL.....Axman.
JAMES BANNER.....Flagman.

[Third Page.]

PRELIMINARY OATHS OF ASSISTANTS.

We, Peter Long, John Short, Eli Marker, and William Tally, do solemnly swear that we will well and faithfully execute the duties of chainmen; that we will level the chain upon even and uneven ground, and plumb the tally pins, either by sticking or dropping the same; that we will report the true distances to all notable objects, and the true lengths of all lines that we assist in measuring, to the best of our skill and ability, and in accordance with instructions given us, in the survey of the Third Standard Parallel North, through Ranges Nos. 21, 22, 23, and 24 East, of the Principal Base and Meridian, in the State of Montana.

PETER LONG, *Chainman*
JOHN SHORT, *Chainman*
ELI MARKER, *Chainman.*
WILLIAM TALLY, *Chainman.*

Subscribed and sworn to before me this second day of August, 1890.
[SEAL.] WILLIAM MARTIN,
Notary Public.

We, Henry Clay and William Stone, do solemnly swear that we will well and truly perform the duties of moundmen, in the establishment of corners, according to the instructions given us, to the best of our skill and ability, in the survey of the Third Standard Parallel North, through Ranges Nos. 21, 22, 23, and 24 East, of the Principal Base and Meridian, in the State of Montana.

HENRY CLAY, *Moundman*
WILLIAM STONE, *Moundman.*

Subscribed and sworn to before me this second day of August, 1890.
[SEAL.] WILLIAM MARTIN,
Notary Public.

We, George Sharp and Adam Dull, do solemnly swear that we will well and truly perform the duties of axmen, in the establishment of corners and other duties, according to instructions given us, and to the best of our skill and ability, in the survey of the Third Standard Parallel North, through Ranges Nos. 21, 22, 23, and 24 East, of the Principal Base and Meridian, in the State of Montana.

GEORGE SHARP, *Axman*
ADAM DULL, *Axman.*

Subscribed and sworn to before me this second day of August, 1890.
[SEAL.] WILLIAM MARTIN,
Notary Public.

I, James Banner, do solemnly swear that I will well and truly perform the duties of flagman, according to instructions given me, to the best of my skill and ability, in the survey of the Third Standard Parallel North, through Ranges Nos. 21, 22, 23, and 24 East, of the Principal Base and Meridian, in the State of Montana.

JAMES BANNER, *Flagman.*

Subscribed and sworn to before me this second day of August, 1890.
[SEAL.] WILLIAM MARTIN,
Notary Public.

I, Lewis Link, do solemnly swear that I will well and faithfully execute the duties of chainman; that I will level the chain upon even and uneven ground, and plumb the tally pins, either by sticking or dropping the same; that I will report the true distances to all notable objects, and the true length of all lines that I assist in measuring, to the best of my skill and ability, and in accordance with instructions given me, in the survey of the Third Standard Parallel North, through Ranges Nos. 23 and 24 East, of the Principal Base and Meridian, in the State of Montana.
LEWIS LINK, *Chainman.*

Subscribed and sworn to before me this twenty-seventh day of August, 1890.
[SEAL.] RICHARD ROODS,
U. S. Deputy Surveyor.

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Third Standard Parallel North, through Range 21 East.

Chains.	
	Survey commenced August 22, 1890, and executed with a W. & L. E. Gurley light mountain transit, No. _____; the horizontal limb having two double verniers placed opposite to each other and reading to 30″ of arc.
	The instrument was examined, tested on the true meridian at Helena, found correct, and was approved by the surveyor general for Montana, August 1, 1890.
	I begin at the standard corner of townships 13 north, ranges 20 and 21 east, which is a sandstone, 8 x 7 x 5 ins. above ground, firmly set, and marked and witnessed as described by the surveyor general.
	At a point 3.39 ft.[68] south of said standard corner, in latitude 45° 34′.5 N., longitude 107° 54′ W.,[69] at 9^{h}. 19.7^{m}. p. m., by my watch, which is 2 minutes fast of local mean time, I observe Polaris at *eastern elongation*, in accordance with instructions[70] in the Manual, and mark the line thus determined, by a tack driven in a wooden plug set in the ground, five chains north of my station.
	August 22, 1890.
	August 23, 1890: At 6 a. m., I lay off the azimuth of Polaris, 1° 49′.6, to the west, and mark the TRUE MERIDIAN thus determined, by cutting a mark on a stone firmly set in the ground, west of the point established last night; the *magnetic* bearing of said true meridian is N. 18° 13′ W., which reduced by the table on page 100 of the Manual, gives the *mean magnetic declination,* 18° 09′ east.
	At this station (i. e., the point 3.39 ft. S. of the standard cor.), I turn off from the *true meridian*, an angle[71] of 89° 57′ 20″.9 toward the east, and run
	N. 89° 57′ E. on the secant, S. of sec. 31.
	Over gently rolling prairie.
28.10	Indian trail, bears N. 28° E. and S. 28° W.
	Difference between measurements of 40.00 chs., by two sets of chainmen, is 4 lks.; position of middle point
	By 1st set, 40.02 chs.
	By 2nd set, 39.98 chs.; the mean of which is
40.00	N. 1.53 ft. from the secant,
	Set a limestone, 20 x 8 x 5 ins., 15 ins. in the ground, for standard ¼ sec. cor., marked S. C. ¼ on N. face; dig pits 18 x 18 x 12 ins., E. and W. of stone, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.
	Samuel Somer's house bears N. 65° E.
54.10	Leave prairie, enter Somer's field, bears N. and S.
71.55	Leave field, enter prairie, bears N. and S.; field extends N. to Somer's house, and S. about 15 chs.
	Difference between measurements[72] of 80.00 chs. by two sets of chainmen, is 6 lks.; position of middle point
	By 1st set, 79.97 chs.
	By 2nd set, 80.03 chs.; the mean of which is
80.00	Set a limestone, 24 x 9 x 6 ins., 18 ins. in the ground, for standard cor. of secs 31 and 32,[73] marked S. C. on N., with 5 grooves on E. and 1 groove on W. faces; dig pits 24 x 18 x 12 ins., crosswise on each line, E. and W., 3 ft., and N. of stone, 7 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, N. of cor.
	Samuel Somer's house bears N. 38° W.
	Land, gently rolling prairie.
	Soil, sandy loam; 1st rate.
	No timber.

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Third Standard Parallel North, through Range 21 East—Continued.

Chains.	
	N. 89° 58′ E. on the secant, through sec. 32.
	Over gently rolling prairie.
3.20	Road from Lake City to Ashland, bears N. 30° W. and S. 30° E.
12.40	Leave prairie, bears N. 25° W. and S. 25° E.; begin descent.
17.50	Pine Creek, 50 lks. wide, 40 ft. below prairie, course S. 20° E.; clear water 5 ft. deep; rapid current, gravelly bottom; bank 10 ft. high.
19.40	Top of bluff bank 25 ft. high, bears N. 20° W. and S. 20° E.; enter heavy pine timber and begin steep ascent, over stony ground, sloping N. W.
	Difference between measurements of 40.00 chs., by two sets of chainmen, is 24 lks.; position of middle point
	By 1st set, 39.88 chs.
	By 2nd set, 40.12 chs.; the mean of which is
40.00	S. 1.19 ft. from the secant,
	Set a granite stone, 14 x 8 x 6 ins., 9 ins. in the ground, for standard ¼ sec. cor., marked S. C. ¼ on N. face; from which
	A pine 16 ins. diam., bears N. 37½° E., 48 lks. dist., marked S. C. ¼ S. B. T.
	A pine, 14 ins. diam., bears N. 42° W., 51 lks. dist., marked S. C. ¼ S. B. T.
54.00	Leave heavy timber, bears N. and S.
74.00	Top of high granite ridge, 320 ft. above Pine Creek, bears N. E. and S. W.
	Difference between measurements of 80.00 chs., by two sets of chainmen, is 22 lks.; position of middle point
	By 1st set, 80.11 chs.
	By 2nd set, 79.89 chs.; the mean of which is
80.00	S. 2.04 ft. from the secant,

68. Interpolated by simple proportion for the given latitude, from the second column of Table III, page 121.

69. The latitude and longitude will be given by the surveyor general, in his special written instructions.

70. See directions for making the observation, page 105.

71. This angle is interpolated by simple proportion, for the given latitude, from the column headed "3 miles" in Table IV. But hereafter the exact angle required will be changed to the nearest angle that can be set off or read on the instrument used.

72. The measurements are counted from the beginning of the mile; 40.00 chs. are measured from the last ¼ sec. cor.; see "Base Line," par. 6, page 51.

73. At this point, the secant intersects the standard parallel. See Plate II, figs. 1 and 2.

Set a granite stone, 20 x 8 x 4 ins., 15 ins. in the ground, for Standard Cor. of secs. 32 and 33, marked S. C., on N., with 4 grooves on E. and 2 grooves on W. faces; and raise a mound of stone, 2 ft. base, 1½ ft. high, N. of cor. Pits impracticable.
NOTE.—I erect a signal at this corner for a test sight from one of the high points visible to the east.
Land, mountainous.
Soil, stony; 4th rate.
Timber, pine and fir.
Mountainous or heavily timbered land, 60.60 chs.

August 22, 1890.

NOTE.—The sky was overcast during the entire night. Polaris not visible.

August 23, 1890.

N. 89° 59′ E. on the secant, through sec. 33.
Over stony ground on top of ridge.
8.10 Begin descent over rocky ground, sloping S. E.
Difference between measurements of 40.00 chs., by two sets of chainmen, is 18 lks.; position of middle point
By 1st set, 39.91 chs.
By 2nd set, 40.09 chs.; the mean of which is
40.00 S. 2.55 ft. from secant,
Set a granite stone, 19 x 8 x 7 ins., 14 ins. in the ground, for standard ¼ sec. cor., marked S. C. ¼ on N. face; and raise a mound of stone, 2 ft. base, 1½ ft. high, N. of cor. Pits impracticable.
This cor. is 40 ft. below top of ridge.
76.30 Enter scattering, stunted cedars, bearing N. and S.
Difference between measurements of 80.00 chs., by two sets of chainmen, is 16 lks.; position of middle point
By 1st set, 80.08 chs.
By 2nd set, 79.92 chs.; the mean of which is
80.00 S. 2.72 ft. from the secant,
Set a granite stone, 19 x 8 x 6 ins., 15 ins. in the ground, for standard cor. of secs. 33 and 34, marked S. C. on N., with 3 grooves on E. and W. faces; from which
A cedar, 6 ins. diam., bears N. 22½° E., 32 lks. dist., marked T. 13 N., R. 21 E., S. 34, B. T.
A cedar, 8 ins. diam., bears N. 41¼° W., 45 lks. dist., marked T. 13 N., R. 21 E., S. 33, B. T.

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Third Standard Parallel North, through Range 21 East—Continued.

Chains.
This cor. is 100 ft. below top of ridge.
Land, mountainous.
Soil, rocky; 4th rate.
Timber, scattering cedars.
Mountainous land, 80.00 chs.

East, on the secant, through sec. 34.
Descend eastern slope through scattering cedars.
16.10 Begin very steep descent to Black River Canon, bears N. E. and S. W.
20.00 Foot of descent, 300 ft. below last cor., bears N. E. and S. W.
20.68 To right bank of Black River, course S. 28° W.
S. 2.64 ft.[74] from the secant,
Set a granite stone 19 x 8 x 5 ins., 15 ins. in the ground, for meander cor. on S. bdy. sec. 34, marked S. C. on N., and
M. C. on E. faces; dig a pit, 3 ft. sq., 8 ft. W., of of stone; and raise a mound of earth, 4 ft. base, 2 feet high, W. of cor.
To find the distance across the river, I set a flag on the secant line, on east bank; then measure a base, N. 6.20 chs., to a point from which the flag bears S. 43° 10′ E.; which gives for the distance, tan. 43° 10′ x base, or 0.938 x 6.20 chs. = 5.82 chs.
26.50 To left bank of Black River, course S. W. Banks, 12 ft. high; rapid current over stony bottom; clear water, about 5 ft. deep:
S. 2.64 ft.[74] from the secant,
Set a granite stone, 17 x 9 x 7 ins., 12 ins. in the ground, for meander cor. on S. bdy. sec. 34, marked S. C. on N., and
M. C. on W. faces; dig a pit, 3 ft. sq., 8 ft. E. of stone; and raise a mound of earth, 4 ft base, 2 ft. high, E. of cor.
Thence, up steep ascent through scattering cedars.
Difference between the measurements of 40.00 chs., by the two sets of chainmen, is 20 lks.; position of middle point
By 1st set, 39.90 chs.
By 2nd set, 40.10 chs.; the mean of which is
40.00 S. 2.55 ft. from the secant:
A cedar, 7 ins. diam., for standard ¼ sec. cor., I mark S. C., ¼ S. on N. side; from which
A cedar, 4 ins. diam., bears N. 31° E., 20 lks. dist., marked S. C., ¼ S., B. T.
A cedar, 6 ins. diam., bears N. 64¼° W., 18 lks. dist., marked S. C., ¼ S., B. T.
Thence up side of ridge, sloping S. W.
40.40 Leave scattering cedars, bearing N. E. and S. W.
Difference between measurements of 80.00 chs., by two sets of chainmen, is 18 lks.; position of middle point
By 1st set, 80.09 chs.
By 2nd set, 79.90 chs.; the mean of which is
80.00 S. 2.04 ft. from the secant,
Set a granite stone, 21 x 8 x 5 ins., 16 ins. in the ground, for standard cor. of secs. 34 and 35, marked S. C. on N., with 2 grooves on . and 4 grooves on W. faces; and raise a mound of stone, 2 ft. base, 1½ ft. high, N. of cor. Pits impracticable.
This cor. is on top of a ridge, about 300 ft. above Black River.
Land, mountainous.
Soil, rocky; 4th rate.
Timber, scattering cedars.
Mountainous land, 80.00 chs.

August 23, 1890.

NOTE.—Continuous rain since afternoon of August 23; observations on Polaris not possible.
August 25, 1890, 7 a. m.
S. 89° 59′ E. on the secant, through sec. 35.

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Third Standard Parallel North, through Range 21 East—Continued.

Chains.
Descend over rough, stony ground sloping S.
Difference between measurements of 40.00 chs., by two sets of chainmen, is 14 lks.; position of middle point
By 1st set, 40.07 chs.
By 2nd set, 39.93 chs.; the mean of which is
40.00 S. 1.19 ft. from the secant,
Set a granite stone, 15 x 8 x 5 ins., 10 ins. in the ground, for standard ¼ sec. cor., marked S. C. ¼ on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of stone, 3 ft. dist.; and raise a mound of earth 3½ ft. base, 1½ ft. high, N. of cor.
This cor. is about 280 ft. below top of ridge.
Descend abruptly, 90 ft.
50.10 Bottom of ravine, 10 lks. wide, course S. 20° W.; water in holes; thence, steep ascent over ground sloping W.

74. These distances may be found by taking the mean of the offsets at the preceding sec., and following ¼ sec. cor.

56.40	Enter pine timber, bears N. E. and S. W.
56.58	A pine, 16 ins. diam., on line, I mark with 2 notches on E. and W. sides.
68.40	Leave pine timber, bears N. E. and S. W.
68.50	Alexander Selkirk's house, bears S., 8.40 chs. dist.
73.50	Road, bears N. and S.
	Difference between measurements of 80.00 chs., by two sets of chainmen, is 16 lks.; position of middle point By 1st set, 79.92 chs. By 2nd set, 80.08 chs.; the mean of which is
80.00	[75]Set a limestone, 20 x 8 x 6 ins., 15 ins. in the ground, for standard cor. of secs. 35 and 36, marked S. C. on N., with 1 groove on E. and 5 grooves on W. faces; dig pits, 24 x 18 x 12 ins., crosswise on each line, E. and W., 3 ft., and N. of stone, 7 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, N. of cor. This cor. is about 60 ft. above ravine.
	Land, mountainous.
	Soil, stony; 4th rate.
	Timber, pine.
	Mountainous land, 80.00 chs.

	S. 89° 58′ E. on the secant, S. of sec. 36.
	Ascend over ground sloping W.
12.70	Enter heavy oak timber, bears N. and S.
28.30	Top of ridge, 80 ft. above last cor., bears N. and S.
38.50	Leave heavy oak timber, bears N. and S.
	Difference between measurements of 40.00 chs., by two sets of chainmen is 14 lks.; position of middle point By 1st set, 40.07 chs. By 2nd set, 39.93 chs.; the mean of which is
40.00	N. 1.53 ft. from the secant,
	Set a limestone, 16 x 7 x 5 ins., 11 ins. in the ground, for standard ¼ sec. cor., marked S. C. ¼ on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of stone, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.
52.20	Road, bears N. 70° E. and S. 60° W.
68.10	Creek, 20 lks. wide, course S. 50° W.; ascend over ground sloping W., about 90 ft.
	Difference between measurements of 80.00 chs., by two sets of chainmen, is 18 lks.; position of middle point By 1st set, 79.91 chs. By second set, 80.09 chs.; the mean of which is
80.00	N. 3.39 ft. from the secant,
	Set a granite stone, 20 x 7 x 67 ins., 15 ins. in the ground for standard cor. of Tps. 13 N., Rs. 21 and 22 E., marked[76] S. C., 13 N. on N., 22 E. on E., and 21 E. on W. faces; with 6 grooves on N. E., and W. faces; dig pits, 30 x 24 x 12 ins., crosswise on each line, E. and W., 4 ft.; and N. of stone, 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, N. of cor.
	Land, mountainous.

(Pages 146 through 160 deleted. They contain field notes and final oaths for the survey of the Third Standard Parallel North, through Ranges 22, 23 and 24 East by Secant, Tangent offset and Solar transit methods. The vein and style of notes are the same.)

75. The secant intersects the standard parallel 1 mile from end of secant, and at the point for the corner of secs. 35 and 36. See Plat II, figs. 1 and 2.

76. See "STANDARD TOWNSHIP CORNERS," page 23.

SPECIMEN FIELD NOTES.

No. 2.

TITLE PAGE.

(See Plate III.)

FIELD NOTES

OF THE SURVEY OF THE

SIXTH GUIDE MERIDIAN EAST

THROUGH

Townships No. 13 North
Between Ranges Nos. 24 and 25 East

OF THE

PRINCIPAL BASE AND MERIDIAN

IN THE

STATE OF MONTANA,

AS SURVEYED BY

RICHARD ROODS,

U. S. DEPUTY SURVEYOR,
UNDER HIS CONTRACT No. 97,
DATED JULY 10, 1890.

Survey commenced August 29, 1890.

Survey completed August 30, 1890.

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(Pages 162 and 163 deleted. They contain the sample index and the preliminary oaths of assistants.)

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6th Guide Meridian East, through Tps. 13 N., between Rs. 24 and 25 E.

Chains.	Survey commenced August 29, 1890, and executed with a W. & L. E. Gurley light mountain transit, No. _____, the horizontal limb being provided with two opposite verniers reading to 30″ of arc. I begin at the Standard Corner of Township 13 North, Ranges 24 and 25 East, which I established August 29, 1890.[77] Latitude 45° 34′.5 N., longitude 107° 24′ W.

77. See footnote, page 154.

At this corner, at 8h 54m p. m., by my watch, which is 3m 49s fast of local mean time, I observe Polaris at eastern elongation in accordance with instructions in the manual,[39] and mark the point in the line thus determined by a tack driven in a wooden plug set in the ground, 5.00 chs. north of my station.

August 29, 1890.

August 30: At 6h 30m a. m., I lay off the azimuth of Polaris, 1° 49′.5 to the *west*, and mark the TRUE MERIDIAN thus determined by a cross on a stone firmly set in the ground, west of the point established last night.

The *magnetic bearing*[78] of the true meridian is N. 18° 05′ W., which reduced by the table on page 100 of the Manual gives the *mean mag. decl. 18° 02′ E.*

From the standard cor. I run

North, bet. Secs. 31 and 36.

Descend over ground sloping N. W.

2.60 Creek 10 lks. wide in ravine, 45 ft. below the Tp. cor., course N. 32° W.

7.50 To edge of table land, bears N. E. and S. W.; thence over level land.

17.40 Bluff bank, bears N. 58° W. and S. 58° E.; descend abruptly 40 ft.

19.00 Bottom of ravine, course S. 58° E.; ascend 50 feet to

22.00 Edge of table land, bears S. 58° E. and N. 58° W.; thence over level land.

Difference between measurements of 40.00 chs., by two sets of chainmen, is 18 lks.; position of middle point

By 1st set, 40.09 chs.

By 2nd set, 39.91 chs.; the mean of which is

40.00 Set a limestone 16 x 7 x 5 ins., 11 ins. in the ground, for ¼ sec. cor., marked ¼ on W. face, and raise a mound of stone, 2 ft. base, 1½ ft. high, W. of cor.

42.60 Stream, 6 lks. wide, in ravine 15 ft. deep, course N. 60° W.

47.00 Enter heavy oak timber, bears E. and W.

53.00 An oak, 30 ins. diam., on line, I mark with 2 notches on E. and W. sides.

55.20 Creek, 20 lks. wide, 1 ft. deep, course N. 83° W.

55.40 Right bank of creek, begin very steep rocky ascent.

60.00 Top of ridge, 250 ft. above creek, bears N. 80° W. and S. 80° E.

64.00 Begin descent.

Difference bet. measurements of 80.00 chs., by two chainmen, is 22 lks.; position of middle point

By 1st set, 79.89 chs.

By 2nd set, 80.11 chs.; the mean of which is

80.00 The point for sec. cor., 150 ft. below top of ridge, falls on a flat rock in place, 10 ft. E. and W. by 6 ft. N. and S., on which I

Cut a cross (x) at the exact cor. point, for cor. of secs. 25, 30, 31, and 36, marked with 5 grooves on N and 1 groove on S. sides; from which

An oak, 10 ins. diam., bears N. 22° E., 54 lks. dist., marked T. 13 N., R. 25 E., S. 30, B. T.

A dogwood, 5 ins. diam., bears S. 64½° E., 40 lks. dist., marked T. 13 N., R. 25 E., S. 31, B. T.

An ash, 13 ins. diam., bears S. 51° W., 37 links dist., marked T. 13 N., R. 34 E., S. 36, B. T.

An oak, 9 ins. in diam., bears N. 34° W., 42 lks. dist., marked T. 13 N., R. 24 E.,S. 25, B. T.

Land, level and mountainous.

Soil, Gravel and rock; 4th rate.

Timber, oak.

Mountainous or heavily-timbered land, 33.00 chs.

78. See footnote, page 106.

Chains.

North, bet. secs. 25 and 30.

Descend through heavy oak timber.

2.00 Precipitous descent of 60 ft., down which I can not chain; set a flag on line at foot of precipice; measure a base east 4 chs. to a point, from which the flag bears N. 68° W.; which gives for the distance (by traverse table) 1.50 chs., which, added to 2.00 chs., makes

3.50 To foot of precipice, bears E. and W.; thence, descend.

8.50 Leave heavy oak timber, bears E. and W.

13.00 Begin abrupt descent.

17.10 To creek, 10 lks. wide, pure water, course N. 70° W.; 240 ft. below top of ridge. Ascend 20 ft. to

20.90 Edge of level plain, bears N. 80° W. and S. 80° E.

Difference bet. measurements of 40.00 chs., by two sets of chainmen, is 20 lks.; position of middle point

By 1st set, 39.90 chs.

By 2nd set, 40.10 chs.; the mean of which is

40.00 Set a cedar post, 3 ft. long, 3 ins. sq., with marked stone, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S., on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.

Diff. between measurements of 80. 00 chs., by two sets of chainmen, is 6 lks.; position of middle point

By 1st set, 80.03 chs.

By 2nd set, 79.97 chs.; the mean of which is

80.00 Set a cedar post, 3 ft. long, 4 ins. sq., with marked stone, 24 ins. in the ground, for cor. of secs. 19, 24, 25, and 30, marked

T. 13 N., S. 19 on N. E.

R. 25 E., S. 30 on S. E.

S. 25 on S. W., and

R. 24 E., S. 24 on N. W. faces; with 4 notches on N. and 2 notches on S. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.

Land, mountainous and level.

Soil, stony and sandy; 4th rate.

Timber, oak.

Mountainous or heavily-timbered land, 20.90 chs.

North, bet. secs. 19 and 24.

Over descending ground.

35.00 Ravine, 20 ft. wide, 8 ft. deep, course E.

Difference between measurements of 40.00 chs., by two sets of chainmen, is 6 lks.; position of middle point

By 1st set, 39.97 chs.

By 2nd set, 40.03 chs.; the mean of which is

40.00 Set a cedar post, 3 ft. long, 3 ins. sq., with marked stone, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S., on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.

40.30 Enter willow brush, bears E. and W.

44.00 Leave willow brush, bears E. and W.; Ford's Creek, 22 lks. wide; banks, 3 ft. high; pure water, gentle current; course E.

48.50 Ford's Creek, 24 lks. wide, course W.

55.00 Ford's Creek, 26 lks. wide, course N. 70° E.

61.70 Ravine, 15 ft. wide, 6 ft. deep, course E.

Difference between measurements of 80.00 chs., by two sets of chainmen, is 12 lks.; position of middle point

By 1st set, 80.06 chs.

By 2nd set, 79.94 chs.; the mean of which is

80.00 Deposit a quart of charcoal, 12 ins. in the ground, for cor. of secs. 13, 18, 19, and 24; dig pits, 18 x 18 x 12 ins., in each sec., 4 ft. dist.; and raise a mound of

earth, 4 ft. base, 2 ft. high, over deposit.
In S. E. pit drive a stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
T. 13 N., S. 18 on N. E.,
R. 25 E., S. 19 on S. E.,
S. 24 on S. W., and
R. 24 E., S. 13 on N. W. faces; with 3 notches on N. and S. edges.

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6th Guide Meridian East, through Tps. 13 N., etc.—Continued.

Chains.	
	Land, nearly all level.
	Soil, sandy loam and clay; 1st stand 4th rate.
	No timber.
	North, bet. secs. 13 and 18.
	Over nearly level plain; gradually ascend.
29.00	Begin ascent to ridge, bears E. and W.
34.10	Top of ridge, 60 ft. above plain, bears E. and W.
35.20	Begin descent from ridge.
37.50	Foot of descent; branch, 10 lks. wide in ravine 5 ft. deep; course E. ascend.
	Difference between measurements of 40.00 chs., by two sets of chainmen, is 16 lks.; position of middle point
	By 1st set, 39.92 chs.
	By 2nd set, 40.08 chs.; the mean of which is
40.00	Set a granite stone, 15 x 8 x 5 ins., 10 ins. in the ground, for ¼ sec. cor., marked ¼ on W. face; and raise a mound of stone, 2 ft. base, 1½ ft. high, W. of cor. Pits impracticable.
47.00	Begin ascent of ridge, bears E. and W.
56.50	Top of ridge, 400 ft. above plain, bears E. and W.
63.00	Begin descent.
	Difference between measurements of 80.00 chs., by two sets of chainmen, is 22 lks.; position of middle point
	By 1st set, 80.11 chs.
	By 2nd set, 79.89 chs.; the mean of which is
80.00	Set a granite stone, 15 x 8 x 6 ins., 10 ins. in the ground, for cor. of secs. 7, 12, 13, and 18, marked with 2 notches on N. and 4 notches on S. edges; and raise a mound of stone, 2 ft. base, 1½ ft. high, W. of cor. Pits impracticable.
	This cor. stands on a bench, about 350 ft. below top of ridge.
	Land, level and mountainous.
	Soil, sandy loam and rocky; 2nd and 4th rate.
	No timber.
	Mountainous land, 11.50 chs.
	North, bet. secs. 7 and 12.
	Over level land.
2.00	Begin ascent, bears E. and W.
7.50	Top of low ridge, 20 ft. above sec. cor., bears E. and W.; thence, descend gradually.
37.00	Branch, 6 lks. wide, in ravine, 10 ft. deep, course E.
	Difference between measurements of 40.00 chs., by two sets of chainmen, is 12 lks.; position of middle point
	By 1st set, 39.94 chs.
	By 2nd set, 40.06 chs.; the mean of which is
40.00	Set a cedar post, 3 ft. long, 3 ins. sq., with a marked stone, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S. on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.
	Thence over plain gradually ascending.
71.00	Begin descent to creek, bears E. and W.
74.00	Foot of descent; creek, 12 lks. wide, course E. Ascend.
79.50	To top of ascent and edge of level plain, bears E. and N. 75° W.
	Difference between measurements of 80.00 chs., by two sets of chainmen, is 14 lks.; position of middle point
	By 1st set, 80.07 chs.
	By 2nd set, 79.93 chs.; the mean of which is
80.00	Set a cedar post, 3 ft. long, 11 ins. sq., with marked stone, 24 ins. in the ground, for cor. of secs. 7, 12, 13, and 18, marked
T. 13 N., S. 6 on N. E.,
R. 25 E., S. 7 on S. E.,
S. 12 on S. W., and
R. 24 E., S. 1 on N. W. faces; with 1 notch on N. and 5 notches on S. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.

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6th Guide Merdian East, through Tps. 13 N., etc.—Concluded.

Chains.	
	Land, nearly level.
	Soil, sandy loam; 2nd rate.
	No timber.
	North, bet. secs. 1 and 6.
	Over level land.
18.00	Branch 4 lks. wide, in ravine 6 ft. deep, course E.
	Difference between measurements of 40.00 chs., by two sets of chainmen, is 6 lks.; position of middle point
	By 1st set, 39.97 chs.
	By 2nd set, 40.03 chs; the mean of which is
40.00	Deposit a marked stone, 12 ins. in the ground, for ¼ sec. cor., dig pits, 18 x 18 x 12 ins., N. and S. of cor., 4 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, over deposit.
	In S. pit drive a cedar stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked ¼ S. on W. face.
61.00	Creek, 12 lks. wide, course S. 23° E.
	Difference between measurements of 80.00 chs., by two sets of chainmen, is 4 lks.; position of middle point
	By 1st set, 80.02 chs.
	By 2nd set, 79.98 chs.; the mean of which is
80.00	Set a cedar post, 3 ft. long, 4 ins. sq., with quart of charcoal, 24 ins. in the ground, for cor. of Tps. 13 and 14 N., Rs. 24 and 25 E., marked
T. 14 N., S. 31 on N. E.,
R. 25 E., S. 6 on S. E.,
T. 13 N., S. 1 on S. W., and
R. 24 E., S. 36 on N. W. faces; with 6 notches on each edge; dig pits, N., E., and W., 4 ft. and S. of post, 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, S. of cor.
	Land, level.
	Soil, sandy loam; 1st rate.
	No timber.
	August 30, 1890.

GENERAL DESCRIPTION.

Townships 13 N., Ranges 24 and 25 East, are generally rolling table-lands, producing an abundant growth of grass, and there is some good land along Ford's Creek and its tributaries. About two miles east of the corner of Tps. 13 and 14 N., Rs. 24 and 25 E., is a lake some two and half miles long by two miles wide, lying in Tps. 13 and 14 N., R. 25 E.

RICHARD ROODS,
U. S. Deputy Surveyor.

AUGUST 30, 1890.

(Page 168 deleted. Contains final oaths.)

SPECIMEN FIELD NOTES.

No. 3.

TITLE PAGE.

[See Plate III.]

FIELD NOTES

OF THE SURVEY OF THE

EAST AND NORTH BOUNDARIES

OF

TOWNSHIP NO. 13 NORTH, RANGE NO. 21 EAST

OF THE

PRINCIPAL BASE AND MERIDIAN

IN THE

STATE OF MONTANA,

AS SURVEYED BY

RICHARD ROODS,

U. S. DEPUTY SURVEYOR,

UNDER HIS CONTRACT No. 97,
DATED JULY 10, 1890.

Survey commenced September 8, 1890.

Survey completed September 13, 1890.

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(Pages 170 and 171 deleted. They contain the sample index and preliminary oaths of assistants.)

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East boundary of T. 13 N., R. 21 E.

Chains.	
	Survey commenced September 8, 1890, and executed with a Young & Sons light mountain transit, No. _____, with solar attachment. The horizontal limb is provided with two double verniers placed opposite to each other, reading to single minutes of arc, which is also the least count of the verniers of the latitude and declination arcs.
	The instrument was examined, tested on the true meridian at Helena, found correct, and was approved by the surveyor general for Montana, September 1, 1890.
	I examine the adjustments of the transit, and correct the level and collimation errors; then, to test the solar apparatus by comparing its indications, resulting from solar observations made during a. m. and p. m. hours, with a true meridian determined by observations on Polaris, I proceed as follows:
	September 8: At the standard corner of Tps. 13 N., Rs. 21 and 22° E., latitude 45° 34′.5 N., longitude 107° 46′ W., at 4^h 57^m p. m., l. m. t., I set off 45° 35′ on the lat. arc; 5° 29′ N. on the decl. arc (these settings being the nearest practicable to the true minutes and fractions thereof required); determine with the solar a *true meridian*; and mark a point thereof on a stone set firmly in the ground, 5.00 chs. N. of the cor.
	At 8^h 15^m.5 p. m., by my watch, which is 4^m 23^s fast of l. m. t., I observe Polaris at eastern elongation, in accordance with Manual of Instructions,[39] and mark a point on the line thus determined on a plug driven in the ground, 5.00 chs. N. of my station.
	September 8, 1890.
	September 9: at 6^h 30^m a. m., l. m. t., I lay off the azimuth of Polaris, 1° 49′.6, to the west and mark the TRUE MERIDIAN thus determined, by cutting a small groove in the stone set September 8, on which the true meridian falls 0.25 ins. *west* of the mark determined by the solar.
	At 6^h 58^m a. m., l. m. t., I set off 45° 35′ on the lat. arc; 5° 15′ N., on the decl. arc; and mark a point in the *true meridian determined* with the solar, by a cross on the stone already set 5.00 chs. N. of my station; this mark falls 0.3 ins. *west* of the *true meridian established by the Polaris observation.*
	The solar apparatus, by p. m. and a. m. observations, defines positions for *true meridians,* respectively about 0′ 13″ *east* and 0′ 16″ *west* of the true meridian established by the Polaris observations; therefore, I conclude the adjustments of the instrument are satisfactory
	The *magnetic bearing* of the true meridian,[79] at 7 a. m., is N. 18° 10′ W.; the angle thus determined, reduced by the table, page 100, gives the *mean mag. decl. 18° 07′ E.*
	I begin at the standard corner of Tps. 13 N., Rs. 21 and 22 E., which I established August 25, 1890.
	Thence I run
	North, bet. secs. 31 and 36.
7.00	Descend abruptly over stony ground, sloping N. W.
10.00	Creek, 80 ft. below Tp. cor., 15 lks. wide, clear water, course S. 75° W.; ascend.
19.00	Road, bears N. 60° E. and S. 60° W.
24.50	Top of ridge, 200 ft. above creek, bears E. and W.
31.00	Begin descent.
34.00	Foot of descent, 150 ft. below top of ridge, bears E. and W. Branch 2 lks. wide, clear water, course E. Thence over level land.
39.50	Begin descent.
40.00	Foot of descent, 30 ft. below bench, bears E. and W.; thence thence over level land.
43.00	Set a sandstone, 15 x 8 x 6 ins., 10 ins. in the ground, for ¼ sec. cor., marked ¼ on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of stone, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.
	Creek 10 lks. wide, pure water, 8 ins. deep, course E. Begin ascent.
49.50	Top of ridge, bears N. 70° E. and N. 80° W., 50 ft. above creek.
50.00	Begin descent.

79. See footnotes, pages 106 and 142.

East boundary of T. 13 N., R. 21 E.—Continued.

Chains.	
54.00	Branch 6 lks. wide, in ravine chs. wide, 30 ft. deep, course E.; thence, over level land.
62.50	Creek 12 lks. wide, 1 ft. deep, pure water, course S. 60° E.
73.00	Enter cedar timber, bears E. and W.
74.79	A cedar, 10 ins. diam., on line, I mark with 2 notches on N. and S. sides.
80.00	A cedar, 8 ins. diam., for cor. of secs. 25, 30, 31, and 36, I mark T. 13 N., S. 30 on N. E., R. 22 E., S. 31 on S. E., S. 36 on S. W., and R. 21 E., S. 25 on N. W. sides; with 5 notches on N. and 1 notch on S. sides; from which A cedar, 7 ins. diam., bears N. 30½° E., 20 lks. dist., marked T. 13 N., R. 22 E., S. 30, B. T. A cedar, 6 ins. diam., bears S. 63¼° E., 18 lks. dist., marked T. 13 N., R. 22 E., S. 31, B. T. A cedar, 9 ins. diam., bears S. 23¼° W., 21 lks. dist., marked T. 13 N., R. 21 E., S. 36, B. T. A cedar, 8 ins. diam., bears N. 64½° W., 19 lks. dist., marked T. 13 N., R. 21 E., S. 25, B. T. Land, mountainous and level. Soil, stony and loam; 2nd and 4th rate. Timber, cedar. Mountainous land, 54.00 chs.
	North, bet. secs. 25 and 30. Over level land, through cedar timber.
9.00	Creek 13 lks. wide, pure water, 1 ft. deep, gentle current, course S. 80° E.
20.40	Creek 15 lks. wide, pure water, 2 ft. deep, gentle current, course S. 70° E.
27.50	Leave cedar timber, begin ascent, bears S. 70° E. and N. 70° W.
39.50	Top of ascent of 40 ft., enter level plain, bears E. and W.
40.00	Set a cedar post, 3 ft. long, 3 ins. sq., with charred stake, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S. on W. face; dig pits, 18 x 17 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor. September 9: At this ¼ sec. cor. I set off 5° 9′ N., on the decl. arc; and at $11^h\ 57^m.1$ l. m. t., observe the sun on the meridian; the resulting lat. is 45° 36.0′ which is about 0.2′ greater than the proper lat.
75.00	Creek 12 lks. wide, pure water, 1 ft. deep, gentle current, course S. 80° E.
80.00	Set a cedar post, 3 ft. long, 4 ins. sq., with quart of charcoal, 24 ins. in the ground, for cor. of secs. 19, 24, 25, and 30; marked T. 13 N., S. 19 on N. E., R. 22 E., S. 30 on S. E., S. 25 on S. W., and R. 21 E., S. 24 on N. W. faces; with 4 notches on N. and 2 notches on S. edges; dig pits, 18 x 18 x 12 ins., in each sec. 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor. Land, level. Soil, sandy loam; 2nd rate. Timber, cedar.
	North, bet. secs. 19 and 24. Over level land.
6.00	Branch 4 lks. wide, course S. 70° E.; ascend.
17.00	Top of ridge, 40 ft. high, bears E. and W.
22.00	Begin descent.
36.50	Foot of descent, bears E. and W.; thence over level land.
40.00	Set a sandstone, 15 x 8 x 6 ins., 10 ins. in the ground, for ¼ sec. cor., marked ¼ on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of stone, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.
47.50	Creek 15 lks. wide, pure water, low banks, course N. 70° W.
64.00	Creek 16 lks. wide, pure water, low banks, course S. 65° E.

East boundary of T 13 N., R. 21 E.—Concluded.

Chains.	
80.00	Set a cedar post, 3 ft. long, 4 ins. sq., with charred stake, 24 ins. in the ground, for cor. of secs. 13, 18, 19, and 24, marked T. 13 N., S. 18 on N. E., R. 20 E., S. 19 on S. E., S. 24 on S. W., and R. 21, S. 13 on N. W. faces; with 3 notches on N. and S. edges; dig pits, 18 x 18 x12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor. Land, level. Soil, sandy loam; 1st rate. No timber. September 9, 1890.
	September 10: At $7^h\ 56.8^m$ a. m., I set off 45° 37′ on the lat. arc; 4° 47′ N., on the decl. arc; and determine a true meridian with the solar, at the cor. of secs. 13, 18, 19, and 24. Thence I run North, bet. secs. 13 and 18.
40.00	Set a cedar post, 3 ft. long, 3 ins. sq., with marked stone, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S. on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.
80.00	Set a limestone, 20 x 8 x 4 ins., 15 ins. in the ground, for cor. of secs. 7, 12, 13, and 18, marked with 2 notches on N. and 4 notches on S. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor. Land, level. Soil, sandy loam; 1st rate. No timber.
	North, bet. secs. 7 and 12. Over level land.
40.00	Set a cedar post, 3 ft. long, 3ins. sq., with quart of charcoal, 24 ins. in the ground, for ¼ sec. cor. marked ¼ S., on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.
55.00	Creek, 8 lks. wide, in ravine 1 ch. wide, 20 ft. deep, course N. 60° E.
80.00	Set a limestone, 19 x 8 x 6 ins., 15 ins. in the ground, for cor. of secs. 1, 6, 7, and 12, marked with 1 notch on N. and 5 notches on S. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor. Land, level. Soil, sandy loam; 1st rate. No timber. September 10: At this cor. I set off 4° 44′ N. on the decl. arc; and at $11^h\ 56^m.8$ l. m. t., observe the sun on the meridian; the resulting lat. is 45° 39′, which is about 0′.1 more than the proper lat.
	North, bet. secs. 1 and 6.
32.50	Creek, 15 lks. wide, impure water, sluggish current, low muddy banks, course E.

40.00	Set a locust post, 3 ft. long, 3 ins. sq., with quart of charcoal, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S., on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3 ½ ft. base, 1½ ft. high, W. of cor.
80.00	Set a limestone, 15 x 8 x 7 ins., 10 ins in the ground, for cor. of Tps. 13 and 14 N., Rs. 21 and 22 E., marked with 6 notches on each edge; dig pits, 24 x 24 x 12 ins., on each line, N., E., and W.; 4 ft., and S. of stone, 8 ft. dist., and raise a mound of earth, 5 ft. base, 2 ½ ft. high, S. of cor.
	September 10, 1890.

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North boundary of T. 13 N., R. 21 E.

Chains.	
	September 11: At 7^h 56.4^m a. m., l. m. t.. I set off 45° 40′ on the lat. arc; 4° 25′ N., on the decl. arc; and determine a true meridian with the solar, at the cor. of Tps. 13 and 14 N., Rs. 21 and 22 E.
	Thence I run
	West on a random line, along the N. bdy. of Tp 13 N., R. 21 E., setting temp. ¼ sec. and sec. cors. at intervals of 40.00 chs.; and, at 479.25 chs., intersect the 5th Guide Meridian, 42 lks. N. of the cor. of Tps. 13 and 14 N., Rs. 20 and 21 E., which is a limestone, 5 x 8 x 6 ins. above ground, marked and witnessed as described by the surveyor general. The falling answers to a correction of 0° 03′, or 7 lks. S. per mile. counting from the N. E. cor. of the Tp.; therefore I run
	N. 89° 57′ E., bet. secs. 6 and 31.
	Over level land.
39.25	Set a cedar post, 3 ft. long, 3 ins. sq., with marked stone, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S., on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.
79.25	Set a limestone, 20 x 8 x 4 ins., 15 ins. in the ground, for cor. of secs. 5, 6, 31, and 32, marked with 5 notches on E. and 1 notch on W. edges; dig pits 18 x 18 x 2 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.
	Land, level.
	Soil, sandy loam; 1st rate.
	No timber.
	September 11, 1890.
	September 12: At _____^{h} _____^{m} a. m., l. m. t.; I set off 45° 40′ on the lat. arc; 4° 02′ N., on the decl. arc; and determine a true meridian with the solar, at the cor. of secs. 5, 6, 31, and 32.
	Thence I run
	N. 89° 57′ E., bet. secs. 5 and 32.
40.00	Set a juniper post, 3 ft. long, 3 ins. sq., with quart of charcoal, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S., on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft base, 1½ ft. high, N. of cor.
47.00	Creek 15 lks. wide, good water, sluggish current, course S. E.
80.00	Deposit a quart of charcoal, 12 ins. in the ground, for cor. of secs. 4, 5, 32, and 33; dig pits, 18 x 18 x 12 ins., in each sec., 4 ft dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, over deposit.
	In S. E. pit drive a cedar stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked T. 14 N., S. 33 on N. E., R. 21 E., S. 4 on S. E., T. 13 N., S. 5 on S. W., and S. 32 on N. W. faces; with 4 notches on E. and 2 notches on W. edges.
	Land, level.
	Soil, sandy loam; 1st rate.
	No timber.
	September 12: At this cor., I set off 4° 53′ N., on the decl. arc; and, at 11^h 5^m.1, l. m. t., observe the sun on the meridian; the resulting lat. is 45° 40′, which is about 0′.3 greater than the proper lat.
	September 12, 1890.
	N. 89° 57′ E., bet. secs. 4 and 33.
7.00	Branch, 4 lks. wide, course S. 35° W.
40.00	Set a limestone, 15 x 8 x 5 ins., 10 ins. in the ground, for ¼ sec. cor. marked ¼ on N. face; dig pits, 18 x 18 x 12 ins., E. and W., of stone, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.
55.00	Enter heavy oak timber, bears N. and S.
57.13	An oak, 38 ins. diam., on line, I mark with 2 notches on E. and W. sides.
68.00	Branch, 3 lks. wide, course N. 30° E.

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North boundary of T. 13 N., R. 21 E.—Continued.

Chains.	
80.00	An oak, 14 ins. diam., for cor. of secs. 3, 4, 33, and 34, I mark T. 14 N., S. 34 N. E., R. 21 E., S. 3 on S. E., T. 13 N., S. 4 on S. W., and S. 33 on N. W. sides; with 3 notches on E. and W. sides; from which An oak, 12 ins diam., bears N. 13½° E., 21 lks. dist., marked T. 14 N., R. 21 E., S. 34 B. T. An oak, 14 ins. diam., bears S. 78¼° E., 25 lks. dist., marked T. 13 N., R. 21 E., S. 3, B. T. An ash, 10 ins. diam., bears S. 63¾° W., 34 lks. dist., marked T. 13 N., R. 21 E., S. 4, B. T. A dogwood, 7 ins. diam., bears N. 26° W., 32 lks. dist., marked T. 14 N., R. 21 E., S. 33, B. T.
	Land, level.
	Soil, sandy loam; 1st rate.
	Timber, oak.
	Heavily timbered land, 25.00 chs.
	September 13: At _____^{h} _____^{m}, l. m. t., I set off 45° 40′ on the lat. arc; _____° _____′ N., on the decl. arc; and determine a true meridian with the solar, at the cor. of secs. 3, 4, 33, and 34.
	Thence I run
	N. 89° 57′ E., bet. secs. 3 and 34.
	Over level land, through heavy oak timber.
28.00	Branch, 4 lks. wide, course S. 10° E.
40.00	An oak, 18 ins. diam., for ¼ sec. cor., I mark ¼ S., on N. side; from which An oak, 14 ins. diam., bears N. 42° E., 27 lks. dist., marked T. 14 N., R. 21 E., S. 34, B. T. An ash, 13 ins. diam., bears S. 48¼° E., 25 lks. dist., marked T. 13 N., R. 21 E., S. 3, B. T.
63.00	Leave heavy oak timber, bears N. and S.
80.00	Set a limestone, 22 x 8 x 7 ins., 17 ins. in the ground, for cor. of secs. 2, 3, 34, and 35, marked with 2 notches on E. and 4 notches on W. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.
	Land, level.
	Soil, sandy loam; 1st rate.
	Timber, oak.
	Heavily timbered land, 63.00 chs.

	N. 89° 57′ E., bet. secs. 2 and 35.
	Over level land.
30.00	South fork of Spring Creek, 22 lks. wide, pure water, gentle current, low banks, course N. 38° E.
40.00	Set a locust post, 3 ft. long, 3 in. sq., with marked stone, 24 ns. in the ground, for ¼ sec. cor., marked ¼ S. on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.
80.00	Set a limestone, 15 x 8 x 6 ins., 10 ins. in the ground, for cor. of secs. 1, 2, 35, and 36, marked with 1 notch on E. and 5 notches on W. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.
	Land, level.
	Soil, sandy loam; 1st rate.
	No timber.
	September 13: At this cor., I set off _____° _____′ N., on the decl. arc; and at _____h _____m l. m. t., observe the sun on the meridian; the resulting lat. is 45° 39′, which is about 0′.7 less than the proper lat.
	N. 89° 57′ E., bet. secs. 1 and 36.
	Over level land.
40.00	Set a limestone, 18 x 18 x 12 ins., 12 ins. in the ground, for ¼ sec. cor.,

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North boundary of T. 13 N., R. 21 E.—Concluded.

Chains.	
	marked ¼ on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of stone, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.
58.00	Branch 4 lks. wide, course N. 30° E.
70.00	Same branch, 6 lks. wide, course S.
80.00	The cor. of Tps. 13 and 14 N., Rs. 21 and 22 E.
	Land, level.
	Soil, sandy loam; 1st rate.
	No timber.
	September 13, 1890.

Boundaries of T. 13 N., R. 21 E.
Latitudes, departures, and closing errors.

Line designated.	True bearing.	Distance.	Latitudes. N.	Latitudes. S.	Departures. E.	Departures. W.
		Chs.	Chs.	Chs.	Chs.	Chs.
3rd Standard Parallel N.	West	480.00				480.00
5th G. Meridian E	North	480.00	480.00			
N. bdy. T. 13 N., R. 21 E	N. 89° 57′ E.	479.25	0.42		479.25	
E. bdy. T. 13 N., R. 21 E	South	480.00		480.00		
Convergency[80]					0.74	
Totals			480.42	480.00	479.99	480.00
			480.00			479.99
Error in lat.			0.42	Error in dep.		0.01

This township is rough and mountainous in the southern part, rolling in the interior, and nearly level in the north and east, while prairie land is found in the vicinity of the southwest corner. The township is well watered, and well timbered in the interior; and the soil along the south fork of Spring Creek and its tributaries is very fertile. The township should be subdivided.

RICHARD ROODS,
U. S. Deputy Surveyor.

September 13, 1890.

(Remainder of page 177 and all of page 178 deleted. They contain the final oaths.)

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SPECIMEN FIELD NOTES.—NO. 4.

Resurvey of the E. bdy. of T. 25 N., R. 2 W., Willamette Meridian.

Chains.	
	(NOTE.—Field notes of retracements and resurveys will be incorporated with the field notes of the subdivisions to which they are directly related, and will be covered by the preliminary and final oaths of said subdivisional field notes. (See page 71.)
	In case the deputy does not know from recent observations that his instrument is in adjustment, he will make the observations prescribed at the beginning of specimen field notes No. 2, or No. 5, as the character of the instrument employed may require.
	A transit with solar attachment is the instrument employed for this resurvey.)
	Preliminary to commencing the subdivision of this township, I run north on a blank line, on the east boundary of sec. 36; at 40.00 chs. I find the ¼ sec. cor., N. 80° E., 30 lks. dist., and at 80.00 chs., the cor. of secs. 24, 30, 31 and 36, east, 58 lks. dist.; therefore, I continue my line north, find no part of the E. bdy. in alinement, and that many of the corners are nearly obliterated. At 5 miles 79.83 chs., intersect E. and W. line, 42 lks. E. of the cor. of Tps. 25 and 36 N., Rs. 1 and 2 W., and as these townships have not been subdivided, I resurvey the range line between them, as follows:
	The old standard cor. of Tps. 25 N., Rs. 1 and 2 W., is a post greatly decayed, and the marks are nearly obliterated. I destroy all traces of the old corner and reestablish it at the same point, as follows:
	Set a sandstone, 18 x 8 x 5 ins., 12 ins. in the ground, for standard cor. of Tps. 25 N., Rs. 1 and 2 W. marked S. C., on N. face, with 6 grooves on N., E., and W. faces; dig pits, 30 x 24 x 12 ins., crosswise on each line, E. and W., 4 ft., and N. of stone, 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, N. of cor.
	Thence I run
	N. 0° 3′ W., bet. secs. 31 and 36.
18.00	Through timber. Ascend.
40.00	Top of ridge, about 40 ft. high, bears E. and W.
	Set a sandstone, 20 x 8 x 4 ins. 15 ins. in the ground, for ¼ sec. cor. marked ¼ on W. face; from which
	A pine 20 ins. diam., bears N. 20° E., 24 lks. dist. marked ¼ S. B. T.
	An oak, 16 ins. diam., bears N. 68¼ W., 27 lks. dist., marked ¼ S. B. T.
	From this point, the old ¼ sec. cor., which is a decayed stake, with marks almost obliterated, bears N. 80° E., 33 lks. dist. I destroy this stake and the marks on the stump of a beech tree, described as a bearing tree in the field notes of the original survey. No trace can be found of a poplar, described as a bearing tree.
52.74	An oak, 14 ins. diam., on line, I mark with 2 notches on E. and W. sides. Descend.

80. The convergency will always be entered in the column containing the departure of the north boundary.

57.00 Foot of ridge, bears E. and W.; enter rich level land.
72.00 Leave timber, bears N. E. and S. W.
80.00 Set a cedar post, 3 ft. long, 4 ins. sq., with marked stone, 24 ins. in the ground, for corner of secs. 25, 30, 31, and 36, marked
T. 25 N., S. 30 on N. E.,
R. 1 W., S. 31 on S. E.,
S. 36 on S. W., and
R. 2 W., S. 25 on N. W. faces; with 5 notches on N. and 1 notch on S. edges; dig pits, 18 x 18 x 12 ins. in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.
From this cor. the old cor., a decayed post, bears E. 65 lks. I destroy all traces of the old cor.
Land, rolling and level.
Soil, N. and S. parts, rich loam; 1st rate; middle part, sandy; 2nd rate.
Timber, pine and oak.

Resurvey of the E. bdy. of T. 25 N., R. 2 W., etc.—Continued.

Chains.
N. 0° 3′ W., bet. secs. 25 and 30.
Over level land.
40.00 Set a locust post, 3 ft. long, 3 ins. sq., with quart of charcoal, 24 ins. in the ground, for ¼ sec. cor. marked ¼ S., on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.
All indications of the old cor. have disappeared.
80.00 Set a granite stone, 15 x 8 x 7 ins., 10 ins. in the ground, for cor. of secs. 19, 24, 25 and 30, marked with 4 notches on N. and 2 notches on S. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dit.; and raise a mound of earth, 4 ft. base, 2 ft high, W. of cor.
From this point, the old sec. cor., a post, bears N. 50° E., 41 lks. dist. I destroy the cor.
Land, level prairie.
Soil, rich loam; 1st rate.
No timber.

N. 0° 3′ W., bet. secs. 19 and 24.
Over level prairie.
40.00 Set an oak post, 3 ft. long, 3 ins. sq., with charred stake, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S. on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.
From this point, the old ¼ sec. cor., a decayed post, bears N. 51½° E., 47 lks. dist. I destroy this post, and marks on old bearing trees.
50.00 Elk Creek, 130 lks. wide, shallow at this point, good water, gentle current, course N. W.
80.00 Set a limestone, 18 x 8 x 5 ins., 12 ins. in the ground, for cor. of secs. 13, 18, 19 and 24, marked with 3 notches on N. and S. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.
After diligent search no signs of the old cor. can be found.
Land, level prairie.
Soil, rich loam; 1st rate.
No timber.

N. 0° 3′ W., bet. secs. 13 and 18.
Over prairie land.
16.50 Coon Creek, 60 lks. wide, 2 ft. deep, good water, course W.
40.00 Set a cedar post, 3 ft. long, 3 ins. sq., wih quart of charcoal, 24 ins. in the ground, for ¼ sec. cor. marked ¼ S. on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.
I can find no traces of old cor. post, but find slight traces of pits N. 86° E. 46 lks. dist., which I destroy.
80.00 Set a limestone, 22 x 8 x 4 ins., 17 ins. in the ground, for cor. of secs. 7, 12, 13 and 18, marked with 2 notches on N. and 4 notches on S. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.
The old cor. which was a post, has disappeared, but indistinct remains of the pits, nearly in their proper places, still remain. The new pits sufficiently obliterate the old ones.
Land, gently rolling prairie.
Soil, rich loam; 1st rate.
No timber.
April 12, 1892: I set off 9° 6′ N., on the decl. arc; and at 12^h 0.3^m p. m., l. m. t., observe the sun on the meridian; the resulting lat., is 47° 35′ N.

N. 0° 3′ W., bet. secs. 7 and 12.
Over prairie land.
17.50 Maple Creek, 10 lks. wide; 1 ft. deep, good water, gentle current, course S. W.

Resurvey of the E. bdy. of T. 25 N., R. 2 W., etc.—Continued.

Chains.
40.00 Set a cedar post, 3 ft. long, 3 ins. sq., with charred stake, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S. on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.
80.00 Set a limestone, 20 x 8 x 5 ins., with marked stone, 24 ins. in the ground, for cor. of secs. 1, 6, 7, and 12, marked with 1 notch on N. and 5 notches on S. edges; dig pits 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.
The old cor. which was a post, has been entirely destroyed by fire, no signs of pits.
Land, level prairie.
Soil, rich loam; 1st rate.
No timber.

April 12, 1892: A 4 p. m., l. m. t., I set off 47° 36′ on the lat. arc; _____°_____′, on the decl. arc; and determine a true meridian, at the cor. of secs. 1, 6, 7, and 12
Thence I run
N. 0° 3′ W., bet. secs. 1 and 6.
Over prairie land.
10.40 A spring branch, 3 lks. wide, good water, course S. 70° W.
22.00 Spring of pure water, 3 ft. diam., 2 ft. deep, bears E., 6.00 chs. dist.
40.00 Set a locust post, 3 ft long, 3 ins. sq., with quart of charcoal, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S., on W. face.; dig pits, 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.
After diligent search no old ¼ sec. cor. can be found.
46.00 Small branch, 3 lks. wide, sluggish current, course N. W.
Enter timber, bears N. W. and S. E.
79.83 The old cor., of Tps. 25 and 26 N., Rs. 1 and 2 W., which is an oak post, burned off at the surface of the ground. I reestablish the cor. at the same point, as follows: Set a cedar post, 3 ft. long, 4 ins. sq., with charred stake and the old post, 24 ins. in the grounds, for cor. of Tps. 25 and 26 N., Rs. 1 and 2 W. marked
T. 26 N., S. 31 on N. E.,
R. 1 W., S. 6 on S. E.,

T. 25 N., S. 1 on S. W., and
R. 2 W., S. 36 on N. W. faces; with 6 notches on each edge; from which
A cherry, 6 ins. diam., bears N. 40½° E., 14 lks. dist., marked T. 26 N., R. 1 W., S. 31, B. T.
A white oak, 5 ins. diam., bears S. 51¼° E., 24 lks. dist., marked T. 25 N., R. 1 W., S. 6, B. T.
A hickory, 8 ins. diam., bears S. 37¼° W., 30 lks. dist., marked T. 25 N., R. 2 W., S. 1, B. T.
A chestnut, 6 ins. diam., bears N. 52¾° W., 13 lks. dist., marked T. 26 N., R. 2 W., S. 36, B. T.
Land, level.
Soil, rich loam, 1st rate.
Timber, oak, hickory, and chestnut.

April 12, 1892.

The field notes of the subdivision of this township read in part as follows:

* * * * * * *

"N. 89° 57′ W., on a random line bet. secs. 7 and 18.
40.00 Set temp. ¼ sec. cor.
79.61 The cor. of secs. 7, 12, 13, and 18 cannot be found.
I find the ¼ sec. cor. bet. secs. 13 and 18, which is a locust post, 1 ft. high, 3 ins. sq., marked and witnessed as described by the surveyor general.
Thence I run
North, on a random line bet. secs. 13 and 18

Chains.	
40.00	Set temp. sec. cor. At this point I again make careful search for the sec. cor., which is described by the surveyor general, as a post, with pits and mound of earth W. of cor., but am unable to find any traces of post, pits, or mound. Thence, bet. secs. 7 and 12.
79.95	Intersect E. and W. line, 5 lks. E. of the ¼ sec. cor. bet. secs. 7 and 12, which is a sandstone, 5 x 10 x 4 ins. above ground, marked and witnessed as described by the surveyor general.
	Thence I run
	S. 0° 2′ E., on a true line bet. secs. 7 and 12.
	Over rolling land.
38.00	Fence, bears E. and W., enter plowed ground.
39.97½	Reëstablish the cor. as follows:
	Set a cedar post, 3 ft. long, 4 ins. sq., with marked stone, 24 ins. in the ground, for cor. of secs. 7, 12, 13, and 20, marked
	T. 25 N. S. 7 on N. E.,
	R. 2 W. S. 18 on S. E.,
	S. 13 on S. W., and
	R. 3 W., S. 12 on N. W. faces; with 2 notches on N. and 4 notches on S. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.

April 18, 1892."

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SPECIMEN FIELD NOTES.

NO. 5.
TITLE PAGE.
(See Plate IV.)

FIELD NOTES

OF THE SURVEY OF THE

SUBDIVISION AND MEANDER LINES

OF

TOWNSHIP NO. 15 NORTH, RANGE NO. 20 EAST,

OF THE

PRINCIPAL BASE AND MERIDIAN

IN THE

STATE OF MONTANA,

AS SURVEYED BY

ROBERT ACRES,
U. S. DEPUTY SURVEYOR,

UNDER HIS CONTRACT, No. 207,
DATED MARCH 22, 1893.

Survey commenced August 4, 1893.

Survey completed August 19, 1893.

(Pages 184 and 185 deleted. They contain the sample index and preliminary oaths of assistants.)

(Pages 186 and 187 were missing from this text.)

Chains.	
32.50	Leave heavy timber, bears N. W. and S. E.
39.98	Deposit a quart of charcoal, 12 ins. in the ground, for ¼ sec. cor.; dig pits, 18 x 18 x 12 ins., E. and W. of cor., 4 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, over deposit. In E. pit drive a cedar stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked ¼ S. on N. face.
46.50	Enter heavy timber, bears N. and S.
76.00	Leave heavy, enter scattering timber, bears N. 25° E. and S. 25° W.
79.96	The cor. of secs. 25, 26, 35, and 36.

Land nearly level; mostly subject to overflow 2 to 5 ft. deep.
Heavily timbered land, 41.50 chs.

N. 0° 1′ W., bet. secs. 25 and 26.
Over level bottom land, through scattering timber.
25.36 Right bank of Yellowstone River.
Set a locust post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for meander cor. of fracl. secs. 25 and 26, marked
M. C. on N.,
T. 15 N. on S.,
R. 20 E., S. 25 on E., and
S. 26 on W. faces; from which
A cottonwood, 12 ins. diam., bears S. 18¼° E., 16 lks. dist., marked
T. 15 N., R. 20 E., S. 25, M. C. B. T.
A sycamore, 31 ins. diam., bears S. 74½° W., 25 lks. dist., marked
T. 15 N., R. 20 E., S. 26, M. C. B. T.
Enter shallow channel, 1 to 2 ft. deep.
26.00 Across shallow channel, 64 lks. wide, to sand bar parallel to river bank; thence on sand bar.
32.12 To right bank of main channel, course E.; point for triangulation.
40.00 Point for ¼ sec. cor. falls in river.
To determine the dist. across, I set a flag on line, on left bank; then measure a base, N. 89° 59′ E., 20.00 chs. to a point, from which the flag bears N. 49° 06′ W.; from the flag the E. end of base bears S. 49° 6′ E.; therefore, the dist. is tan. 40° 55′ x base, or 0.867 x 20.00 = 17.34 chs.;[81] making the whole distance from meander cor., 0.64 + 6.12 + 17.34 = 24.10 chs., which added to 25.36, makes
49.46 To left bank of Yellowstone River; bank, 12 ft. high.
Deposit a marked stone, 12 ins. in the ground for meander cor. of fracl. secs. 25 and 26, dig a pit, 36 x 36 x 12 ins., 5 ft. N. of cor. and raise a mound of earth, 4 ft. base, 2 ft. high, over deposit.
In the pit drive a cedar stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
M. C. on S.,
T. 15 N. on N.,
R. 20 E., S. 26 on W., and
S. 25 on E. faces.
Thence over level bottom land. Some small cottonwoods, none within limits suitable for bearing trees.
52.60 Leave bottom, begin ascent, bears E. and W.
53.60 Top of ascent and edge of sandy plain, 40 ft. above river, bears E. and W.
55.70 Wire fence, bears E. and W.
62.80 Telegraph line, bears E. and W.
80.00 Set a cedar post, 3 ft. long, 4 ins. sq., with marked stone, 24 ins. in the ground, for cor. of secs. 23, 24, 25, and 26, marked
T. 15 N., S. 24 on N. E.,
R. 20 E., S. 25 on S. E.,
S. 26 on S. W., and
S. 23 on N. W. faces; with 2 notches on S. and 1 notch on E. edges; dig pits, 18 x 18 x 12 ins. in each sec. 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.
Land, level.

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Subdivision of T. 15 N., R. 20 E.—Continued.

Chains. Soil, alluvia land sand; 1st and 2nd rate.
Timber, cottonwood and sycamore.

August 5: At this cor. I set off 16° 47′ N., on the decl. arc; and, at $0^h 6^m$ p. m., l. m. t., observe the sun on the meridian; the resulting lat. is 45° 47′.0 or about 0′.3 greater than the proper lat.

S. 89° 56′ E., on a random line bet. secs. 24 and 25.
40.00 Set temp. ¼ sec. cor.
79.98 Intersect E. bdy. of Tp. 3 lks. N. of cor. of secs. 19, 24, 25, and 30, which is a sandstone, 5 x 9 x 4 ins. above ground, marked and witnessed as described by the surveyor general.
Thence I run
N. 89° 55′ W., on a true line bet. secs. 24 and 25.
Over level land.
20.00 Fletcher's Station bears S. 64° W.
39.99 Set a cedar post, 3 ft. long, 3 ins. sq., with marked stone, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S. on N. face; dig pits, 18 x 18 x 12 ins., E. and W. 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.
Fletcher's Station bears S. 7° E.
58.00 Short Creek, 3 lks. wide, alkali water, 8 ins. deep, course S. 20° E.
79.98 The cor. of secs. 23, 24, 25, and 26.
Land, level.
Soil, sandy; 3rd rate.
No timber.

N. 0° 1′ W., bet. secs. 23 and 24.
Over level land.
21.00 Enter alkali flat, bears N. 70° W. and S. 70° E.
40.00 Set a sandstone, 16 x 8 x 16 ins., 11 ins. in the ground, for ¼ sec. cor., marked ¼ on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of stone, 3 ft. dist., and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.
Alkali flat extends about 65.00 chs. E. and 35.00 chs. W.
73.50 Leave alkali flat, bears E. and W.
78.00 Alkali creek (dry), course E.
80.00 Set a sandstone, 20 x 7 x 5 ins., 15 ins. in the ground, for cor. of secs. 13, 14, 23 and 24, marked with 3 notches on S. and 1 notch on E. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.
Land, level.
Soil, sandy and alkali; 4th rate.
No timber.

S. 89° 55′ E., on a random line, bet. secs. 13 and 24.
Over level land.
40.00 Set temp. ¼ sec. cor.
80.01 Intersect E. bdy. of the Tp. at the cor. of secs. 13, 18, 19, and 24, which is a locust post 1 ft. above ground, 4 ins. sq., marked and witnessed as described by the surveyor general.
Thence I run
N. 89° 55′ W., on a true line bet. secs. 13 and 24,
Over sandy alkali land.
40.00½ Set a juniper post, 3 ft. long, 3 ins. sq., with marked stone, 24 ins. in the ground, for ¼ sec. cor. marked ¼ S., on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.
80.01 The cor. of secs. 13, 14, 23, and 24.
Alkali creek (now dry), runs eastward about 4.00 chs. south of this line.
Land, level.
Soil, alkali sand; 4th rate.
No timber.

81. See page 136.

Chains.	
	N. 0° 1′ W., bet. secs. 13 and 14.
	Over level land.
40.00	Set an oak post 3 ft. long, 3 ins. sq., with quart of charcoal, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S. on W. face; dig pits 18 x 18 x 12 ins. N. and S. of post, 3 ft. dist., and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.
	Thence gradually ascending.
58.00	Begin steep ascent, sloping S. W.; broken stony ground.
80.00	Set a limestone, 20 x 8 x 6 ins., 15 ins. in the ground, for cor. of secs. 11, 12, 13, and 14, marked with 4 notches on S., and 1 notch on E. edges; and raise a mound of stone, 2 ft. base, 1½ ft. high, W. of cor. Pits impracticable.
	This cor. is about 150 ft. above last ¼ sec. cor.
	Land, level and mountainous.
	Soil, sandy and rocky; 3rd and 4th rate.
	No timber.
	Mountainous land, 22.00 chs.
	S. 89° 55′ E., on a random line, bet. secs. 12 and 13.
40.00	Point for ¼ sec. cor. falls in Rancho San Blas.
80.03	Intersect E. bdy. of Tp. 7 lks. N. of the cor. of secs. 7, 12, 13, and 18, which is a sandstone 5 x 6 x 6 ins. above ground, marked and witnessed as described by the surveyor general.
	Thence, I run
	N. 89° 52′ W., on a true line bet. secs. 12 and 13.
	Over level land.
31.49	Intersect E. bdy. of Rancho San Blas, at a point, from which the 5 mile post on the rancho bdy. bears S. 33° E. 7.00 chs. dist.
	Set a limestone, 15 x 8 x 5 ins., 10 ins. in the ground, for closing cor. of fracl. secs. 12 and 13, marked C. C. on E. and S. B., on W. faces; dig pits, crosswise on each line, 30 x 24 x 12 ins., N. 33 W., 3 ft., and 24 x 18 x 12 ins., E. of stone, 7 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, E. of cor.
	Thence, across the rancho on a blank line.
67.07	Intersect W. bdy. of Rancho San Blas at a point, from which the 3½ mile post on the rancho bdy., bears N. 19½° W., 12.20 chs. dist.
	Set a granite stone, 15 x 7 x 6 ins., 10 ins. in the ground, for closing cor. of fracl. secs. 12 and 13, marked S. B. on E., with 4 grooves on S. and C. C. on W. faces; and raise a mound of stone 2 ft. base, 1½ ft. high, W. of cor. Pits impracticable.
	This cor. is on a granite ridge 220 ft. above closing cor. on E. bdy. of the rancho. Thence, over rough stony ground.
76.00	Begin descent of rocky slope, bears N. and S.
80.03	The cor. of secs. 11, 12, 13, and 14.
	This cor. is 40 ft. below top of ridge.
	Land, level and mountainous.
	Soil, sandy loam and stony; 3rd and 4th rate.
	No timber
	Across Rancho San Blas, 35.58 chs. of blank line.
	Mountainous land, 12.96 chs.
	August 5: At 4^h 35^m p. m., l. m. t., I set off 45° 49′ on the lat. arc; 16° 45° N., on the decl. arc; and determine a true meridian with the solar, at the corner of secs. 11, 12, 13, and 14.
	Thence I run
	N. 0° 1′ W., bet. secs. 11 and 12.
	Ascend over rough stony ground sloping W.
11.00	Top of ascent, bears about N. 50° W., and S. 50° E.
	Thence over level land.
36.60	Intersect W. bdy. of Rancho San Blas at a point from which the N. W. cor. of the rancho bears N. 19½° W., 7.40 chs. dist.

Chains.	
	Set a cedar post, 3 ft. long, 4 ins. sq., with marked stone, 24 ins. in the ground, for closing cor. of fracl. secs. 11 and 12, marked S. B. on E., C. C. T. 15 N., R. 20 E. on S., and S. 11 on W. faces; dig pits, crosswise on each line, 30 x 24 x 12 ins., N. 19½° W., 3 ft., and 24 x 18 x 12 ins., S. of stone, 7 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, S. of cor.
	Thence, across the rancho on a blank line.
40.00	The point for ¼ sec. cor. falls in the rancho.
44.32	Intersect N. bdy. of Rancho San Blas at a point from which the N. W. cor. of the rancho bears S. 73° W., 2.58 chs. dist.
	Set a juniper post 3 ft. long, 4 ins. sq., with a quart of charcoal, 24 ins. in the ground, for closing cor. of fracl. secs. 11 and 12, marked C. C., T. 15 N., R. 20 E. on N., S. B. on S., and S. 11 on W. faces; dig pits, crosswise on each line, 30 x 24 x 12 ins., S. 73° W., 3 ft., and 24 x 18 x 12 ins., N. of stone, 7 ft. dist., and raise a mound of earth, 4 ft. base, 2 ft. high, N. of cor.
	Leave rancho, enter public land; thence, over rolling ground.
59.50	Branch, 6 lks. wide, course S. E.
80.00	Deposit a marked stone, 12 ins. in the ground, for cor. of secs. 1, 2, 11, and 12, dig pits, 18 x 18 x 12 ins., in each sec., 4 ft. dist. and raise a mound of earth, 4 ft. base, 2 ft. high, over deposit. In S. E. pit, drive a cedar stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked T. 15 N., S. 1 on N. E., R. 20 E., S. 12 on S. E., S. 11 on S. W., and S. 2 on N. W. faces; with 5 notches on S. and 1 notch on E. edges.
	Land, mountainous and level.
	Soil stony, clay, and loam; 3rd and 4th rate.
	No timber.
	Across Rancho San Blas, 7.72 chs. of blank line.
	Mountainous land, 11.00 chs.
	S. 89° 52′ E., on a random line bet. secs. 1 and 12.
40.00	Set temp. ¼ sec. cor.
80.04	Intersect E. bdy. of Tp.; 7 lks. N. of cor. of secs. 1, 6, 7, and 12 which is a juniper post, 1 ft. high, 4 ins. sq., marked and witnessed as described by the surveyor general.
	Thence I run
	N. 89° 49′ W., on a true line bet. secs. 1 and 12.
	Over rolling land.
7.00	Enter oak timber, bears N. 20° E. and S. 20° W.
9.00	Begin ascent of ridge, bears N. 27° E. and S. 27° W.
11.50	Top of ridge, 50 ft. high, bears N. 27° E. and S. 27° W.
13.60	Begin descent, bears N. 30° E. and S. 30° W.
16.50	Foot of descent, bears N. 33° E. and S. 33° W.
18.07	An oak, 12 ins. diam., on line, I mark with 2 notches on E. and W. sides.
40.02	Set a cedar post, with charred stake, 24 ins in the ground for ¼ sec. cor., marked ¼ S. on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of post, 3 ft. dist.;

and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.

43.00 Ravine, 2.00 chs. wide, 18 ft. deep, course S. 20° W.

51.50 Ravine, 3.00 chs. wide, 22 ft. deep, course S. 30° W.

59.50 Ravine, 3.50 chs. wide, 25 ft. deep, course S. 20° E.

72.00 Leave oak timber, bears N. and S.

80.04 The cor. of secs. 1, 2, 11 and 12.
Land, rolling.
Soil, sandy loam; 3d rate.
Timber, oak.

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Subdivision of T. 15 N., R. 20 E.—Continued.

Chains.

N. 0° 1′ W., on a random line bet. secs. 1 and 2.

40.00 Set temp. ¼ sec. cor.

79.77 Intersect N. bdy. of Tp. at cor. of secs. 1, 2, 35, and 36, which is a limestone, 6 x 6 x 5 ins., above ground, marked and witnessed as described by the surveyor general.
Thence I run
S. 0° 1′ E. on a true line bet. secs. 1 and 2.
Over rolling land.

30.50 Ravine, 3.50 chs. wide, 30 ft. deep, course N. 70° E.

39.77 Deposit a marked stone, 12 ins. in the ground, for ¼ sec. cor.; dig pits, 18 x 18 x 12 ins. N. and S. of cor., 4 ft. dist.; and raise a mound of earth, 3¼ ft. base, 1½ ft. high, over deposit.
In S. pit drive a cedar stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground marked ¼ S. on W. face.

79.77 The cor. of secs. 1, 2, 11, and 12.
Land, rolling.
Soil, clay and loam; 3rd and 4th rate.
No timber.

Aug. 5, 1893.

From the cor. of secs. 2, 3, 34, and 35, on S. bdy. of the Tp., which is a locust post, 4 ins. sq., 12 ins. high, marked and witnessed as described by the surveyor general, I run
N. 0° 2′ W., bet. secs., 34 and 35.
Over local bottom land.

40.00 Set a cedar post, 3 ft. long, 3 ins. sq., with marked stone, 24 ins. in the ground, for ¼ sec. cor. marked ¼ S., on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.

42.00 Begin ascent of sand hills, bears N. 70 E. and S. 70 W.

46.00 Top of sand ridge, 35 ft. high, bears N. 65° E. and S. 65° W., begin descent.

50.50 Foot of descent, bears N. 70° E. and S. 70° W.; thence, over sandy plain, gently ascending.

80.00 Set a locust post, 3 ft. long, 4 ins. sq., with quart of charcoal, 24 ins. in the ground, for cor. of sec. 26, 27, 34 and 35, marked
T. 15 N., S. 26 on N. E.,
R. 20 E., S. 25 on S. E.,
S. 34 on S. W., and
S. 27 on N. W. faces; with 1 notch on S. and 2 notches on E. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist., and raise a mound of earth, 4ft. base, 2 ft. high, W. of cor.
Land, level.
Soil, alluvial and sandy; 1st and 4th rate.
No timber.

S. 89° 57′ E., on a random line bet. secs. 26 and 35.

40.00 Set temp. ¼ sec. cor.

48.13 To left bank of Yellowstone River, set temp. meander cor.
To determine the dist. across[82], I set a flag on line on right bank of the river; then measure a base line S. 22° 58′ E. 15.00 chs. to a point, whence the flag bears N. 41° 47′ E. From the flag the S. end of the base bears S. 41° 47′ W.; therefore the angles taken in order of measurement are respectively 66° 59′, 64° 48′, and 48° 16′; their sum being 180° 03′, or 3′ too great. I diminish each angle by one-third of the excess and compute the distance across the river, as follows:

$$\frac{\sin 64° 47'}{\sin 48° 15'} \times \text{base, or} \frac{0.905 \times 15}{0.746} = 18.19 \text{ chs}^{81}.\text{; also,}$$

48.13 + 18.19 makes

66.32 To right bank of river; set temp. meander cor.

80.06 Intersect N. and S. line, 3 lks. S. of cor. of secs. 25, 26, 35, and 36; thence I run
N. 89° 58′ W., on a true line bet. secs. 26 and 35.

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Subdivision of T. 15 N., R. 20 E.—Continued.

Chains.

Over level bottom land, through scattering timber.

13.74 To right bank of Yellowstone River.
Set a limestone, 19 x 7 x 5 ins., 15 ins. in the ground, for meander cor. of fracl. secs. 26 and 35, marked M. C. on W. face, with 1 groove on S. face; from which
A sycamore, 19 ins. diam., bears N. 49¼° E., 26 lks. dist., marked T. 15 N., R. 20 E., S. 26, M. C. B. T.

31.93 To left bank of Yellowstone River.
A sycamore, 13 ins. diam., for meander cor. of fracl. secs. 26 and 35, I mark
M. C on E.,
T. 15 N. on W.,
R. 20 E., S. 35 on S., and
S. 26° on N. sides; dig a pit, 36 x 36 x 12 ins., 8 ft. W. of tree, and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.

37.50 Leave scattering timber, bears N. W. and S. E.

40.03 Set a cedar post, 3 ft. long, 3 ins. sq., with marked stone, 24 ins. in the ground, for ¼ sec. cor. marked ¼ S., on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of post, 3 ft. dist ; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.

80.06 The cor. of secs. 26, 27, 34, and 35.
Land, level.
Soil, alluvial and sandy; 1st and 3rd rate.
Timber, sycamore and cottonwood.

N. 0° 2′ W., bet. secs. 26 and 27.
Over nearly level land.

4.50 Road from Mound City to Lake City, bears N. 65° W. and S. 60° E.

40.00 Set a locust post, 3 ft. long, 3 ins. sq., with marked stone, 24 ins. in the ground, for ¼ sec. cor. marked ¼ S. on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.

44.20 Telegraph line, bears N. 70° E. and S. 70° W.

48.50 Spring branch, 2 lks. wide, course S.E.; flows from a spring of pure water, 3 ft. diam., 2 ft. deep, which bears N. 63° W., 4.00 chs. dist.

57.50 Road from Mound City to Lake City, bears N. 60° E. and S. 60° W.

80.00 Set a cedar post, 3 ft. long, 4 ins. sq., with marked stone, 24 ins. in the ground, for cor. of secs. 22, 23, 26, and 27, marked
T. 15 N., S. 23 on N.E.,
R. 20 E., S. 26 on S.E.,
S. 27 on S. W., and
S. 22 on N. W. faces; with 2 notches on S. and E.

82. The triangulation will always be made on the random line when a random line is run. See page 61 and Plate II, fig. 4.

	edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.
	Land, level.
	Soil, sandy loam; 1st and 2nd rate.
	No timber.
	S. 89° 58′ E., on a random line bet. secs. 23 and 26.
40.00	Set temp. ¼ sec. cor.
80.01	Intersect N. and S. line, 5 lks. N. of cor. of secs. 23, 24, 25, and 26.
	Thence I run
	N. 89° 56′ W., on a true line bet. secs. 23 and 26.
	Over level land.
40.00½	Deposit a quart of charcoal, 12 ins. in the ground, for ¼ sec. cor.; dig pits, 18 x 18 x 12 ins., E. and W. of cor., 4 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, over deposit. In E. pit drive a cedar stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked ¼ S., on N. face.
53.00	Road from Mound City to Lake City, bears N. 50° E. and S. 50 W.; wire fence bears S. 53° E.
80.01	The cor. of secs. 22, 23, 26, and 27.

(Pages 194 through 203 deleted. They contain sample field notes in the same vein and style.)

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Subdivision of T. 15 N., R. 20 E.—Continued.

Chains.	
	N. 0° 4′ W., bet. secs. 16 and 17.
	Over level land.
34.00	S. E. cor. of James Wilkie's field, extends W., 18.00 chs., and along line.
40.00	Set a cedar post, 3 ft. long, 3 ins. sq., with quart of charcoal, 24 ins. the ground, for ½ sec. cor., marked ¼ S., on W. face; dig pits 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.
46.00	Old Military Road, bears N. 65° W. and S. 65° E.
47.00	Branch, 4 lks. wide, pure water, swift current, course S. 40° W.
	This branch is the outlet of the pond in sec. 16, fed by numerous fine springs in sec. 9.
50.20	Acequia, 8 lks. wide, course N. 86° W. Thence gradually ascending.
80.00	Set a limestone, 21 x 7 x 5 ins., 16 ins. in the ground, for cor. of secs. 8, 9, 16, and 17, marked with 4 notches on S. and E. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.
	Land, level and rolling.
	Soil, rich loam; 1st rate.
	No timber.
	S. 89° 59′ E., on a random line bet. secs. 9 and 16.
40.00	Set temp. ¼ sec. cor.
79.90	Intersect N. and S. line 9 lks. N. of cor. of secs. 9, 10, 15, and 16.
	Thence I run
	N. 89° 55′ W., on a true line bet. secs. 9 and 16.
	Over rolling land.
31.40	Spring branch, 3 lks. wide, course S.; enters pond about 6.00 chs. S.
39.95	Set a cedar post, 3 ft. long, 3 ins. sq., with marked stone, 24 ins. in the ground, for ¼ sec. cor., marked ¼ s. on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.
49.20	Spring branch, 3 lks. wide, course S.; enters pond about 8.00 chs. S.
	The branches crossing this line are fed by numerour large springs 4.00 to 10.00 chs. N. of the line.
79.90	The cor. of secs. 8, 9, 16, and 17.
	Land, rolling.
	Soil, gravelly loam; 2nd rate.
	No timber.
	N. 0° 4′ W., bet. secs. 8 and 9.
	Over rolling land.
38.00	To S. bank of limestone quarry, bears E. and W. To pass the quarry, I offset 2.00 chs. E., then, N. 0° 4′ W., on the offset line.
40.00	The point for ¼ sec. cor. falls in quarry. Continue offset line to 40.60 chs.; then, W., 2.00 chs., to true line.
40.60	Set a limestone, 15 x 9 x 5 ins., 10 ins., in the ground, for witness cor. to ¼ sec. cor. marked W. C. ¼ on W. face; and raise a mound of stone, 2 ft. base, 1½ ft. high, W. of cor. Pits impracticable.
66.00	Middle of single track of the Montana and Manitoba Railroad, bears N. 42° E. and S. 42° W.
68.00	Telegraph line, bears N. 42° E. and 42° W.
80.00	Set a limestone, 17 x 9 x 5 ins., 12 ins. in the ground, for cor. of secs. 4, 5, 8, and 9, marked with 5 notches on S. and 4 notches on E. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.
	From this cor. the U.S. mineral monument in sec. 5 bears N. 59½° W.
	Soil, thin and gravelly, with many limestone outcrops; 3rd and 4th rate.
	No timber.
	August 14: at 4^{h} 30^{m} p.m. l. m. t., I set off 45° 49 on the lat. arc; 14° 6′ N. on the decl. arc; and determine a true meridian with the solar, at the cor. of secs. 4, 5, 8 and 9.
	Thence I run
	S. 89° 55′ E., on a random line bet. secs. 4 and 9.

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Subdivision of T. 15 N., R. 20 E. — Continued.

Chains.	
40.00	Set temp. ¼ sec. cor.
79.94	Intersect N. and S. line, 5 lks. S. of cor. of secs. 3, 4, 9, and 10.
	Thence I run
	N. 89° 57′ W., on a true line bet. secs. 4 and 9.
	Descend through heavy pine timber.
20.00	Foot of spur, 300 ft. below sec. cor.; leave heavy pine timber, bears N. and S.
39.50	Wood road, bears N. 20° E. and 20° W.
39.97	Set a limestone, 18 x 18 x 6 ins., 12 ins. in the ground, for ¼ sec. cor., marked ¼ on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of stone, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.
68.50	Middle of single track of the Montana and Manitoba Railroad bears N. 38° E. and S. 38° W.
70.20	Telegraph line bears N. 38° E. and S. 38° W.
79.94	The cor. of secs. 4, 5, 8, and 9.
	Land, mountainous.
	Soil, thin and gravelly; 3rd and 4th rate.
	Timber, Pine.
	Mountainous or heavily timbered land, 20.00 chs.
	N. 0° 4′ W., on a random line bet. secs. 4 and 5.
40.00	Set temp. ¼ sec. cor.
79.96	Intersect N. bdy. of the Tp. 2 lks. W. of cor. of secs. 4, 5, 32, and 33.
	Thence I run
	S. 0° 3′ E., on a true line bet. secs. 4 and 5.

	Over ridges and ravines; ascend.
4.00	Top of spur, bears E. and W.; descend.
10.00	Ravine 20 ft. deep, course E., ascend.
16.00	Top of spur, 40 ft. above ravine, bears S. 70° E. and N. 70° W.; descend.
27.00	Ravine, 30 ft. deep, course S. 80° E.; ascend.
32.00	Top of spur, bears S. 85° E. and N. 85° W.; descend.
37.00	Ravine, 25 ft. deep, course S. 65° E.; ascend.
39.96	Set a limestone, 15 x 6 x 6 ins. 10 ins. in the ground, for ¼ sec. cor., marked ¼ on W. face; and rasie a mound of stone, 2 ft. base, 1½ ft. high, W. of cor. Pits impracticable.
	This cor. stands on the N. E. slope of a spur descending southeasterly; ascend.
50.00	Top of spur, bears E. and W., about 35 ft. above ¼ sec. cor., bears E. and W.; descend.
55.00	Ravine, 20 ft. deep, course N. 55° E., ascend.
62.00	Top of low spur, bears E. and W.; descend.
74.00	Foot of slope, bears N. 40° E. and S. 65° W.
79.96	The cor. of secs. 4, 5, 8, and 9.
	Land, mountainous.
	Soil, rocky; 4th rate.
	No timber.
	Mountainous land, 74.00 chs.
	August 14, 1893.
	August 15: At 7^h 35^m a.m., l. m. t., I set off 45° 45′ on the lat. arc; 13° 54′ N., on the decl. arc; and determine true meridian with the solar, at the cor. of sec. 5, 6, 31, and 32; which is a limestone, 5 x 8 x 6 ins., above ground; marked and witnessed as described by the surveyor general.
	Thence I run
	N. 0° 5′ W., bet. secs. 31 and 32.
	Over level land.
6.50	Trail, bears E. and W.
	The S. W. cor. of James Parker's Desert Land Claim, which is an oak post, 2 ft. high, 6 ins. sq., marked J. p. D. L. C. 3, bears N. 49½° W.
	The S. E. cor. of the same claim, which is a round pine post, 3 ft. high, 6 ins. diam., marked J. P. D. L. C. 4, bears N. 66° E.

Chains.	
40.00	Set a locust post, 3 ft. long, 3 ins. sq., with marked stone, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S. on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.
80.00	Set a limestone, 20 x 7 x 5 ins., 15 ins. in the ground, for cor. of secs. 29, 30, 31, and 32, marked with 1 notch on S. and 5 notches on E. edges; dig pits, 18 x 18 x 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.
	From this cor. the above described S. W. cor. of James Parker's Desert Land Claim bears S. 29¼° W.
	The N. W. cor., which is a post 3 ft. long, 5 ins. sq., marked J. P. D. L. C. 2, bears N. 42°W.
	Land, level.
	Soil, sand; 4th rate.
	No timber.
	S. 89° 57′ E., on a random line bet. secs. 29 and 32.
40.00	Set temp. ¼ sec. cor.
79.97	Intersect N. and S. line 7 lks. N. of cor. of secs. 28, 29, 32 and 33.
	Thence I run
	N. 89° 54′ W., on a true line bet. secs. 29 and 32.
	Over level land.
14.50	Begin ascent, bears N. and S.
16.50	Top of ascent and edge of sandy plain, bears N. and S.
28.50	A fine spring of good water, 3 ft. diam:, 1 ft. deep, bears S., 2.50 chs. dist.
	The N. E. cor. of James Parker's Desert Land Claim, a mound of stone, without marks, beras N. 2¾° E.
39.98½	Set a sandstone, 18 x 6 x 5 ins., 12 ins. in the ground, for ¼ sec. cor., marked ¼ on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of stone, 3 ft. dist.; and raise a mound of earth, 3½ base, 1½ ft. high, N. of cor.
	From this ¼ sec. cor. the above described S. E. cor. of James Parker's Desert Land Claim bears S. 14½° E.
79.97	The cor. of secs. 29, 30, 31, and 32.
	Land, level.
	Soil, sand; 4th rate.
	No timber.
	The cor. of secs. 25, 30, 31, and 36, on the W. bdy. of the Tp. being plainly visible, I run for said cor.
	N. 89° 57′ W., on a random line bet. secs. 30 and 31.
40.00	Set temp. ¼ sec. cor.
78.35	Intersect the W. bdy. of the Tp. at the cor. of secs. 25, 30, 31, and 32, which is a mound of earth, with snake and pit, marked and witnessed as described by the surveyor general.
	Thence I run
	S. 89° 57′ E., on a true line bet. secs. 30 and 31.
	Over level land.
38.35	Set a juniper post, 3 ft. long, 3 ins. sq., with charred stake, 24 ins. in the ground for ¼ sec. cor., marked ¼ S., on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.
	From this ¼ sec. cor., the N. W. cor. of James Parker's Desert Land Claim bears N. 23° E.
78.35	The cor. of secs. 29, 30, 31, and 32.
	Land, level.
	Soil, sand; 4th rate.
	No timber.
	August 15: At this corner, I set off 13° 50′ N., on the decl. arc; and at O^h 4^m p.m., l. m. t., observe the sun on the meridian; the resulting lat. is 45° 46′.

Chains.	
	N. 0° 5′ W., bet. secs. 29 and 30.
	Over level land.
40.00	Deposit a marked stone, 12 ins. in the ground, for ¼ sec. cor.; dig pits, 18 x 18 x 12 ins.; N. and S. of cor., 4 ft dist; and raise a mound of earth, 3½ ft. base 1½ ft. high, over deposit. In S. pit drive a cedar stake, 2 ft. long, 2 ins. sq., marked ¼ S., on ¼. face.
	From this ¼ sec. cor. the N. E. cor. of James Parker's Desert Land Claim bears S. 80° E.
56.00	Telegraph line, bears E. and W.
59.00	Road leading to Lake City and Mound City, bears E. and W.
76.50	Begin descent over rocky ground, bears E. and W.
80.00	Set a sandstone, 15 x 8 x 6 ins., 10 ins. in the ground, for cor. of secs. 19, 20, 29, and 30, marked with 2 notches on S. and 5 notches on E. edges; and raise a mound of stone, 2 ft. base, 1½ ft. high, W. of cor. Pits impracticable.
	This cor. stands on stony ground sloping N., about 25 ft. below level of the plain.
	S. 89° 54′ E., on a random line bet. secs. 20 and 29.
40.00	Set temp. ¼ sec. cor.
79.93	Intersect N. and S. line at cor. of secs. 20, 21, 28, and 29.
	Thence I run
	N. 89° 54′ W., on a true line bet. secs. 20 and 29.
	Over level land.
16.50	Telegraph line, bears N. and S.

21.00	Road leading to Lake City, bears N. and S.
39.96½	Set a cedar post, 3 feet long, 3 ins. sq., with quart of charcoal, 24 ins. in the ground, for ¼ sec. cor. marked ¼ S., on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of post 3 ft. dist. and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.
63.00	Begin descent from plain, bears N. and S.
66.00	Foot of descent, 35 ft. below plain, bears N. and S.; thence over broken ground to
79.93	The cor. of secs. 19, 20, 29 and 30.
	Land, level.
	Soil, sand and stony; 4th rate.
	No timber.
	N. 89° 57′ W., on a random line bet. secs. 19 and 30.
	Over rough stony ground.
40.00	Set Temp. ¼ sec. cor.
78.21	Intersect W. bdy. of the Tp. 3 lks. N. of the cor. of secs. 19, 24, 25, and 30, which is a juniper post, 18 ins. above ground, 4 ins. sq., marked and witnessed as described by the surveyor general.
	Thence I run
	S 89° 58′ E., on a true line bet. secs 19 and 30.
	Over level land.
38.21	Set a maple post, 3 ft. long, 3 ins. sq., with charred stake, 24 ins. in the ground, for ¼ sec. cor. marked ¼ S., on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.
72.21	Begin ascent, over stony ground.
78.21	The cor. of secs. 19, 20, 29, and 30.
	Land, level.
	Soil, sandy loam; 3rd and 4th rate.
	No timber.
	N. 0° 5′ W., bet. secs. 19 and 20.
	Descend over stony ground.
2.00	Foot of descent, 10 ft. below sec. cor., and 35 ft. below the sandy plain, bears E. and W. Thence gradual descent toward Lin's Lake.

Subdivision of T. 15 N., R. 20 E. — Continued.

Chains.	
32.50	Enter scattering timber, bears E. and W.
40.00	Set a cedar post, 3 ft. long, 3 ins. sq., 24 ins. in the ground, for ¼ sec. cor. marked ¼ S., on W. face; from which A maple, 22 ins. diam., bears N. 22° W., 19 lks. dist., marked ¼ S., B. T. An ash, 13 ins. diam., bears N. 70½° E., 28 lks. dist., marked ¼ S., B. T.
44.50	To bank of Lin's Lake.
	Set a cedar post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for meander cor. of fracl. secs. 19 and 20, marked M.C. on N., T. 15 N. on S., R. 20 E., 20 on E., and S. 19 on W. faces; from which A maple, 8 ins. diam., bears S. 22½° E., 21 lks. dist., marked T. 15 N., R. 20 E., S. 20, M.C. B. T. An ash, 12 ins. diam., bears S. 56¼° W., 27 lks. dist., marked T. 15 N., R. 20 E., S. 19, M. C. B. T.
	Land, gently rolling.
	Soil, mostly rich loam; 1st rate.
	Timber, maple, ash and oak.
	August 15, 1893.
	August 16: At 7h 4m. a.m., l. m. t., I set off 45° 48′ on the lat. arc; 13° 36′ N., on the decl. arc; and determine a true meridian at the cor. of secs. 16, 17, 20 and 21, described on page 203; thence I run
	N. 89° 57′ W., on a true line[83], bet. secs. 17 and 20.
	Over gently rolling land, descending toward Lin's Lake.
16.40	Telegraph Line, bears N. and S.
20.50	Road to Lake City, bears N. and S.
30.00	Irrigating ditch, 8 lks. wide, course S. 60° W. Enter field cultivated by irrigation; extends N., 5.00 chs., and S. about 10.00 chs.
36.50	Leave field, enter scattering timber, bears N. 65° E. and S. 5° W.
40.00	Set a cedar post, 3 ft. long, 3 ins. sq., 24 ins. inthe ground, for ¼ sec. cor., marked ¼ S., on N. face; from which A sycamore, 22 ins. diam., bears N. 22° W., 19 lks. dist., marked ¼ S., B. T. An ash, 13 ins. diam., bears S. 70½° W., 28 lks. dist., marked ¼ S., B. T.
43.20	To bank of Lin's Lake.
	A sycamore, 18 ins. diam., for meander cor. of fracl. secs. 17 and 20, I mark M.C. on W., T. 15 N. on E., R. 20 E., S. 17 on N., and S. 20 on S. sides; from which An ash, 10 ins. diam., bears N. 40¾° E., 20 lks. dist., marked T. 15 N., R. 20 E., S. 17, M. C. B. T. A maple, 9 ins. diam., bears S. 49½° E., 23 lks. dist., marked T. 15 N., R. 20 E., S. 20, M.C. B. T.
	Land, gently rolling.
	Soil, rich loam; 1st rate.
	Timber, ash, maple, and sycamore.
	From the cor. of secs. 8, 9, 16, and 17, described on page 204, I run
	N. 89° 57′ W., on a true line[83], bet. secs. 8 and 17.
	Over rolling land.
39.20	Telegraph line, bears N. 28° W. and S. 28° E.
40.00	Set a cedar post, 3 ft. long, 3 ins. sq., with charred stake, 24 ins. in the ground, for ¼ sec. cor., marked ¼ S., on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.

Subdivision of T. 15 N., R. 20 E.—Continued.

Chains.	
55.00	Old Military Road, bears N. W. and S. E. The road branches about 2.00 chs. S. E.
60.00	Enter road, leading to Lake City, bears W.; thence, along middle of road.
61.00	Middle of single track of the Montana and Manitoba Railroad, bears N. 60° E. and S. 60° W.
63.50	Telegraph line, bears N. 60° E. and S. 60° W.
80.00	The point for sec. cor. falls in the road; therefore
	Deposit a marked stone, 24 ins. in the ground, for cor. of secs. 7, 8, 17 and 18.
	Land, rolling.
	Soil, sandy loam; 3rd rate.
	No timber.
	From the cor. for secs. 7, 8, 17 and 18, which falls in road, I run
	S. 0° 5′ E., bet. secs. 17 and 18.
	Over rolling land; descending towards Lin's Lake.
0.50	Set a limestone,[84] 15 x 8 x 7 ins., 10 ins. in the ground, for witness cor. to cor. of secs. 7, 8, 17 and 18, marked W. C., on N. E. face; with 4 notches on S.

83. See paragraph 8, page 55.

84. A Witness Corner to a section corner will always have the letters "W. C." conspicuously displayed on the northeast face.

and 5 notches on E. edges; dig pits, 18 x 18 x 12 ins., N. E., S. E., S. W., and N. W. of cor., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.

4.00 Telegraph line, bears N. 84° E. and S. 84° W.

5.20 Middle of the single track of the Montana and Manitoba Railroad, bears N. 84° and S. 84° W.

20.19 To bank of Lin's Lake.

Set a limestone, 15 x 9 x 6 ins., 10 ins. in the ground, for meander cor. of fracl. secs. 17 and 18, marked M. C. on S. face, with 5 grooves on E. face; and raise a mound of stone, 2 ft. base, 1½ ft. high, N. of cor. Pits impracticable.

Limestone outcrops near the lake.

Land, rolling.

Soil, rocky; 4th rate.

No timber.

August 16: At this meander cor. I set off 13° 31′ N. on the decl. arc; and at 0^h 4^m p. m., l. m. t., observe the sun on the meridian; the resulting lat. is 45° 48′.

From the cor. of secs. 7, 8, 17 and 18, established this day, I run

N. 89° 57′ W., on a random line bet. secs. 7 and 18.

40.00 Set temp. ¼ sec. cor.

77.90 Intersect W. bdy. of the Tp., 3 lks. S. of the cor. of secs. 7, 12, 13, and 18, which is a limestone, 6 x 8 x 6 ins. above ground, marked and witnessed as described by the surveyor general.

Thence I run

S. 89° 56′ E., on a true line bet. secs. 7 and 18.

Over gently rolling ground.

17.90 Intersect the W. bdy. of Lake City.

The N. W. cor., which is an oak post, 2 ft. above ground, 12 ins. sq., marked N. W. cor. L. C., bears N. 0° 5′ W., 40.00 chs. dist. The S. W. cor., which is a limestone, 8 x 6 x 6 ins., above ground, marked S. W. cor. L. C., bears S. 0° 5′ E., 29.50 chs. dist.

Methodist church bears S. 33° E.

18.20 Middle of West street, 40 ft wide, bears N. 0° 5′ W. and S. 0° 5′ E.

Thence along middle of Fourth street, 60 ft. wide.

23.70 Middle of Cedar street, 60 ft. wide, bears N. 0° 5′ W. and S. 0° 5′ E.

27.00 Baptist church bears N., 3.00 chs. dist.

29.20 Middle of Pine street, 60 ft. wide, bears N. 0° 5′ W. and S. 0° 5′ E. Methodist church bears S. 43° W.

35.00 Middle of Main street, 100 ft. wide, bears N. 0° 5′ W. and S. 0° 5′ E. Court house bears N. 4° W., 22.00 chs. dist. Wharf bears S. 0° 5′ E. 16.50 chs dist. Catholic church bears N. 39° E.

Chains.

37.90 Deposit a limestone, 12 x 8 x 6 ins., 24 ins. in the ground, for ¼ sec. cor., marked x ¼; from which

A granite stone, 16 x 8 x 7 ins., set 11 ins. in the ground, marked W. C. ¼, on N. face, bears N., 45 lks. dist.

A granite stone 20 x 9 x 6 ins., set 15 ins. in the ground, marked W. C. ¼, on N. face, bears S., 45 lks. dist. Pits impracticable.

No natural bearing objects available.

40.80 Middle of Elm street, 60 ft. wide, bears N. 0° 5′ W. and S. 0° 5′ E.

46.30 Middle of Walnut street, 60 ft. wide, bears N. 0° 5′ W., and S. 0° 5′ E. Railroad station bears S. 14 E., 6.00 chs. dist.

51.80 Middle of East street, 40 ft. wide, bears N. 0° 5′ W. and S. 0° 5′ E. Catholic church bears N. 21° W.

52.10 Intersect E. bdy. of Lake City. The N. E. cor., which is a limestone, 14 x 9 x 7 ins. above ground, marked N. E. cor. L. C., bears N. 0° 5′ W., 40.00 chs. dist. The S. W. cor., which is a limestone, 9 x 6 x 6 ins. above ground, S. W. cor. L. C., bears S. 0° 5′ E., 7.53 chs. dist.

Thence along the middle of the Mound City road.

77.90 The cor. of secs. 7, 8, 17, and 18.

Land, gently rolling.

Soil, sandy loam; 1st rate.

No timber.

August 16, 1893.

August 17: At 7^h 4^m a. m., l. m. t., I set off 45° 49′ on the lat arc; 13° 17′ N., on the decl. arc; and determine a true meridian with the solar, at the point for cor. of secs. 7, 8, 17 and 18, which falls in the road, and is described on page 209.

Thence I run

N. 0° 5′ W., bet. secs. 7 and 8.

Over rolling land.

0.50 Set a limestone[85] 15 x 8 x 7 ins., 10 ins. in the ground, for witness cor. to cor. of secs. 7, 8, 17 and 18, marked W. C., on N. E. face; with 4 notches on S. and 5 notches on E. edges; dig pits, 18 x 18 x 12 ins., N. E., S. E., S. W., and N. W. of cor., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.

28.00 Road to Lake City, bears N. 75° W. and S. 75° E.

32.00 Old Military Road, bears N. 35° W. and S. 35° E.

40.00 Set a juniper post, 3 ft. long, 3 ins. sq., with marked stone, 24 ins. in the ground, for ¼ sec. cor. marked ¼ S., on W. face; dig pits, 18 x 18 x 12 ins. N. and S. of post, 3t. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, W. of cor.

67.50 S. E. cor. of cemetery bears W., 5.00 chs. dist.

75.50 N. E. cor. of cemetery bears W., 5.00 chs. dist.

80.00 Set a limestone, 20 x 8 x 4 ins., 15 ins. in the ground, for cor. of secs. 5, 6, 7, and 8, marked with 5 notches on S. and E. edges; dug pits, 18 x 18 x 12 ins., in each sec., 5¼ ft. dist., and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.

Land, rolling.

Soil, gravelly loam; 2nd and 3rd rate.

No timber.

S. 89° 57′ E., on a random line bet. secs. 5 and 8.

40.00 Set temp. ¼ sec. cor.

79.96 Intersect N. and S. line 3 lks. S. of the cor. of secs. 4, 5, 8 and 9.

Thence I run

N. 89° 58′ W., on a true line bet. secs. 5 and 8.

Over rolling land.

12.00 Begin ascent bears N. E. and S. W.

25.00 Top of spur, bears N. and S.; descend.

35.00 Foot of descent, bears N. 35° W. and S. 35° E.

Chains.

39.98 Set a limestone, 14 x 8 x 6 ins., 10 ins. in the ground, for ¼ sec. cor. marked ¼ on N. face; dig pits, 18 x 18 x 12 ins., E. and W. of stone, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.

From this ¼ sec. cor. the U. S. mineral monument in sec. 5 bears N. 37° 30′ E.

85. See page 48 and footnote.

64.00 Road, bears N. and S.
79.96 The cor. of secs. 5, 6, 7, and 8.
Land, rolling.
Soil, gravelly loam; 2nd and 3rd rate.
No timber.

N. 89° 56′ W., on a random line bet. secs. 6 and 7.
40.00 Set temp. ¼ sec. cor.
77.87 Intersect W. bdy. of the Tp. 9 lks. S. of the cor. of secs. 1, 6, 7, and 12, which is a limestone, 6 x 8 x 6 ins. above ground, marked and witnessed as described by the surveyor general.
Thence I run
S. 89° 52′ E., on a true line bet. secs. 6 and 7.
Over rolling land.
37.87 Set a limestone, 15 x 8 x 6 ins., 10 ins. in the ground, for ¼ sec. cor., marked ¼ on the N. face; dig pits, 18 x 18 x 12 ins., E. and W. of stone, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.
51.00 Old Military road, bears N. 30° E. and S. 30° W.
57.50 The N. W. cor. of cemetery, bears S., 5.00 chs. dist.
72.00 The N. E. cor. of cemetery, bears S., 5.00 chs. dist.
77.87 The cor. of secs. 5, 6, 7, and 8.
Land, rolling.
Soil, gravelly loam; 2nd rate.
No timber.

N. 0° 5′ W., on a random line bet. secs. 5 and 6.
40.00 Set temp. ¼ sec. cor.
80.05 Intersect N. bdy. of the Tp. 3 lks. E. of the cor. of secs. 5, 6, 31 and 32, which is a limestone marked and witnessed as described by the surveyor-general.
Thence I run
S. 0° 6′ E., on a true line bet. secs. 5 and 6.
Over rolling ground.
40.05 Set a limestone, 18 x 8 x 5 ins., 12 ins. in the ground, for ¼ sec. cor., marked ¼ on W. face; dig pits, 18 x 18 x 12 ins., N. and S. of the stone, 3 ft. dist.; and raise a mond of earth, 3½ ft. base, 1½ ft. high, W. of cor.
80.05 The cor. of secs. 5, 6, 7, and 8.
Land, rolling.
Soil, gravelly loam; 2nd rate.
No timber.

11 a. m., August 17, 1893.

In order to locate Ivy Island, I proceed as follows:
I begin at the meander cor. of fracl. secs. 17 and 20, at $0^h\ 45^m$ p. m., which being too near noon to secure accurate results with the solar, I take a back sight on the cor. of secs. 16, 17, 20 and 21, prolong the direction, N. 89° 57′ W., bet. secs. 17 and 20, and set a flag on line, on the S. E. side of the island. To determine the distance to the flag, I lay off a base line, S. 30° 32′ W., 36.00 chs., to a point, at which the angle bet. flag and meander cor. measures 68° 01′; from the flag, the base line subtends an angle of 52° 31′. The sum of the three angles is 180° 03′; therefore the corrected angles, taken in the order of their measurement, are, respectively, 59° 30′, 68° 00′, and 52° 30′; and the distance is

$$\frac{\sin.\ 68° \times 36}{\sin.\ 52°\ 30'} \text{ or } \frac{0.9272 \times 36}{0.7934} = 42.07 \text{ chs.}^{86}$$

Subdivision of T. 15 N., R. 20 E.—Continued.

Chains.
36.80 The point for cor. of secs. 17, 18, 19, and 20 falls in the lake; thence N. 89° 57′ W. bet. secs. 18 and 19.

5.27 In place of the flag, I
Set a limestone, 15 x 8 x 6 ins., 10 in. in the ground, for meander cor. of fracl. secs. 18 and 19, marked M. C. on E. face, with 3 grooves on S. face; dig a pit, 36 x 36 x 12 ins., 8 ft. W. of stone, and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.
Thence I run
N. 89° 57′ W., on a true line bet. secs. 18 and 19.
Over level land.
9.38 Intersect W. shore of island.
Set a limestone, 18 x 8 x 5 ins., 12 ins. in the ground, for meander cor. of fracl. secs. 18 and 19, marked M. C. on W. face; dig a pit, 36 x 36 x 12 ins., 8 ft. E. of stone, and raise a mound of earth, 4 ft. base, 2 ft. high, E. of cor.

August 17, 1893.

To locate a small island called Diamond Rock, in Lin's Lake, sec. 19, I proceed as follows:
From the meander cor. of secs. 19 and 24, on the W. bdy. of the township, I set a flag on the south point of the island, which bears N. 71° 30′ E.; then measure a base S. 48° 01′ E., 23.14 chs., to a point, from which the flag bears N. 8 E.; which gives for the distance to flag

$$\frac{\sin.\ 60°\ 29' \times 23.14}{\sin.\ 63°\ 30'} \text{ or } \frac{0.87 \times 23.14}{0.89\ 49} = 22.50 \text{ chs., the required distance.}$$

22.50 In place of the flag, I
Set a limestone, 15 x 8 x 6 ins., 12 ins. in the ground, for an auxiliary[87] meander cor. in sec. 19, marked A. M. C., on S. face; dig a pit, 36 x 36 x 12 ins., 8 ft. N. of stone, and raise a mound of earth, 4 ft. base, 2 ft. high, N. of cor.

August 17, 1893.

Meanders, T. 15 N., R. 20 E.

Meanders of the right bank of Yellowstone River, up stream.
I commence at the meander cor. of fracl. secs. 25 and 30, on the E. bdy. of the Tp., which is a sandstone, 6 x 9 x 7 ins. above ground, marked and witnessed as described by the surveyor general.
At this cor., August 8, I set off 45° 46′ on the lat. arc; 16° 1′ N., on the decl. arc; and at $7^h\ 35^m$ a. m., l. m. t., determine a true meridian with the solar.
Thence I run with meanders in sec. 25.
Through heavy timber.

S. 85° W.	13.00	chs.	Bank 20 ft. high.
S. 72° W.	7.10	″	Bank 9 ft. high
S. 64½° W.	13.00	″	
S. 40° W.	5.40	″	Low bank 5 ft. high. Head of course, leave heavy timber, enter dense willow and cottonwood undergrowth, bears S.
S. 77¾° W.	7.00	″	At 3.20 chs., mouth of Cherry Creek, 14 lks. wide, course N.
N. 76° W.	7.50	″	Bank 7 ft. high. At 2.00 chs., leave dense undergrowth, enter heavy timber, bears S.
S. 80° W.	12.00	″	At end of course, lower end of sand bar, bears N., 2.00 chs. dist.
S. 81° W.	19.39	″	Bank 4 ft. high. At 5.00 chs. leave heavy, enter scattering timber, bears S. To the meander cor. of fracl. secs. 25 and 26.

86. For other methods of computing the distance, see page 136.

87. See pages 44 and 58.

Meanders of the right bank of Yellowstone River, up stream—Continued.

Land, river bottom.
Soil, alluvial; 1st rate.
Timber, cottonwood, sycamore, ash, and walnut,
Heavily timbered land or land covered with dense undergrowth, 70.00 chs.

Thence in sec. 26.
Through scattering timber.

S. 81° W.	8.70	chs.	Bank 8 ft. high.
S. 70¾° W.	4.90	"	At 2.30 chs., upper end of bar, bears N. about 2.00 chs. dist.
S. 44¾° W.	3.60	"	
S. 21° W.	3.50	"	
S. 5¼° W.	4.20	"	
South.	4.30	"	
S. 9¼° E.	3.80	"	
S. 34¾° E.	5.27	"	To meander cor. of fracl. secs. 26 and 35.

Land, level.
Soil, alluvial; 1st rate.
Timber, scattering ash, hickory, walnut, and cottonwood.

Thence in sec. 35.
August 8: At the meander cor. of fracl. secs. 26 and 35, I set off 15° 57′ N., on the decl. arc; and, at 0^h 5^m p. m., l. m. t., observe the sun on the meridian; the resulting lat. is 45° 46′.
Through scattering timber.

S. 28° E.,	8.80	chs.	Bank 8 ft. high.
S. 0¾° E.,	7.70	"	At 4.30 chs., leave scattering timber, enter dense cottonwood and willow undergrowth, bears N. 60° E.
S. 6½° W.	10.00	"	Low bank 4 ft. high. At end of course, road to Mound City, bears S. 70° E. Ferry, and road to Lake City, bears N.____ W.
S. 31° W.	12.00	"	At 5.50 chs. leave dense undergrowth, bears N. 65° E.; enter Pat Curran's field, bears E. At end of course, house bears S. 62° E., 5.00 chs. dist.
S. 38° W.	5.50	"	Bank 13 ft. high. At 5.10 chs., leave Pat Curran's field, fence bears E. At 5.30 chs. middle of road, bears E.
S. 43½° W.	7.70	"	At 1.50 chs., N. W. cor. of Alexander's field, bears E., 0.50 chs. dist.
S. 47½° W.	6.50	"	
S. 37° W.	2.00	"	
S. 58° W.	2.10	"	
S. 42¼° W.	5.40	"	At 3.30 chs., wire fence, bears S. E.
S. 47° W.	4.80	"	
S. 50° W.	4.90	"	
S. 57° W.	9.50	"	
S. 48½° W.	16.68	"	To meander cor. of fracl. secs. 2 and 35, on S. bdy. of the Tp., which is a limestone 5 x 8 x 6 ins. above ground, marked and witnessed as described by the surveyor general.

Land, nearly level.
Soil, alluvial; 1st rate. North of Curran's field subject to inundation, 2 to 5 ft. deep.
Timber, scattering ash, walnut, and cottonwood.
Dense undergrowth, 18.90 chs.

August 8, 1893.

(Pages 214 through 220 deleted. They contain the remainder of the meanders in the township, general description and final oaths.)

PRIVATE LAND CLAIM SURVEYS.

1. Before ordering any survey of a private land claim the surveyor general will receive full instructions from this office, by which he will be governed in issuing his instructions to the deputy. The instructions to the deputy must be entered in full at the commencement of the field notes of such survey.

2. The instruments used in the survey of private land claims must be the same as those required for the survey of public lands, and must be registered and tested in like manner at the surveyor general's office previous to the deputy's commencing work; and the instructions for the survey of public lands must, as far as applicable, be strictly observed in the survey of private land claims.

3. The true magnetic variation must be noted at the beginning point of each survey, and wherever the variation of the needle is observed to change along the line the same must be noted and the reasons therefor stated, if known.

4. At the end of each mile along a boundary, the character of the soil and amount of timber, grass, etc., will be stated; and the date of each day's work in the field must be noted at the end of the record thereof.

5. The requirements in the "Summary of objects and data required to be noted," as set forth in the instructions for the survey of public lands, must be observed by the deputy in the survey of private land claims. Where practicable, bearings must be taken from at least two points on the line to all prominent or otherwise notable objects in the vicinity, and where only one bearing can be taken the estimated distance must be noted.

6. At the beginning point upon the boundaries of each grant survey, a corner must be established of the same character, size, and materials as prescribed for township corners upon the lines of the survey of public lands, except that only two pits will be dug, one on each side of the corner, on the line. Upon the side of such corner facing the claim, the initial letters of the name of the grant, and immediately under the same the letters "Beg. Cor. 1" (for beginning corner one) must be neatly cut or chiseled.

7. Each of the mile corners or stations of survey must be established in the manner prescribed for the establishment of section corners upon the lines of public surveys, except that they will be marked on the side facing the grant with the initials of the grant and the number of the station or mile, as the case may be; and only two pits will be dug, one on each side of the corner, on the line.

8. Where mile corners are established, except upon meandered portions of the line, half-mile corners will also be estab-

lished in the manner prescribed for the establishment of quarter-section corners upon the lines of public surveys, except that they will be marked upon the side facing the grant with the initials of the grant.

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9. Such other marks, in addition to those above described, will be placed upon the corners as may be required by the surveyor general in his special written instructions.

10. As far as practicable, bearings and distances must be taken from each of the corners or stations to two or more trees, or prominent natural objects, if any, within a convenient distance, in the same manner as required in the instructions for the survey of public lands, and such trees or objects must be marked with the initials of the grant, and underneath same the letters "B. T." or "B. O.," as the case may be.

11. Witness corners will be established, where necessary, in the same manner as required in the instructions for the survey of public lands.

12. In all cases where the lines of the grant boundary surveys intersect established lines of survey of public lands or private land claims, the course and distance from such point of intersection to the nearest corner on the line of the prior survey must be carefully run, measured, and noted, and whenever necessary such corner must be reëstablished.

13. The survey of a private land claim must always be connected by a line actually run and measured in the field with some corner of the public surveys, if any such have been established within a distance not exceeding two miles from any point on the boundary lines of the private land claim.

14. Boundaries or portions of boundaries of previously established grant surveys, which also form a portion of the boundaries of the claim to be surveyed, will be adopted so far as common to both grants, but no payment will be made for such common boundaries unless it is necessary to reëstablish the same.

15. The field notes must embrace a full, clear, and concise statement of the deputy's reasons for his location and establishment of each boundary.

16. A general description of each tract must be given at the end of the field notes of the survey of same, which description must embrace a brief statement of the main features of the tract surveyed, character of the land, timber, and other natural growth, kinds of mineral, if any, population of towns and settlements, characteristics of mountains, streams, springs, etc., and such other data as may be of importance.

17. The deputy must particularly note all facts relative to present inhabitancy of the land and designate all tracts occupied by actual settlers or residents.

18. The deputy surveyor must return with the field notes a topographical map or plat of the survey. As far as practicable all objects described in field notes, and the main features of the tract surveyed, including towns, streams, mountains, roads, etc., must be protracted on such plat as accurately as possible.

19. The field-note books must embrace a list of assistants, and preliminary and final oaths, as required in the instructions for the survey of public lands.

20. The deputy will note all objections to his survey that may be brought to his knowledge, and the surveyor general will promptly report to the Commissioner of the General Land Office all complaints made to him, and send up all protests filed in his office, together with a full report thereon.

21. Official plats of the survey of private land claims will not be furnished to any person until the cost of surveying and platting the same shall have been paid to the United States.

APPENDIX RELATIVE TO ACCOUNTS FOR SURVEYING AND EXAMINATION.

U.S. surveyors general and deputy surveyors are required to comply strictly with the following instructions:

All surveying accounts transmitted to the General Land Office for adjustment must be in duplicate and in a separate letter from that forwarding the plats and field notes of the survey. The name of the deputy surveyor, date and number of the contract, the amount of the estimated liability, and whether said liability is limited or not, should be noted on the face of the deputy's account.

The amount of the account and the approprition from which it is to be paid should be stated both in the letter of transmittal and in the account rendered. The deputy's affidavit that the survey was executed by him, and that it was just and correct, should be attached to the account.

The date of the surveyor general's approval should appear in the certificate thereto, and the destination of the draft or drafts, the name of the payee or payees, with the post-office address, should be added.

When the survey is chargeable to "Deposits by individuals for surveying the public lands," it should be so stated, and the deposit to which the field work is chargeable should be listed by number and date of certificate of deposit, with number of township and range for which the deposit is made, and the amount of each certificate.

When the amount of an account is in excess of the liability of the contract, a copy of office letter authorizing the excess must always accompany the account.

When stating an expense account for examination in the field or office on surveys, the number of the contract under which the survey was made, the name of the surveyor, with the number of township and range examined, should be inserted in the account, accompanied by a copy of letter of authorization, said account and vouchers to be furnished in duplicate and to have the affidavit of the examiner as to the correctness of the charges and the approval of the surveyor general attached.

When surveys are continued and executed beyond the time limited in the contract and the contract has expired, and there has been no properly-granted extension of time thereto, the compensation of the deputy surveyor for the lines of survey executed after the expiration of the contract will be reduced, and said lines completed at such rates as the Commissioner of the General Land Office may in his judgment determine to be proper, taking into consideration the value of the work and the limitations of the appropriation from which the account must be paid.

The field notes of a U. S. deputy surveyor, which are the

data upon which his surveying account is stated by the surveyor general, and

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subsequently adjusted by the Commissioner of the General Land Office, should describe the surface, soil, etc., at the end of each mile or fractional mile of survey, and should state the number of chains and links which are "mountainous," "heavily timbered," or covered with "dense undergrowth," using always the exact phraseology of the appropriation act which establishes the rates for said lines of surveys.

By dense undergrowth is meant thick bushes, boughs, or other vegetable growth of such height as to obstruct the use of the transit, and require cutting away to obtain sights along line; also bushes, brush, vines or other vegetation which is of such tangled and difficult character as to seriously impede the work of chaining the line.

Connecting lines, showing closing distances to closing corners, will be paid for at the minimum rate allowed in the contract for that class of line which is run to the closing corner, unless otherwise specially provided in the contract.

The practice of allowing deputies to retrace any and all lines which they may deem necessary in connection with their work, and compensating them therefor, has been discontinued.

If it becomes necessary to retrace any of the exterior lines in order to properly close their lines of survey it must be done at the deputy's own expense as a legitimate contingent in executing the contract. If it should be found to be absolutely necessary to resurvey and retrace any portion of the exterior township lines, except such as are clearly provided for in the article on pages 72, 73, and 74, the deputy should report the facts immediately to the surveyor general and await further instructions. The facts as reported to him will be promptly laid before the Commissioner of the General Land Office, specifying the number of miles of retracement required, and, is such resurvey is authorized, the deputy will be immediately notified. In no other case will any resurvey be paid for which is not specifically authorized by the Commissioner.

PROCEDURE OF COUNTY AND PRIVATE SURVEYORS IN RESTORING LOST AND OBLITERATED CORNERS AND SUBDIVIDING SECTIONS.

The General Land Office assumes no control or direction over the acts of local and county surveyors in the reestablishment of extinct corners of original surveys. It follows the general rule that disputes, arising from uncertain or erroneous location of original corners, are to be settled by the proper local authorities or by amicable adjustment; and to aid in this result it furnishes a circular pamphlet which is merely advisory and explanatory of the principles which should prevail in performing such duties.

Surveyors who have been United States deputies should bear in mind that in their private capacity they must act under somewhat different rules of law from those governing original surveys, and should carefully distinguish between the provisions of the statute which guide a Government deputy and those which apply to retracement of lines once surveyed. The failure to observe this distinction has been prolific of erroneous work and injustice to land owners.

The circular on "Restoration of lost and obliterated corners," dated March 13, 1883, and the circular on subdividing a section. dated June 2, 1887, are furnished to applicants.

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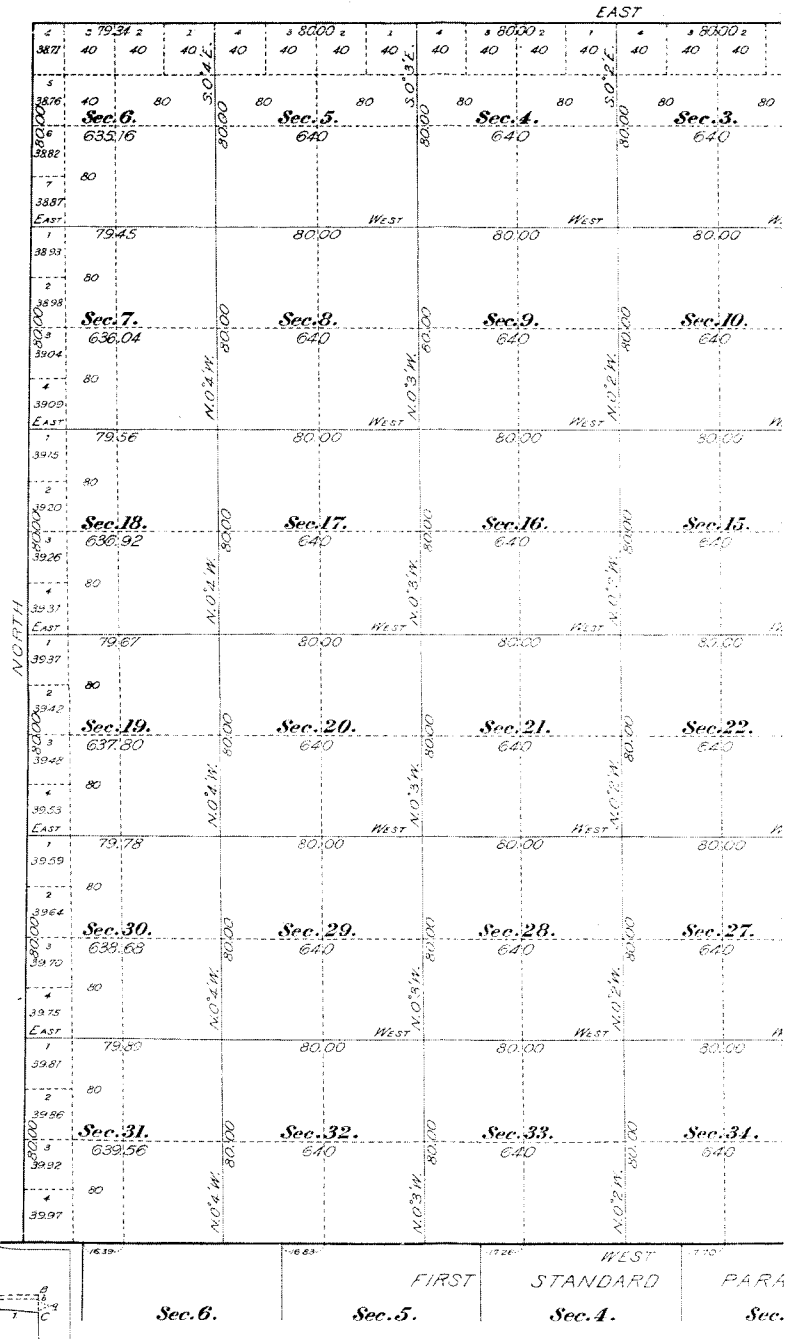
(Pages 226 through 236 deleted. They contain the remainder of the Index.)

[Ed. Note: The 1894 Manual was the first Manual to contain a detailed Index.]

Fig. 1.

Township No. 5 North, Range No. 9 West, (



The above plat represents a Theoretical Town
perfect subdivisions, contiguous to the north
Standard Parallel, in assumed Latitud
and Longitude 100°00' W. of Gr. Area 23

Fig. 2.

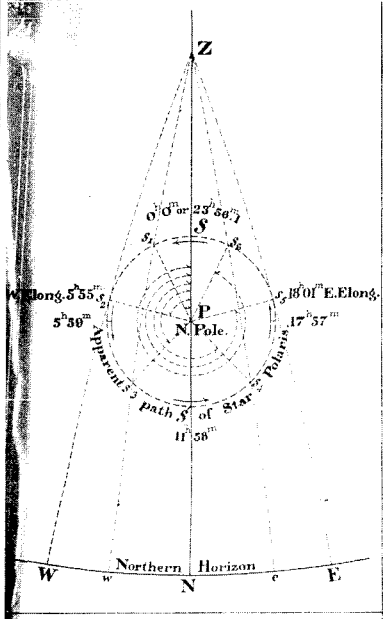


Fig. 3.

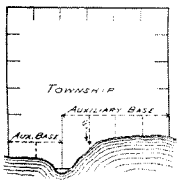
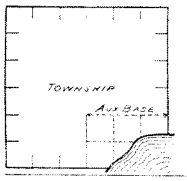


Fig. 4.

Fig. 5.



Note:
Figures 3, 4 and 5, illustrate possible cases under paragraph 10, "Method of Subdividing."

Note:
AB and ab, are drawn parallel to S. bdy. of the sec; then: CA : CB :: Ca : Cb
N. bdy. sec. 6: {diff. of meridional boundaries sec. 6.} :: 60 chs : q;
then will E. bdy. of Lot 4 = E. bdy. of Lot 1 & q, as in the text, under title "Areas of Lots" &c.

Fig. 6.

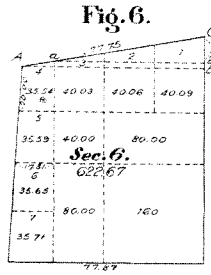
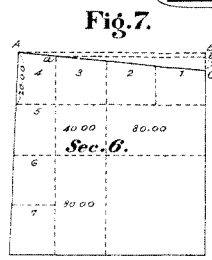


Fig. 7.

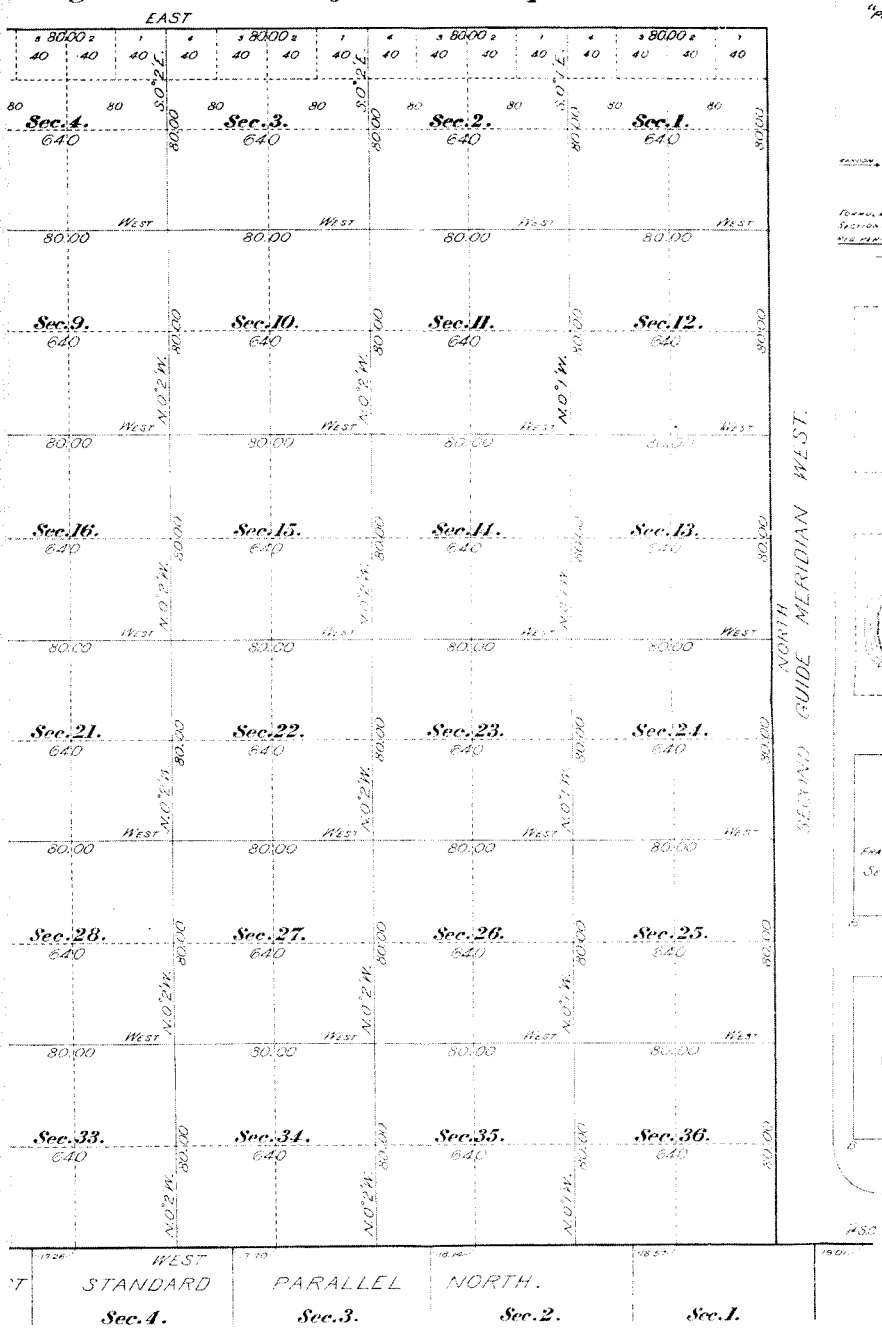


* 35.53, if East boundary of sec = 80.00 chains.

PLATE I.

Fig. 1.

...ange No. 9 West, of a Principal Meridian.



Note:

Figures 8, 9, 10, 11 and 12 illustrate applications of paragraph 7, of "Prescribed Limits" &c.

Fig. 8.

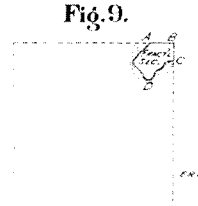
Allowable limits in the falling of Section Lines; see "Prescribed Limits" paragraph 5.

Error for Meander Line, only; see paragraph 7.

Formula for closing error of Sectional Boundaries, Fig. 8.

$\frac{\text{Length of Meander Line in Miles}}{4} \times 50$ links.

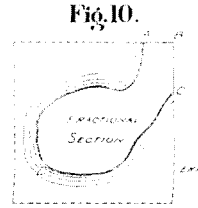
Fig. 9.



ABC = 1/4 mile.
ADC = 1/2 mile.

1/2 × 50 = 25 links,
1/4 × 71 = 4 links;
Error allowed = 29 links.

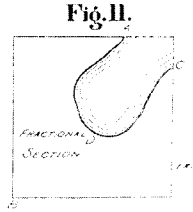
Fig. 10.



ABC = 1/2 mile.
ADC = 2 1/2 miles.

2 1/2 × 50 = 125 links;
1/2 × 71 = 9 links;
Error allowed = 134 links.

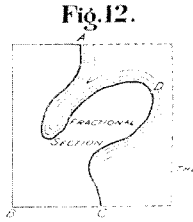
Fig. 11.



ABC = 3 1/2 miles.
ADC = 1 1/2 miles.

1 1/2 × 50 = 75 links,
3 1/2 × 71 = 65 links;
Error allowed = 137 links.

Fig. 12.



ABC = 2 miles.
ADC = 2 1/2 miles.

2 1/2 × 50 = 125 links,
2/4 × 71 = 35 links;
Theoretical error = 160 links;
Reduce to 150 links.

...epresents a Theoretical Township with
...ons, contiguous to the north side of a
...allel; in assumed Latitude 42°15'N.,
...de 100°00'W. of Gr. Area 23024.16 A.

Fig.1.

SECANT METH

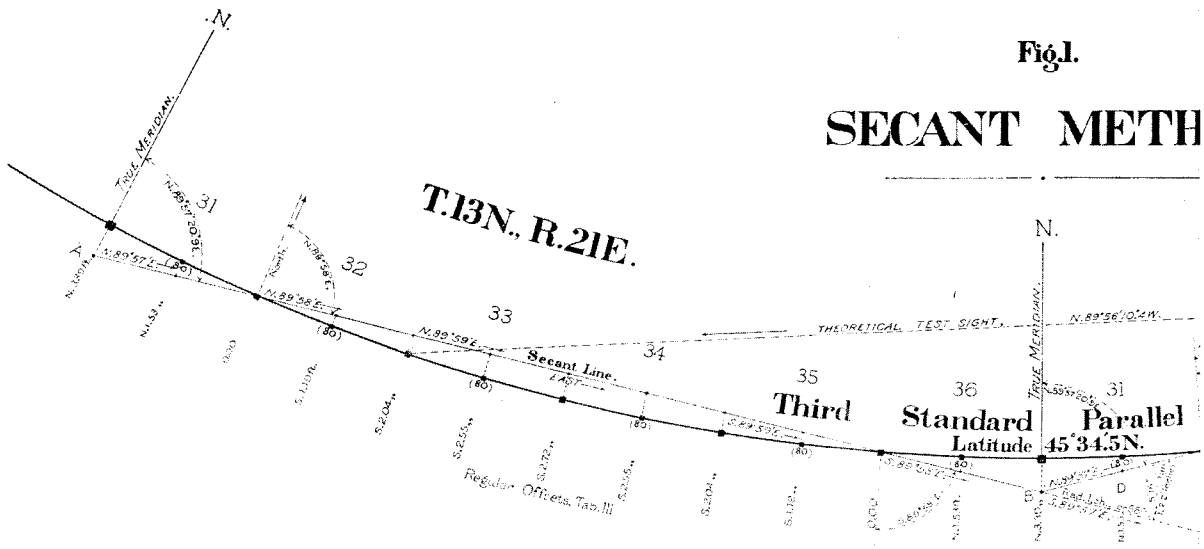
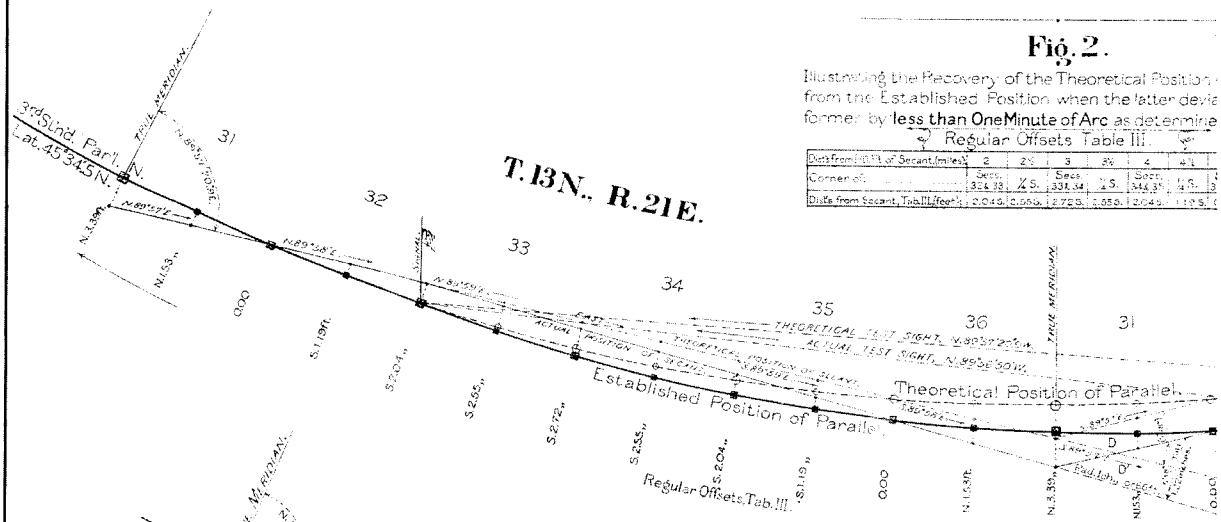


Fig. 2.

Illustrating the Recovery of the Theoretical Position from the Established Position when the latter devia former by less than One Minute of Arc as determine

Regular Offsets Table III.

Dist. from (mil.) of Secant, (miles)	2	2½	3	3½	4	4½
Corner of:	Secs. 32 & 33	¼ S.	Secs. 33 & 34	¼ S.	Secs. 34 & 35	¼ S.
Dist. from Secant, Tab. III, (feet)	2.04 S.	2.55 S.	2.72 S.	2.55 S.	2.04 S.	1.19 S.



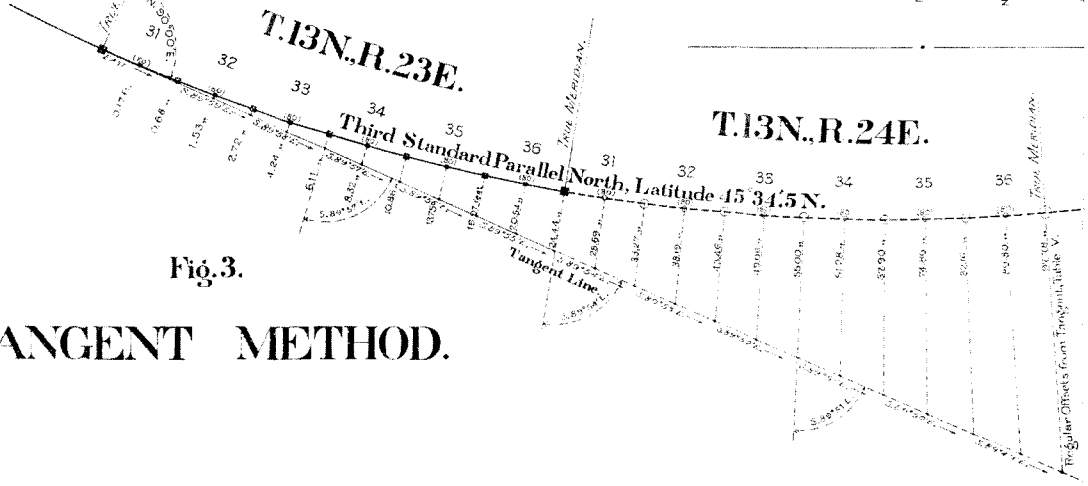


Fig.3.

TANGENT METHOD.

Fig. 1.

ECANT METHOD.

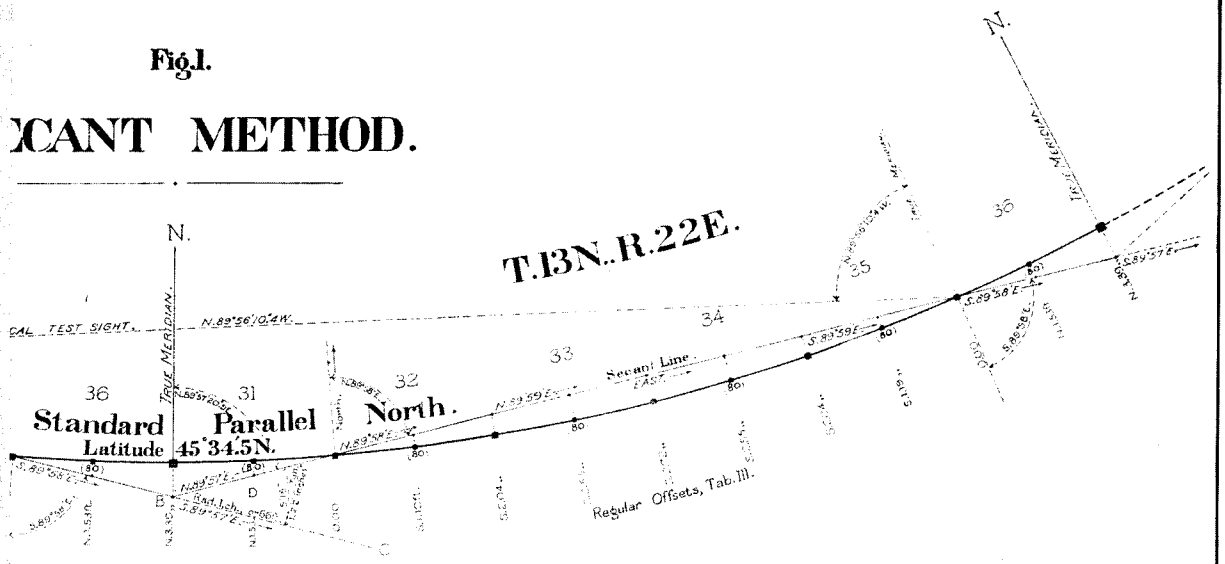


Fig. 2.

The Recovery of the Theoretical Position of the Parallel established Position when the latter deviates from the less than One Minute of Arc as determined by Polaris Obs.

Regular Offsets Table III.

Secant (miles)	2	2½	3	3½	4	4½	5	5½	6
	Secs. 32 & 33	½ S.	Secs. 33 & 34	½ S.	Secs. 34 & 35	½ S.	Secs. 35 & 36	½ S.	Tp. 13 N. Rs. 22 & 23 E
Tab. III (feet)	2.04 S.	2.55 S.	2.72 S.	2.55 S.	2.04 S.	1.19 S.	0.00	1.53 N.	3.39 N.

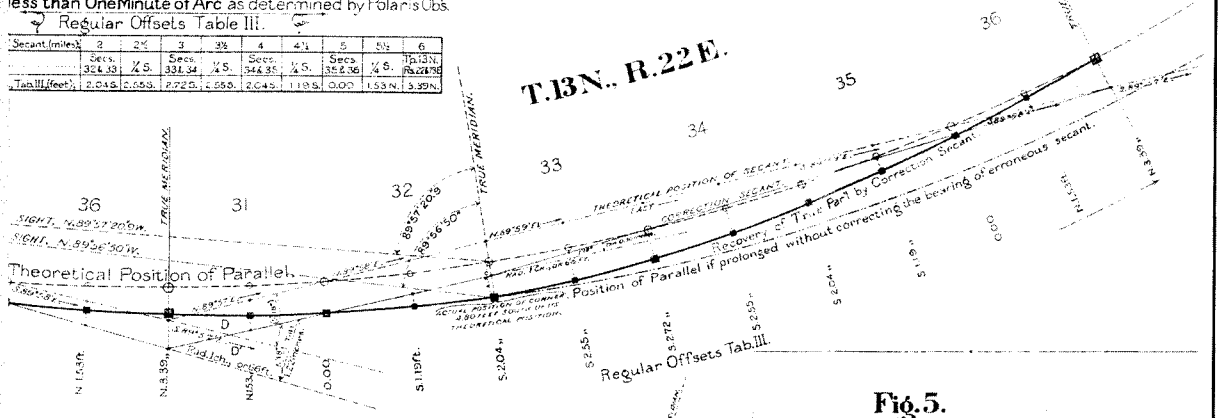
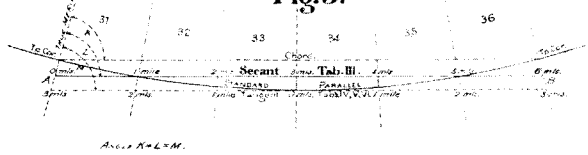
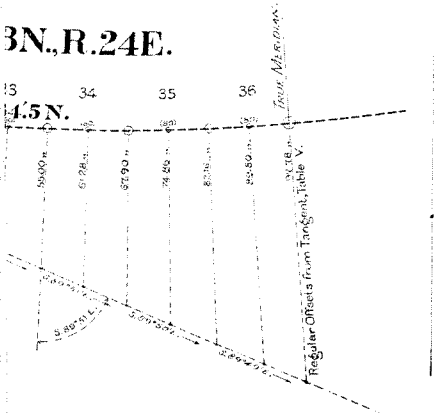


Fig. 5.





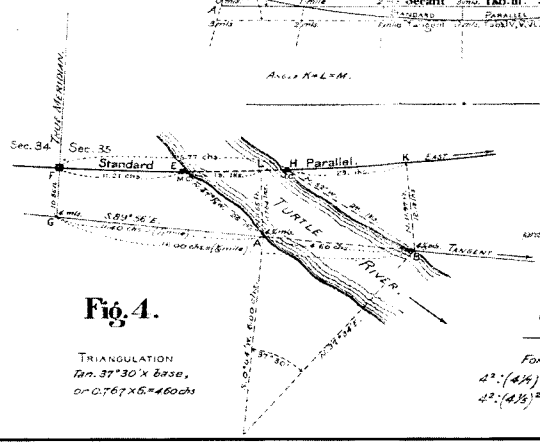


Fig. 4.

TRIANGULATION
Tan. 37°30' x base,
or 0.767 x 6. = 4.60 chs

AL = diff. lat. of course AE;
EL = departure of AE;
whence, AG = FL;
then, EF = AG − EL;

HK = departure of BH;
and, FH = GB − HK.

For the distances AL and BK.
$4^2 : (4\frac{1}{2})^2 :: 10.86 : 11.65$ ft. = 17.64 lks. = AL.
$4^2 : (4\frac{1}{2})^2 :: 10.86 : 11.97$ ft. = 18.13 lks. = BK.

TOWNSHIP EXTERI

Scale: 1 inch to 160 chains.

Explanations.

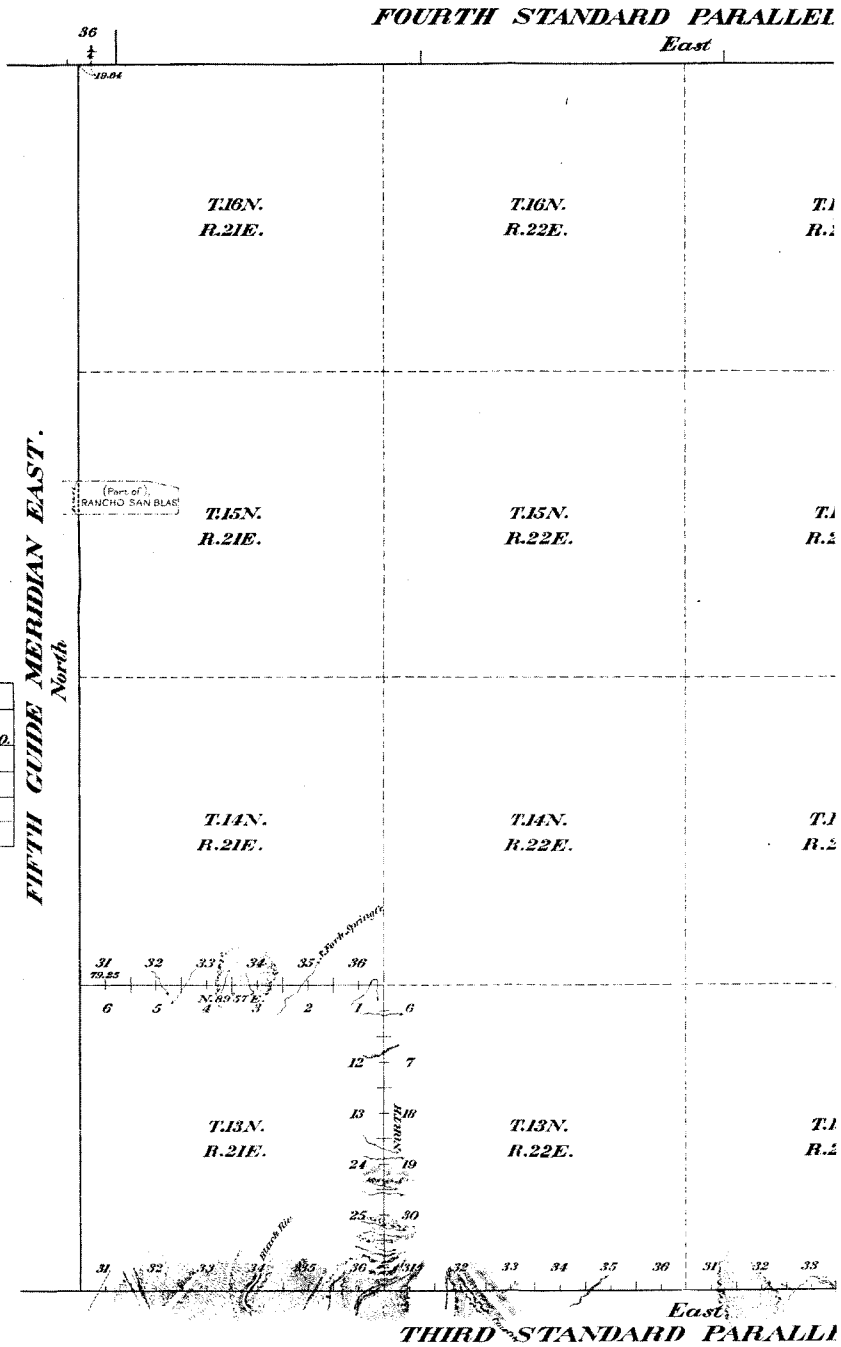
Old Surveys.

Surveyed under current contract.

Unsurveyed.

Table of Mileage.

Surv's Designated	Amount			When Surveyed.
	Mi.	Ch.	Lks.	
Standard Lines	30	00	00	Aug. 22 to 30, 1890.
Township "	11	79	25	Sept. 8 to 13, "
Connecting "				

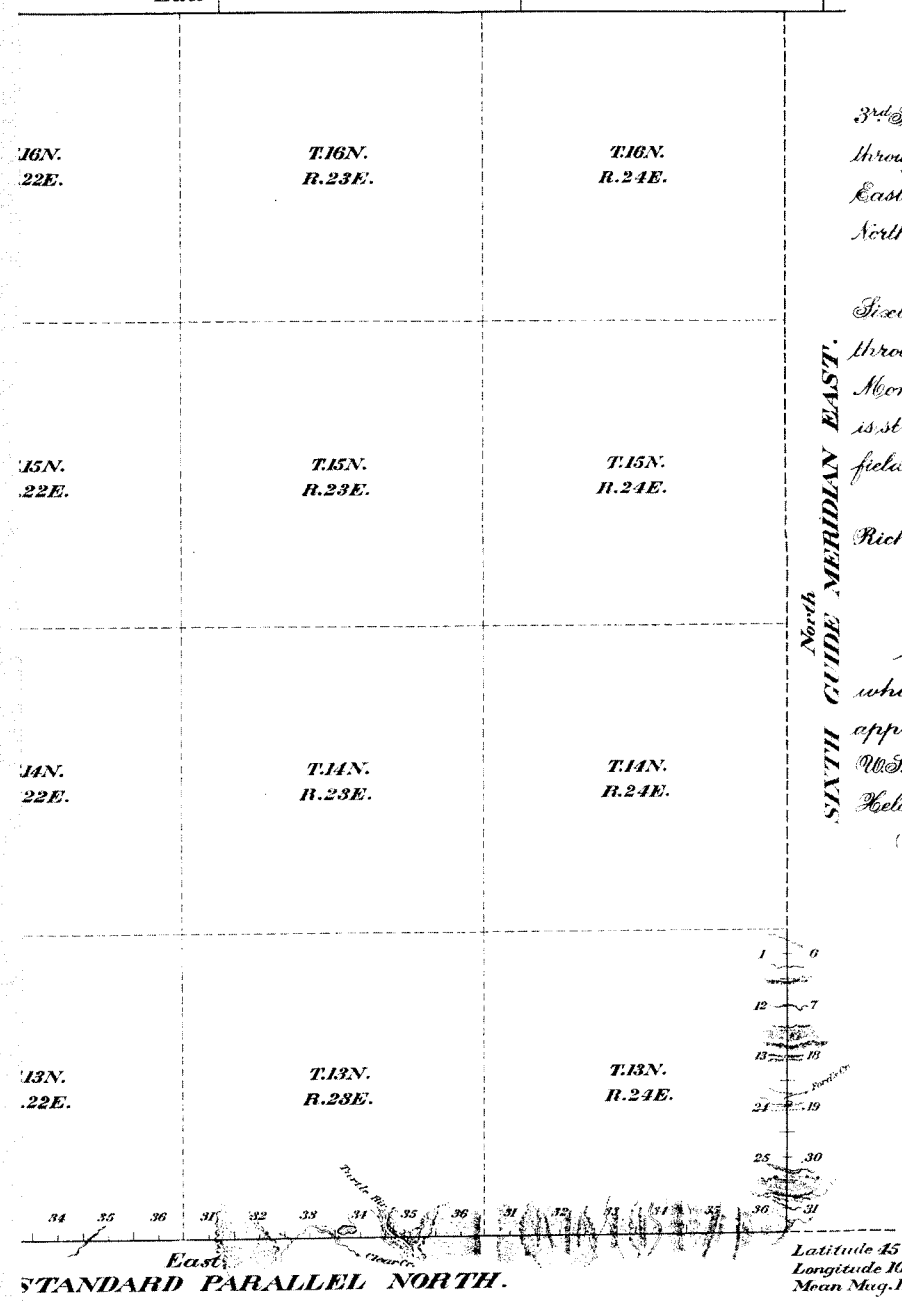


NSHIP EXTERIORS.

Scale: 1 inch to 160 chains.

STANDARD PARALLEL NORTH.

East



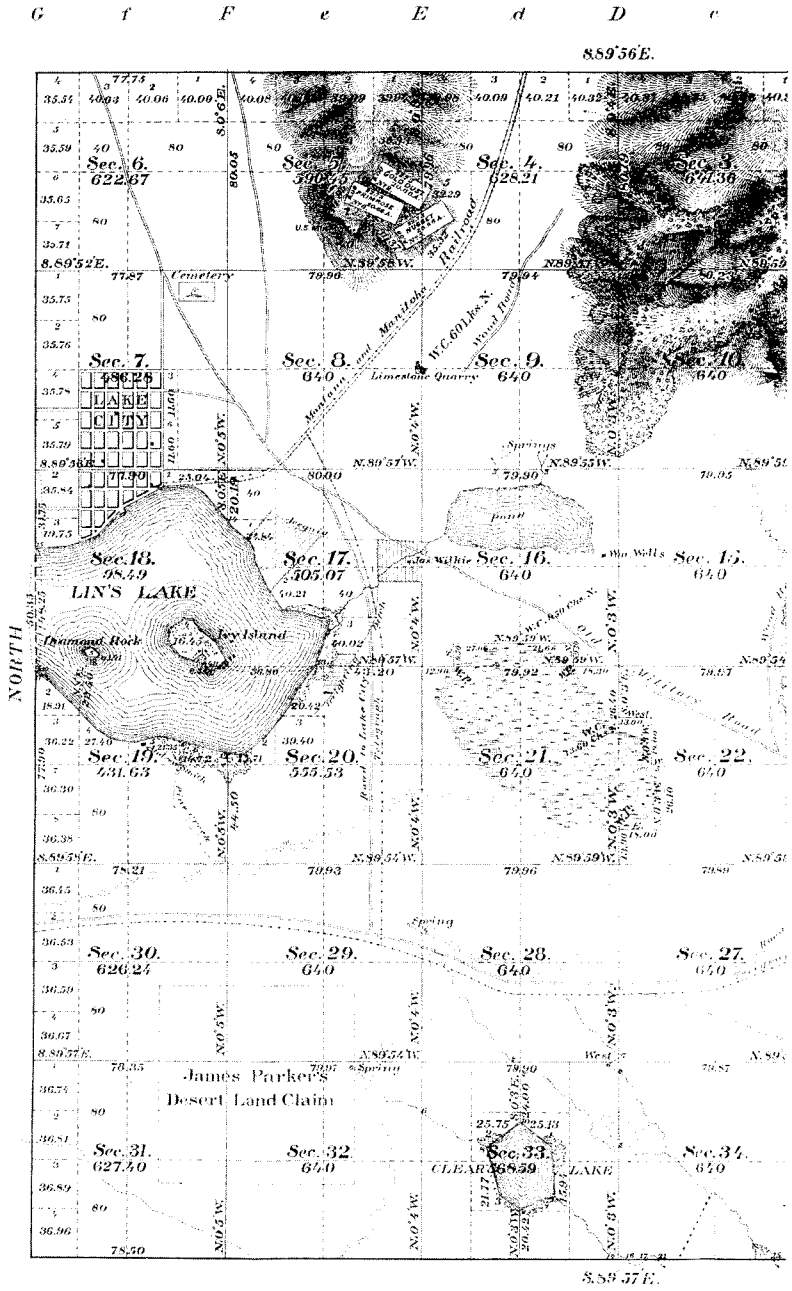
This Plat.
of the
3rd Standard Parallel North
through Ranges 21, 22, 23 & 24 E.;
East Boundary of T. 13 N., R. 21 E.;
North " " " "
and the
Sixth Guide Meridian East
through Township 13 North,
Montana Principal Meridian;
is strictly conformable to the
field notes of the survey thereof
by
Richard Roods, U.S. Dep. Surv.,
under his
Contract No. 97,
dated July 10th 1890,
which have been examined,
approved and filed in this office.
U.S. Surv. Gen'l's Office.
Helena, Montana.

(Date of Approval.)

U.S. Surv. Gen'l.

Latitude 45° 34.5' N.
Longitude 107° 24' W. of Gr.
Mean Mag. Decl. 18° 02' East.

Township Nº 15 North, Range Nº 20 East of the



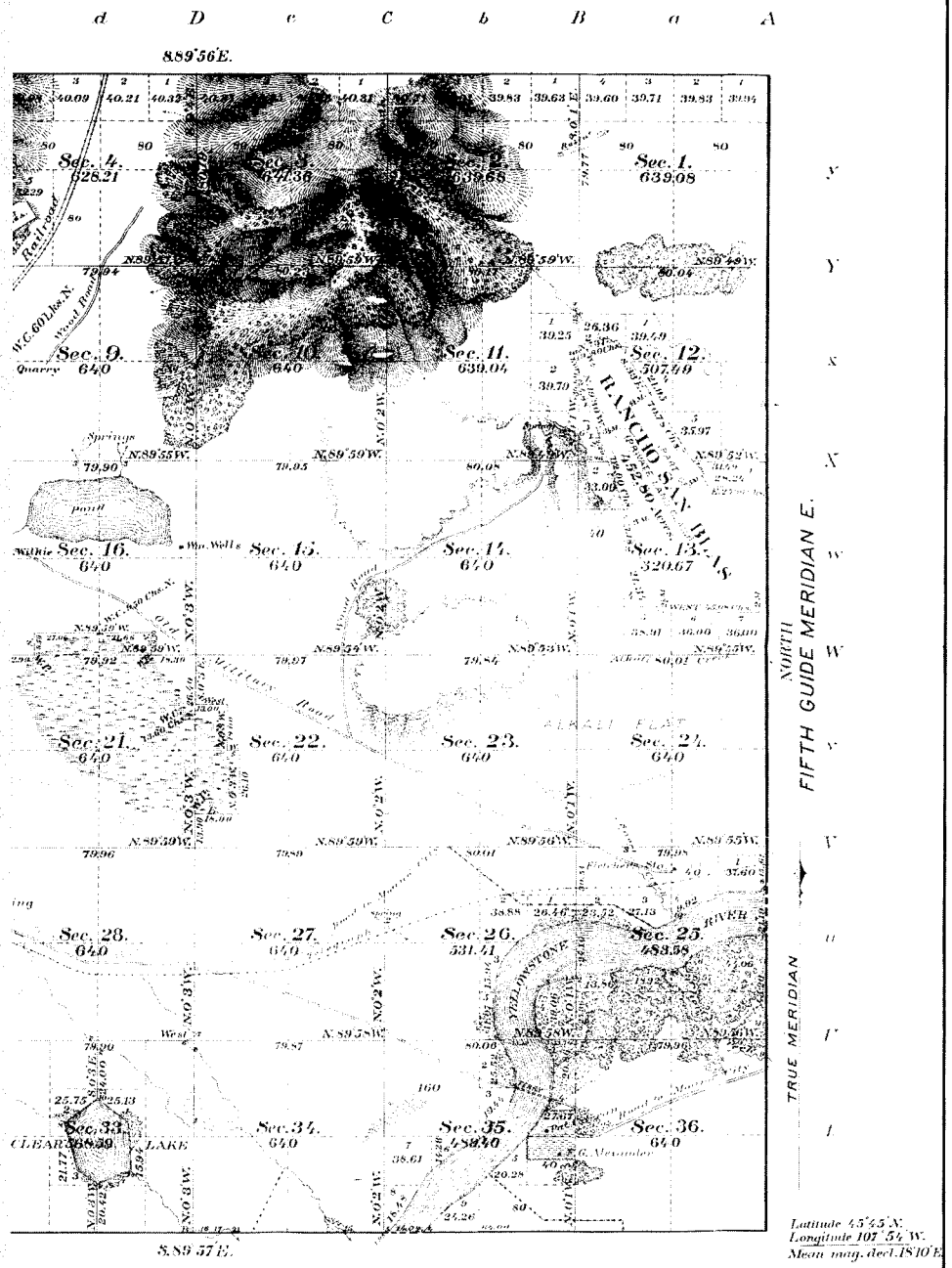
n O o P p Q q

Area in acres: Public Land, 20872.27. Townsite 199.01. Private Land Claim, 452.80.
Water surface, 1362.99. Mineral Claims, 61.98. Total Area, 22949.05 Acres.

Surveys Designated	By Whom Surveyed	Contract No.	Contract Date	Amount of Surveys Ms.	Chs.	Lks.	When Surveyed
Subdivisions	Robert Acres	207	March 22nd 1893	56	60	72	Aug. 4th to 19th 1893.
Connections	"	"	"		73	60	"
Meanders	"	"	"	12	19	26	"

PLATE IV.

nge Nº 20 East of the Principal Meridian Mont.



Private Land Claim. 452.80.
08. Total Area. 22949.05 Acres.

nount of Surveys s.	Chs.	Lks.	When Surveyed
5	60	72	Aug. 4th to 19th 1893.
	73	60	"
2	19	26	"

The above Map of Township No. 15 North, of Range No. 20 East of the Principal Meridian, Montana, is strictly conformable to the field notes of the survey thereof on file in this Office, which have been examined and approved.
Surveyor Generals Office.

Sur: Genl

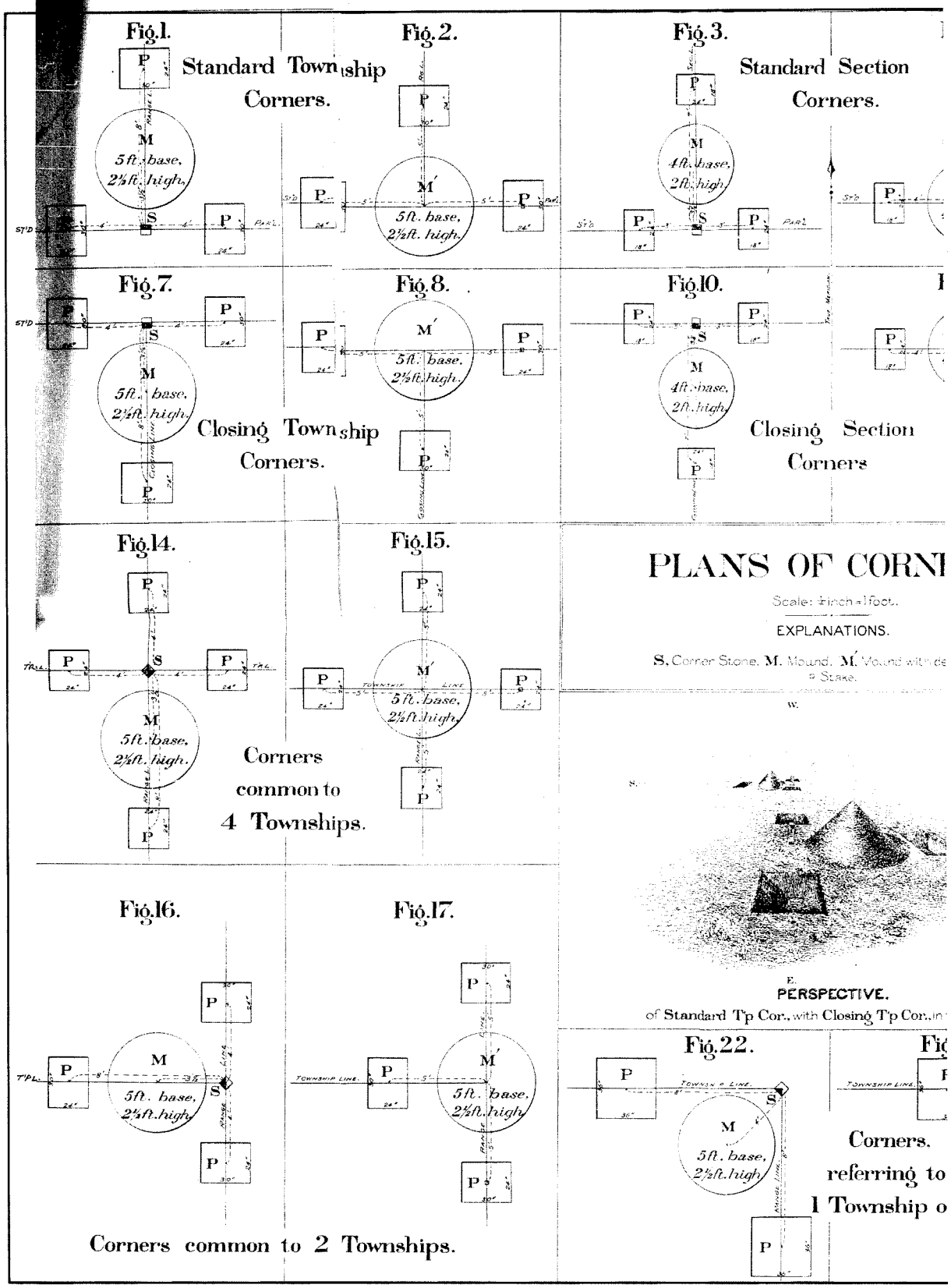


Fig. 1.
Standard Township Corners.
Fig. 2.
Fig. 3.
Standard Section Corners.
Fig. 7.
Fig. 8.
Fig. 10.
Closing Township Corners.
Closing Section Corners
Fig. 14.
Fig. 15.
PLANS OF CORNI
Scale: 1 inch = 1 foot.
EXPLANATIONS.
S, Corner Stone. M. Mound. M′ Mound with de
Stake.
Corners common to 4 Townships.
Fig. 16.
Fig. 17.
PERSPECTIVE.
of Standard Tp Cor., with Closing Tp Cor., in
Fig. 22.
Corners. referring to 1 Township o
Corners common to 2 Townships.

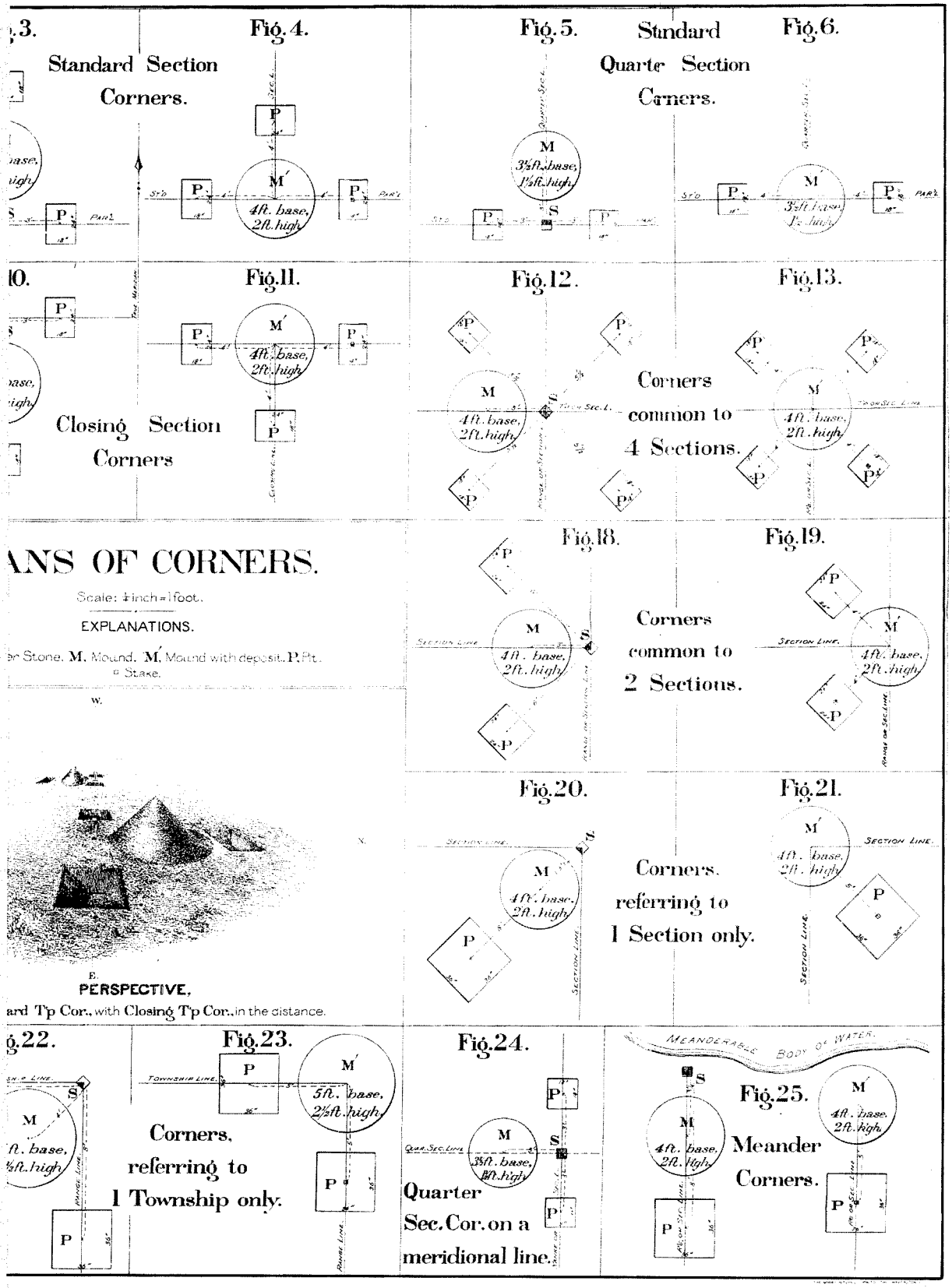
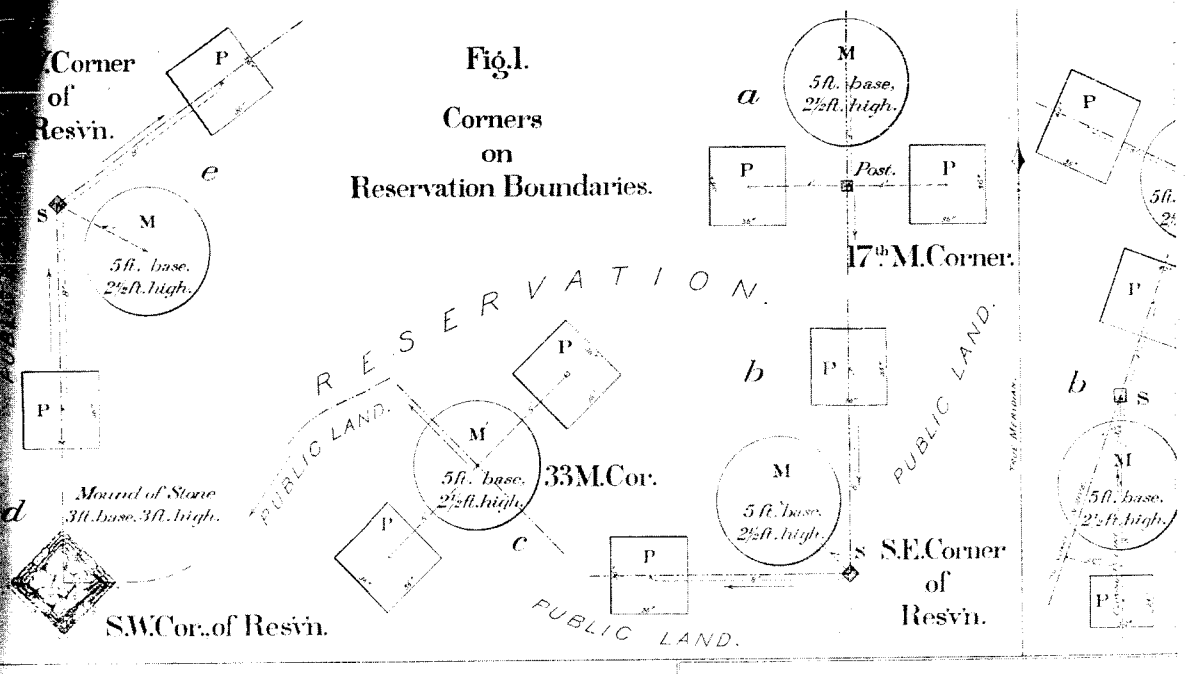
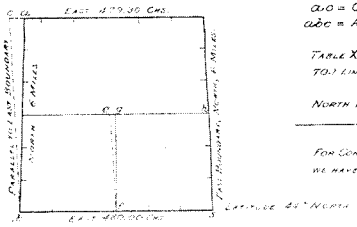


Fig. 3.
Standard Section Corners.
Fig. 4.
4ft. base, 2ft. high
Fig. 5.
Standard Quarter Section Corners.
3½ft. base, 1½ft. high
Fig. 6.
3ft. base, 1½ft. high
Fig. 10.
Closing Section Corners
Fig. 11.
4ft. base, 2ft. high
Fig. 12.
Corners common to 4 Sections.
Fig. 13.
4ft. base, 2ft. high
ANS OF CORNERS.
Scale: 1 inch = 1 foot.
EXPLANATIONS.
Stone. M. Mound. M′. Mound with deposit. P. Pit.
Stake.
Fig. 18.
Corners common to 2 Sections.
Fig. 19.
4ft. base, 2ft. high
PERSPECTIVE,
ard Tp Cor., with Closing Tp Cor., in the distance.
Fig. 20.
Corners, referring to 1 Section only.
Fig. 21.
4ft. base, 2ft. high
Fig. 22.
Fig. 23.
Corners, referring to 1 Township only.
5ft. base, 2½ft. high
Fig. 24.
Quarter Sec. Cor. on a meridional line.
3ft. base, 1½ft. high
Meanderable Body of Water.
Fig. 25.
Meander Corners.
4ft. base, 2ft. high



Convergency of Meridians.

Fig. 5.



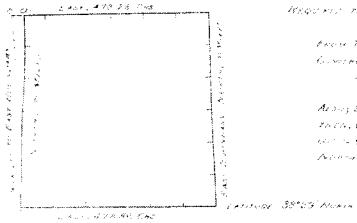
Q.O. = Convergency on the Parallel.
ωOC = Angle of Convergency.

Table X: opposite Latitude 44° will be found 70.1 links, the convergency.

North Boundary = 480.00 − 0.70 = 479.30 Chs.

For convergence of the meridians 5th and 6th, we have: $70.1 \times \frac{5}{6} \times \frac{2}{6} = 17.15$ links, as in the text.

Fig. 6.



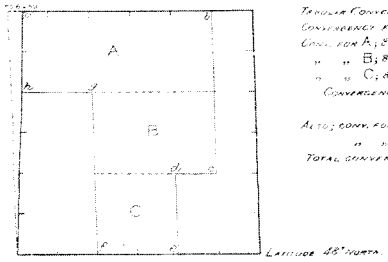
Required: the convergency for a township in Lat. 38°59' N.

From Table X
Convergency in Latitude 38° = 75.9 links
" " " 39° = 56.3 "
Difference = 2.0 "

As 1° : 59' = 0°48';
then, 0.48 × 2.0 = 1.02 links;
Q.O. = 65.8 + 0.16 = 67.96 = the convergency required.
North Boundary = 479.90 − 0.67 = 479.23 chains.

* Taken at the least value of Q.O.

Fig. 7.



Tabular Convergency, is 80.6 links.
Convergency for the tract 6th in height:
Conv. for A: $80.6 \times \frac{5}{6} \times \frac{5}{6} = 22.39$ links;
" " B: $80.6 \times \frac{5}{6} \times \frac{2}{6} = 13.43$ "
" " C: $80.6 \times \frac{2}{6} \times \frac{2}{6} = 8.96$ "
Convergency required = 43.77 "

As to; conv. for E. tract is 17.92 "
" " S.W. " " 17.91 "
Total convergency, 80.60 links, for Township

PLANS OF CORNE

(Scale: ½ inch = 1 foot.).

AND

Miscellaneous Diagram

EXPLANATIONS.

S. Corner Stone. M. Mound with dep
a Stone.

Fig. 8.

Meander Corner.

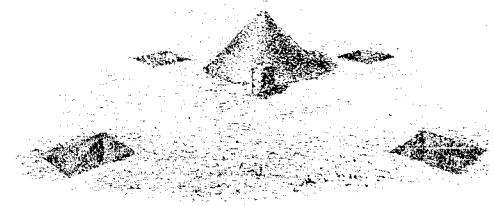
PERSPECTIVE.

Cor. com

View Looking North.

Fig. 10.

Cor. common to Four Sections.



View Looking West.

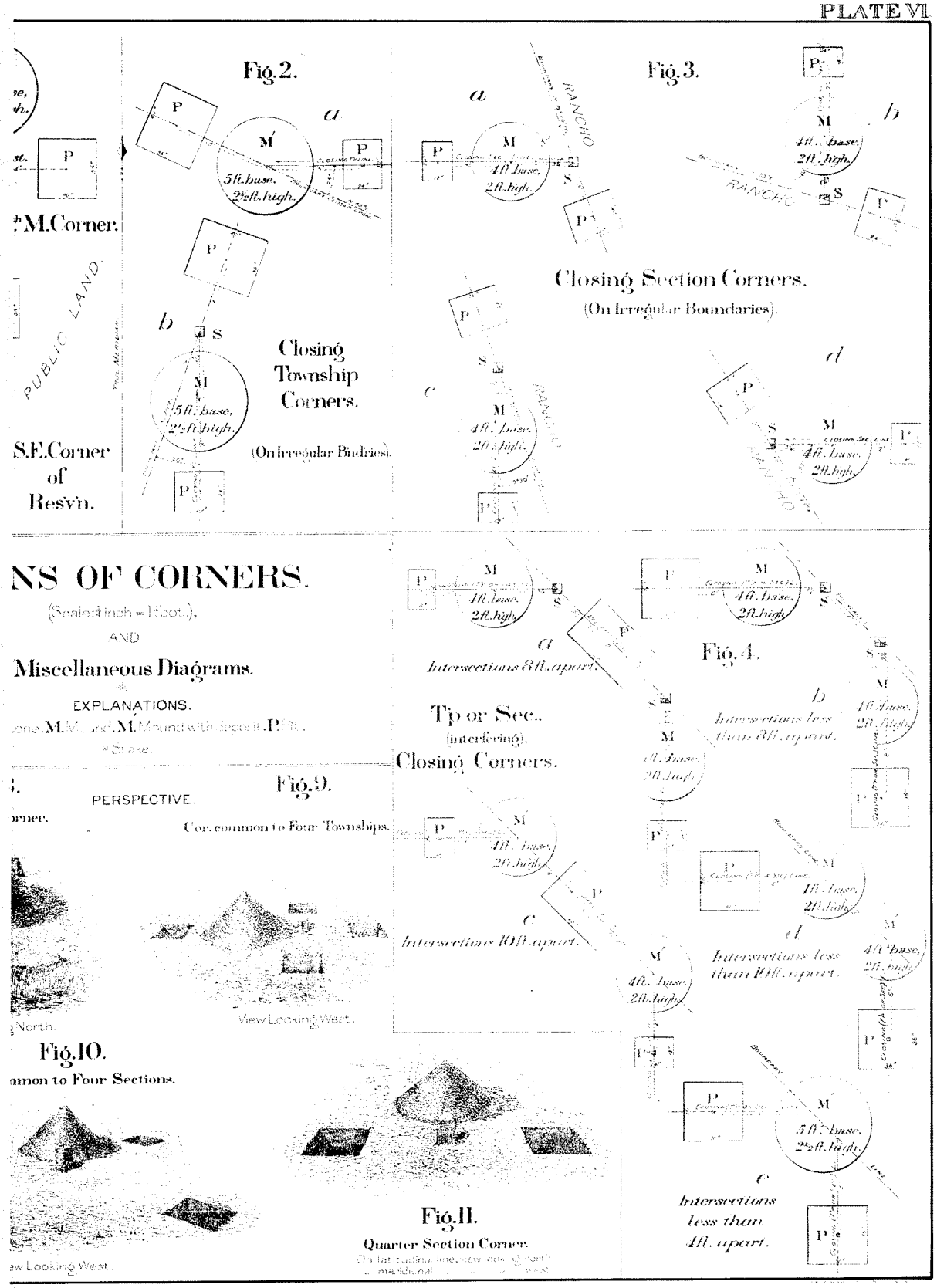


Fig. 2.
Fig. 3.
Closing Township Corners.
(On Irregular Bindries).
Closing Section Corners.
(On Irregular Boundaries).
RANCHO
PUBLIC LAND
M. Corner.
S.E. Corner of Res'vn.
NS OF CORNERS.
(Scale: ¼ inch = 1 foot.),
AND
Miscellaneous Diagrams.
EXPLANATIONS.
Fig. 4.
Intersections 8 ft. apart.
Intersections less than 8 ft. apart.
Tp or Sec.
(interfering).
Closing Corners.
Intersections 10 ft. apart.
Intersections less than 10 ft. apart.
Intersections less than 4 ft. apart.
PERSPECTIVE.
Fig. 9.
Cor. common to Four Townships.
View Looking West.
Fig. 10.
mmon to Four Sections.
Fig. 11.
Quarter Section Corner.
ew Looking West.

Fig. 1.

East Boundary defective in Alignment.

See Clause 1, Paragraph 1.

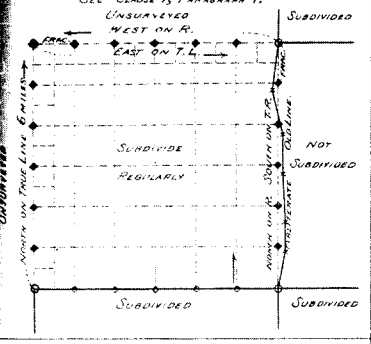


Fig. 2.

East Boundary defective in Measurement.

See Clause 1, Paragraph 1.

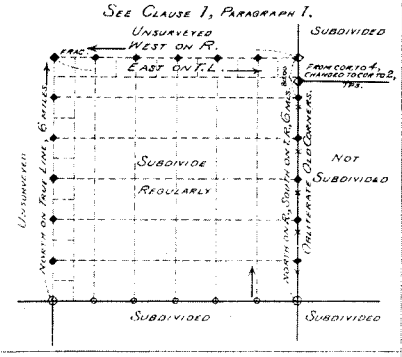


Fig. 3.

South Boundary defective in Alignment.
East " " " Position.

See Clause 1, Paragraph 1.

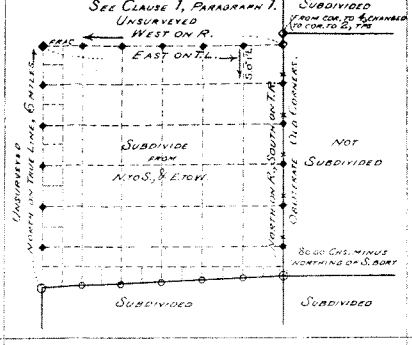


Fig. 6.

South and East Boundaries defective in Alignment, Measurement & Position.

See Clause 1, Paragraph 2.

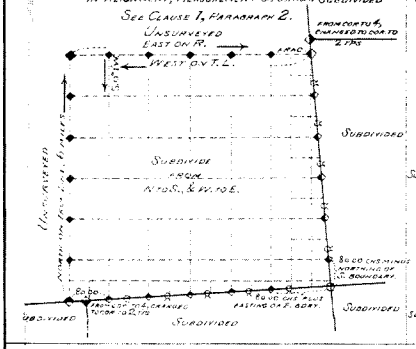


Fig. 7.

North Boundary
South "
East "
West "
defective in Alignment, Measurement & Position.

See Clause 1, Paragraph 2.

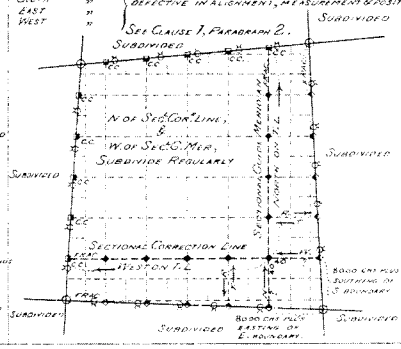


Fig. 8.

East Boundary defective in Measurement & Position.

See Clause 2, Paragraph 3.

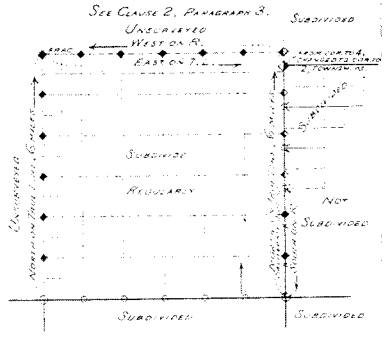


Fig. 9.

S. Boundary defective in Alignment, Measurement and Position.

See Clause 3, Paragraph 3.

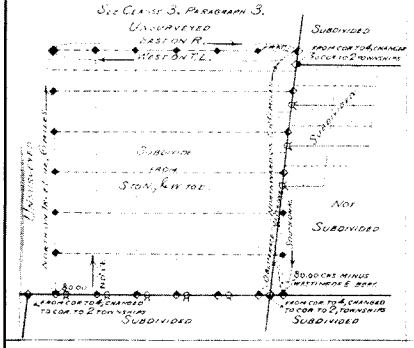


Fig. 10.

East Boundary defective in Measurement & Position.

See Clause 4, Paragraph 3.

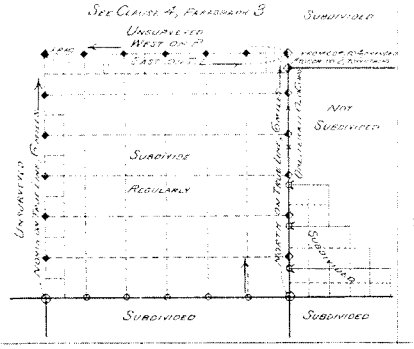


Fig. 11.

East Boundary defective in Alignment, Measurement & Position.

See Clause 4, Paragraph 3.

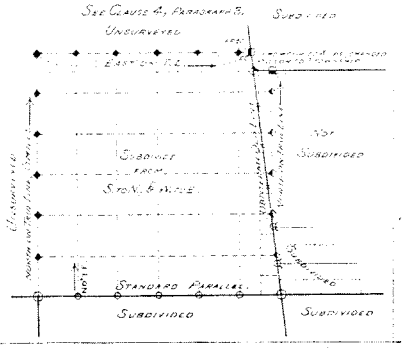


Fig. 12.

East Boundary defective in Measurement & Position.

See Clause 1, Paragraph 4.

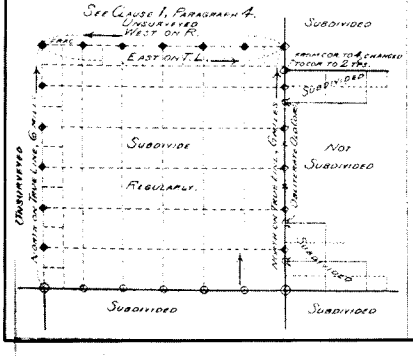


Fig. 13.

East Boundary defective in Alignment, Measurement & Position.

See Clause 1, Paragraph 4.

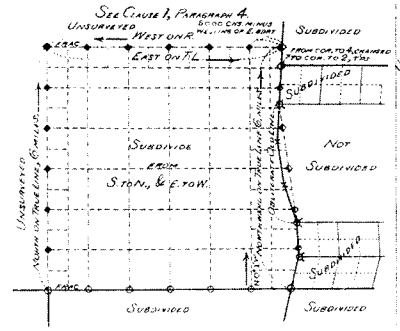


Fig. 14.

East Boundary defective in Alignment, Measurement & Position.

See Clause 1, Paragraph 4.

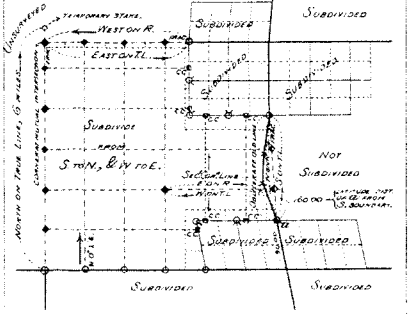


PLATE VII.

Fig. 3.

…n Boundary defective in Alignment.
" " " Position.
See Clause 1, Paragraph 1.

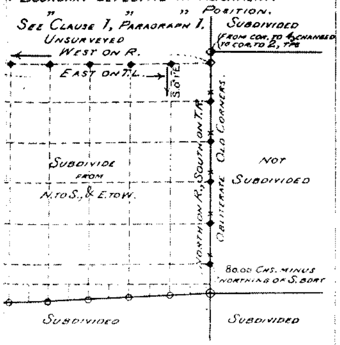


Fig. 4.

East Boundary defective in Alignment.
See Clause 2, Paragraph 1.

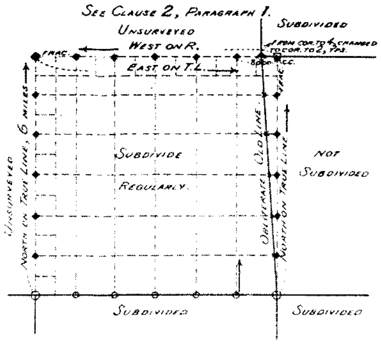


Fig. 5.

East Boundary defective in Alignment.
See Clause 2, Paragraph 1.

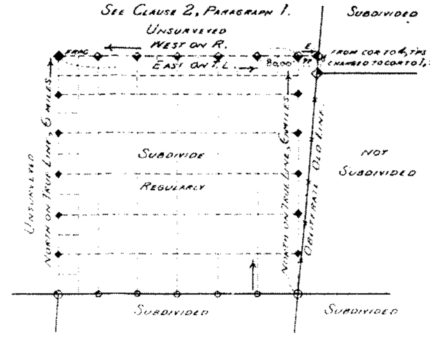


Fig. 8.

… Boundary defective in Measurement & Position.
See Clause 2, Paragraph 3.

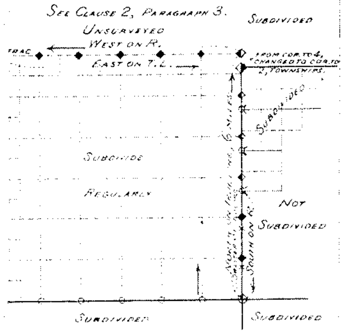


Fig. 15.

See Article on "Retracement or Resurvey of Township Lines" (in general).

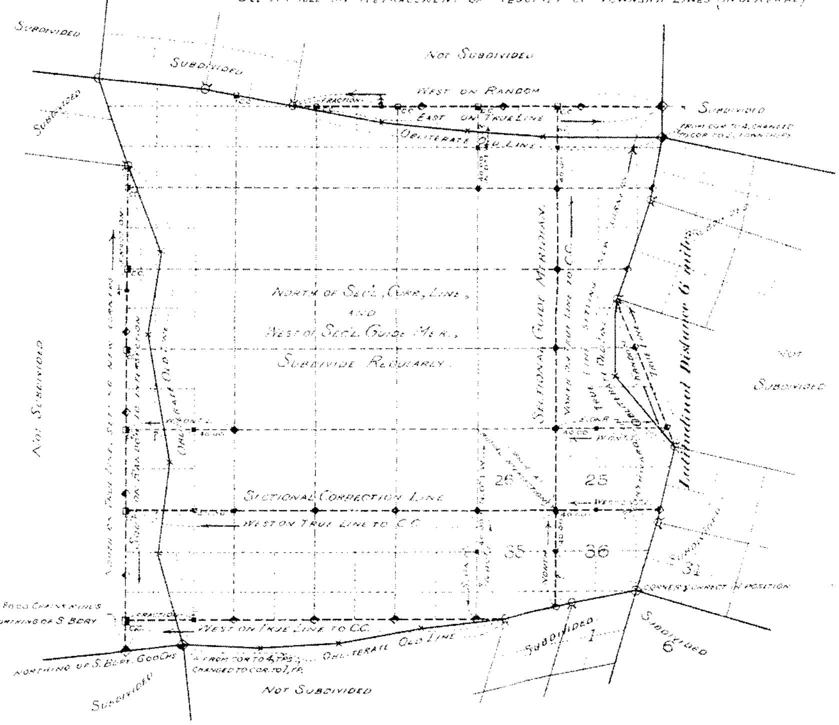


Fig. 11.

…ary defective in Alignment, Measurement & Position.
See Clause 4, Paragraph 3.

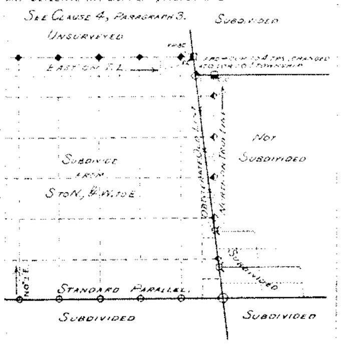
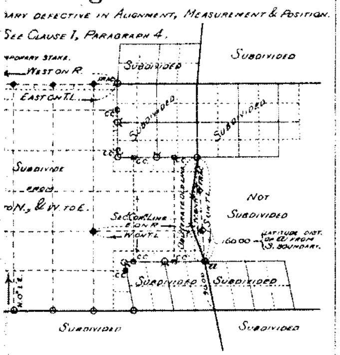
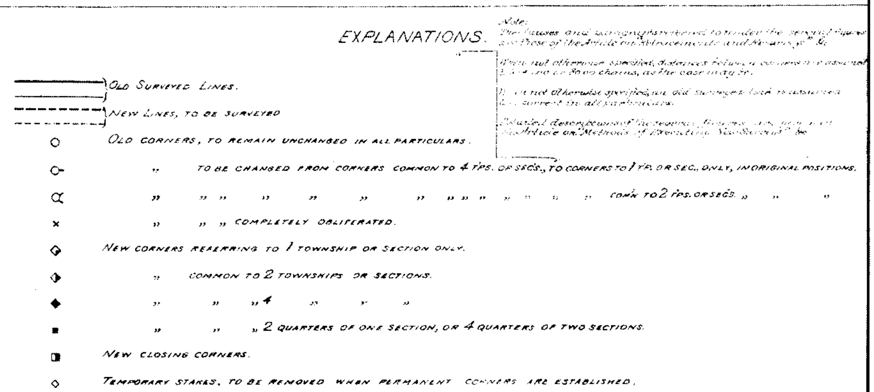


Fig. 14.

…ary defective in Alignment, Measurement & Position.
See Clause 1, Paragraph 4.





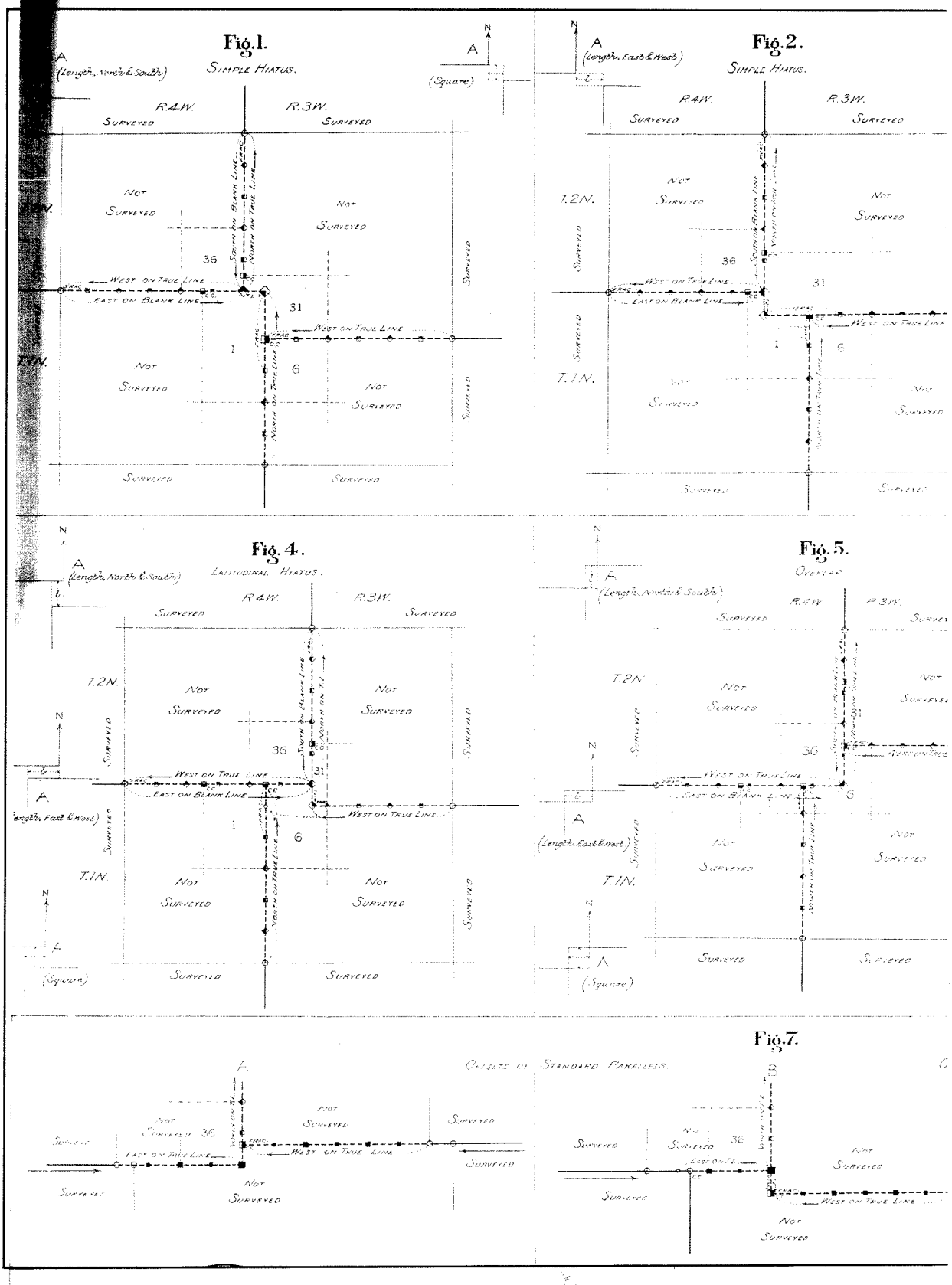


Fig. 1.
Simple Hiatus.
A (Length, North & South)
A (Square)
R.4W.
R.3W.
Surveyed
Not Surveyed
T.2N.
T.1N.
36
31
1
6
West on True Line
East on Blank Line
South on Blank Line
North on True Line
Fig. 2.
Simple Hiatus.
A (Length, East & West)
Fig. 4.
Latitudinal Hiatus.
A (Length, North & South)
A (Length, East & West)
A (Square)
Fig. 5.
Overlap
A (Length, North & South)
A (Length, East & West)
A (Square)
Fig. 7.
Offsets on Standard Parallels.
A
B
C
East on True Line
West on True Line

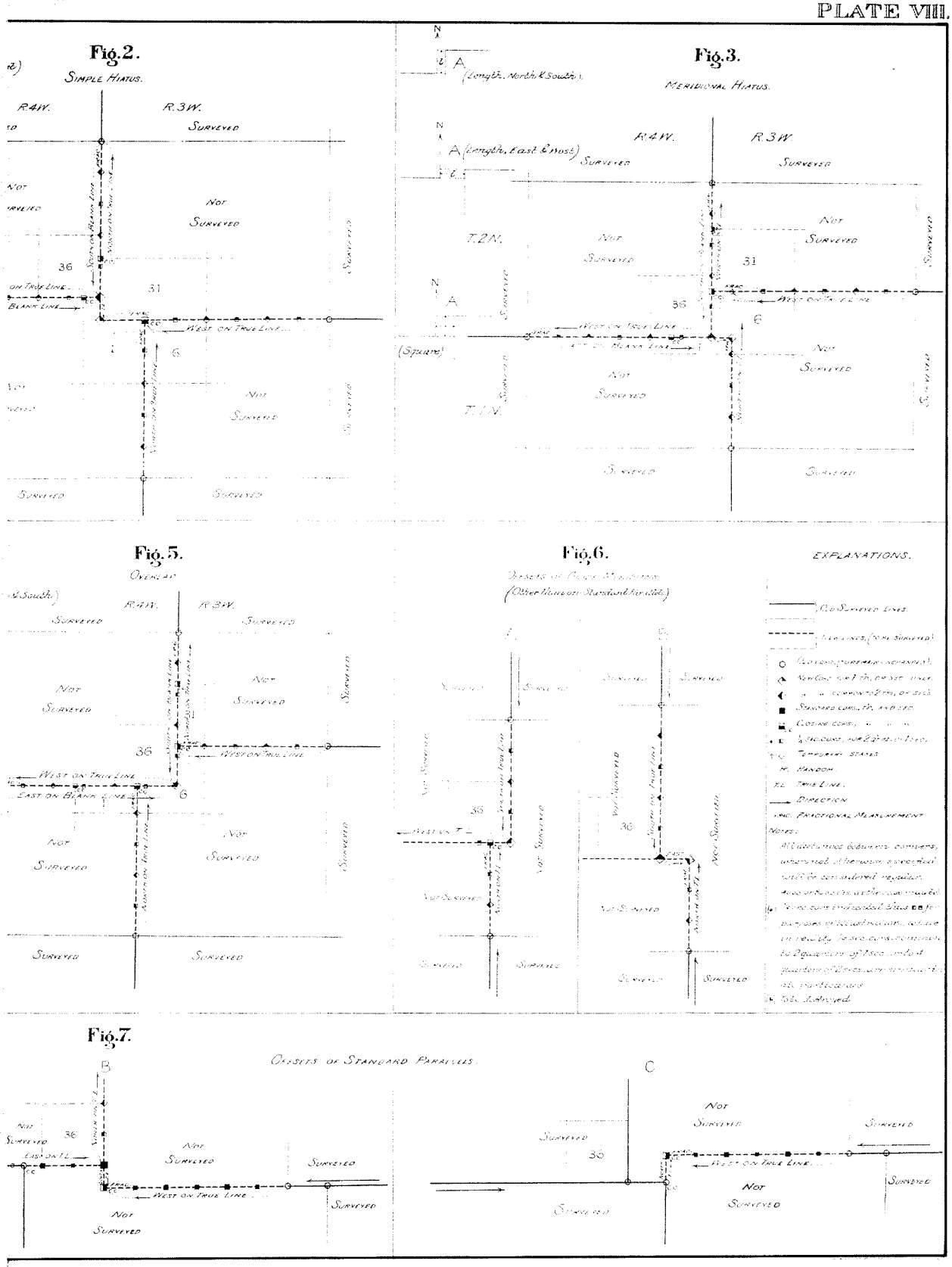
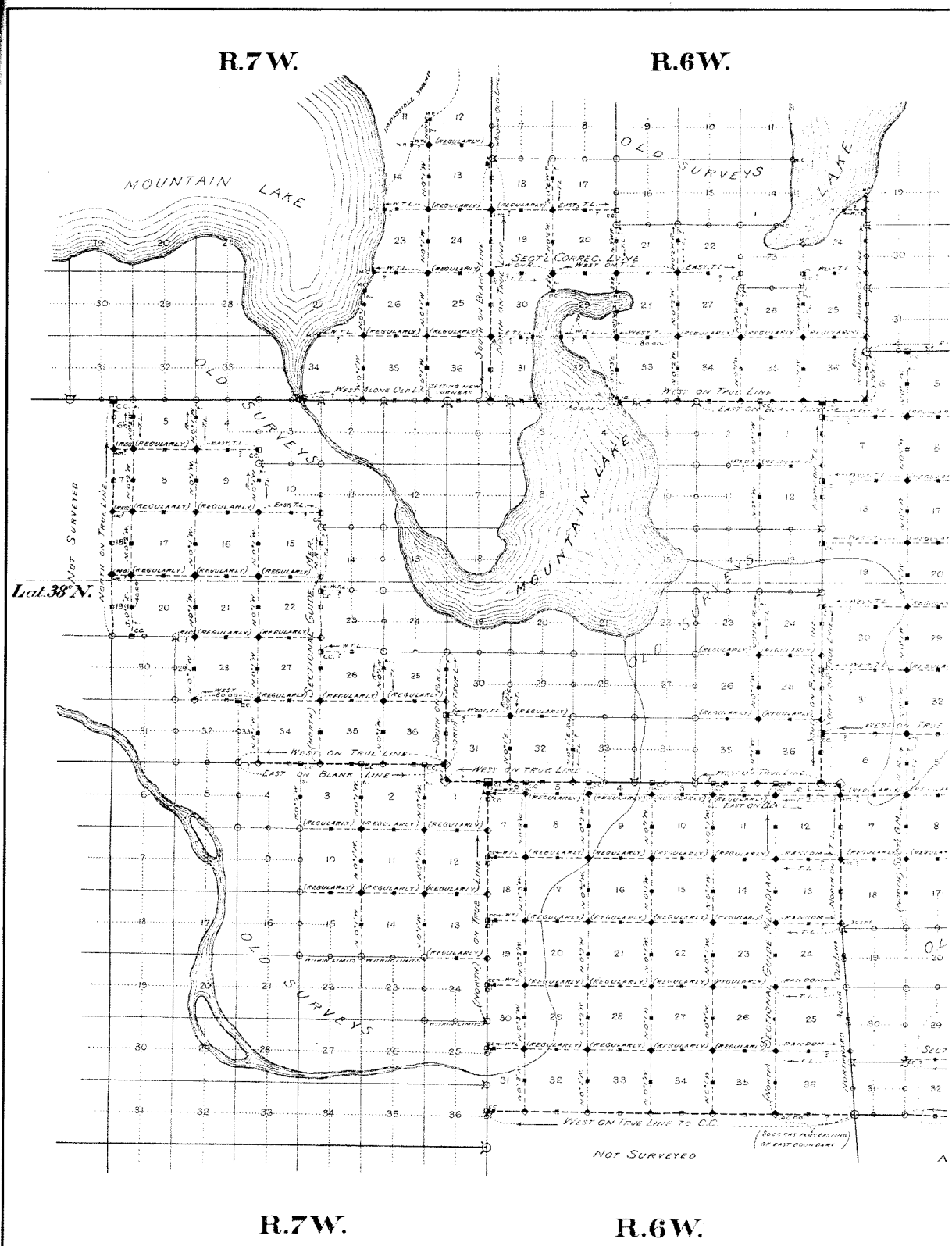
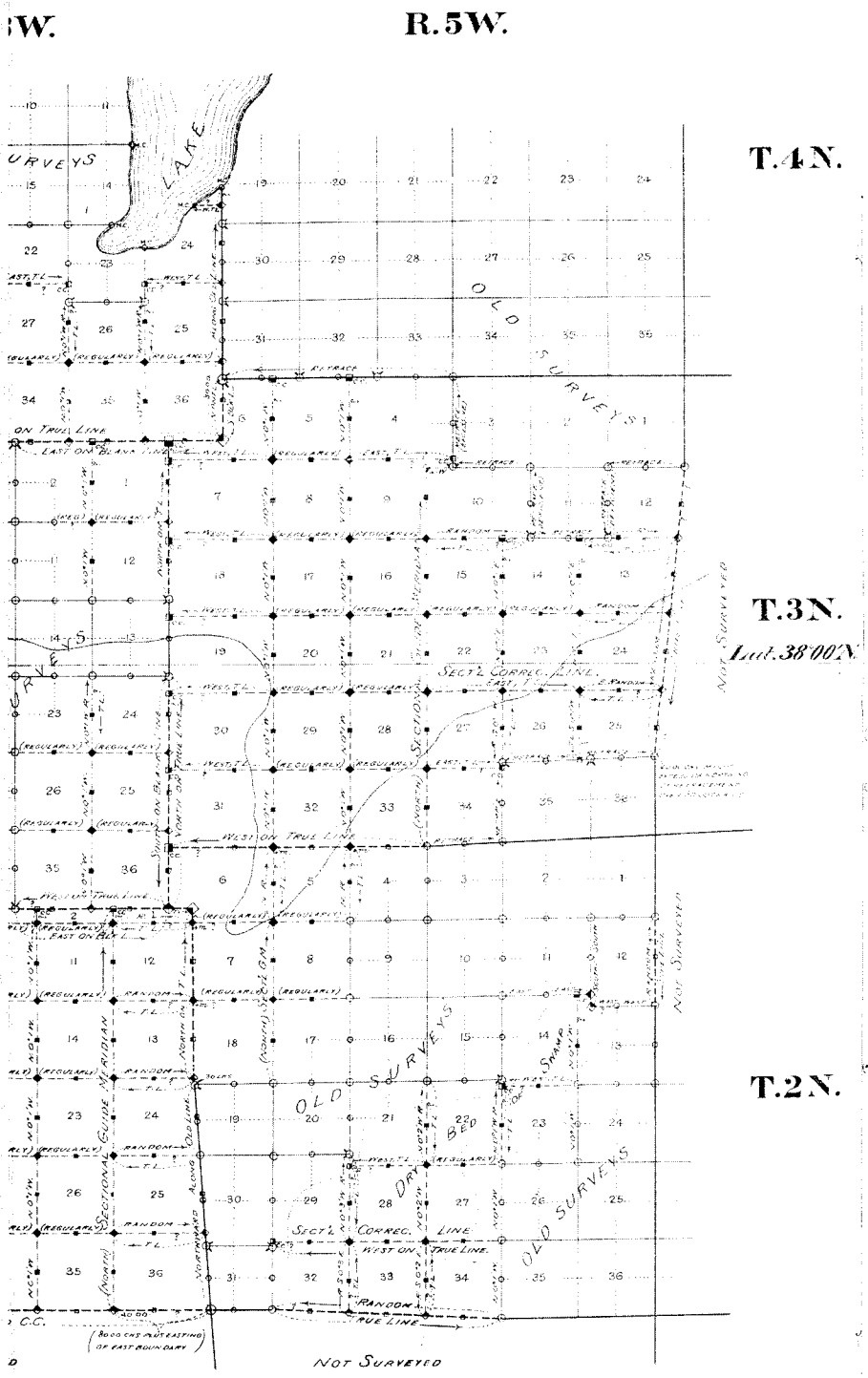


Fig. 2.
Simple Hiatus.
R.4W.
R.3W.
Surveyed
Not Surveyed
36
31
6
West on True Line
Blank Line
Fig. 3.
Meridional Hiatus.
A (Length, North & South)
A (Length, East & West)
T.2N.
T.1N.
(Square)
Fig. 5.
Overlap
Fig. 6.
Offsets of Guide Meridians
(Other than on Standard Parallels)
Explanations.
Fig. 7.
Offsets of Standard Parallels.
B
C
East on T.L.
West on True Line
Not Surveyed
Surveyed


R.7W.
R.6W.
MOUNTAIN LAKE
OLD SURVEYS
LAKE
SECT'L CORREC. LINE
WEST ON TRUE LINE
EAST ON BLANK LINE
NORTH ON TRUE LINE
SOUTH ON BLANK LINE
WEST ALONG OLD L.
SECTIONAL GUIDE MER.
NOT SURVEYED
Lat. 38° N.
WEST ON TRUE LINE TO C.C.
NOT SURVEYED
R.7W.
R.6W.


R.5W.
T.4N.
T.3N.
T.2N.
Lat. 38°00'N
LAKE
OLD SURVEYS
SECT'L CORREC. LINE
WEST ON TRUE LINE
EAST ON BLAK. LINE
NORTH ON TRUE LINE
SOUTH ON BLAK. LINE
NOT SURVEYED
DRY BED
SHAMP
GUINE MERIDIAN
SECTIONAL
NORTHWARD ALONG
(800 CHS. NORTHING OF EAST BOUN. DARY)
RANDOM
TRUE LINE
EXPLANATIONS.
OLD LINES (FOR REVIEW).
NEW LINES (TO BE SURVEYED).
OLD CORS. (TO REMAIN UNCORRECT).
OLD CORS. (CORRECTED TO 4 TPS. OR SECS.).
NEW CORNERS (COMMON TO 4 TPS. OR SECS.).
NEW CORNERS (COMMON TO 2 TPS. OR SECS.).
NEW CORNERS (PERTAINING TO 1 TP. OR SEC.).
NEW CORS. (TO BE ESTABLISHED AS ABOVE, BUT SUBSEQUENTLY CHANGED, BY HIGHER ADDITIONAL MEAS., AS COMMON TO 4 TPS. OR SECTIONS).
NEW CORS. (COMMON TO 4 QUARTERS OR 2 SECS.).
NEW CORS. (COMMON TO 2 QUARTERS OR 1 SEC.).
NEW CORS. (CORNERS, 1 TP. OR SEC.).
(REGULARLY) AS IN REGULAR SURVEY (AT RANDOM AND TRUE LINES).
PROJECTED DIRECTION.
AT RANDOM.
TRUE LINE.
FOUNDING OF DEVELOPED FRACTIONAL MEASUREMENTS.
MISCELLANEOUS CORNERS.
MC. OLD MEANDER CORNERS.
MC. NEW MEANDER CORNERS.
WP. WITNESS POINTS.
NOTE:
Quarter section corners common to two quarters of 1 section are similar in all respects to those that are common to four quarters of 2 sections, but are represented on this diagram for purposes of illustration.
When not otherwise specified, the distance between any two consecutive line corners is practically 40.00 ch's.

(This copy of the Circular Pamphlet is taken from an original now in the possession of the National Archives.)

CIRCULAR ON RESTORATION OF LOST OR OBLITERATED CORNERS AND SUBDIVISION OF SECTIONS.

GENERAL LAND OFFICE,
October 16, 1896.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1896.

[Revised March 14, 1901. Pages, etc., exactly the same except signed by Binger Hermann, and has penalty statement in front.]

RESTORATION OF LOST AND OBLITERATED CORNERS.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., October 16, 1896.

The increasing number of letters from county and local surveyors received at this office making inquiry as to the proper method of restoring to their original position lost or obliterated corners marking the survey of the public lands of the United States, or such as have been willfully or accidentally moved from their original position, have rendered the preparation of the following general rules necessary, particularly as in a very large number of cases the immediate facts necessary to a thorough and intelligent understanding are omitted. Moreover, surveys having been made under the authority of different acts of Congress, different results have been obtained, and no special law has been enacted by that authority covering and regulating the subject of the above-named inquiries. Hence, the general rule here given must be considered merely as an expression of the opinion of this office on the subject, based, however, upon the spirit of the several acts of Congress authorizing the surveys, as construed by this office, and by United States court decisions. When cases arise which are not covered by these rules, and the advice of this office is desired, the letter of inquiry should always contain a description of the particular corner, with reference to the township, range, and section of the public surveys, to enable this office to consult the record.

An *obliterated* corner is one where no visible evidence remains of the work of the original surveyor in establishing it. Its location may, however, have been preserved beyond all question by acts of landowners, and by the memory of those who knew and recollect the true situs of the original monument. In such cases it is not a lost corner.

A *lost* corner is one whose position can not be determined, beyond reasonable doubt, either from original marks or reliable external evidence.

Surveyors sometimes err in their decision whether a corner is to be treated as *lost* or only *obliterated.*

Surveyors who have been United States deputies should bear in mind that in their private capacity they must act under somewhat different rules of law from those governing original surveys, and should carefully distinguish between the provisions of the statute which guide a Government deputy and those which apply to retracement of lines once surveyed. The failure to observe this distinction has been prolific of erroneous work and injustice to landowners.

To restore extinct boundaries of the public lands correctly, the surveyor must have some knowledge of the manner in which townships were subdivided by the several methods authorized by Congress. Without this knowledge he may be greatly embarrassed in the field, and is liable to make mistakes invalidating his work, and leading

eventually to serious litigation. It is believed that the following synopsis of the several acts of Congress regulating the surveys of the public lands will be of service to county surveyors and others, and will help to explain many of the difficulties encountered by them in the settlement of such questions.

Compliance with the provisions of Congressional legislation at different periods has resulted in two sets of corners being established on *township lines* at one time; at other times *three* sets of corners have been established on *range lines*; while the system now in operation makes but *one* set of corners on *township boundaries,* except on standard lines—i.e., base and correction lines, and in some exceptional cases.

The following brief explanation of the modes which have been practiced will be of service to all who may be called upon to restore obliterated boundaries of the public land surveys:

Where two sets of corners were established on township boundaries, one set was planted at the time the exteriors were run, those on the north boundary belonging to the sections and quarter sections north of said line, and those on the west boundary belonging to the sections and quarter sections west of that line. The other set of corners was established when the township was subdivided. This method, as stated, resulted in the establishment of two sets of corners on all four sides of the townships.

Where three sets of corners were established on the range lines, the subdivisional surveys were made in the above manner, except that the east and west section lines, instead of being closed upon the corners previously established on the east boundary of the township, were run due east from the last interior section corner, and new corners were erected at the points of intersection with the range line.

The method now in practice requires section lines to be initiated from the corners on the south boundary of the township, and to close on existing corners on the east, north, and west boundaries of the township, except when the north boundary is a base line or standard parallel.

But in some cases, for special reasons, an opposite course of procedure has been followed, and subdivisional work has been begun on the north boundary and has been extended southward and eastward or southward and westward.

In the more recent general instructions, greater care has been exercised to secure rectangular subdivisions by fixing a strict limitation that no new township exteriors or section lines shall depart from a true meridian or east and west line more than twenty-one minutes of arc; and that where a random line is found liable to correction beyond this limit, a true line on a cardinal course must be run, setting a closing corner on the line to which it closes.

This produces, in new surveys closing to irregular old work, a great number of exteriors marked by a double set of corners. All retracing surveyors should proceed under these new conditions with full knowledge of the field notes and exceptional methods of subdivision.

SYNOPSIS OF ACTS OF CONGRESS.

The first enactment in regard to the surveying of the public lands was an ordinance passed by the Congress of the Confederation May 20, 1785, prescribing the mode for the survey of the "Western Territory," and which provided that said territory should be divided into "townships of six miles square, by

lines running due north and south, and others crossing them at right angles" as near as might be.[1]

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It further provided that the first line running north and south should begin on the Ohio River, at a point due north from the western terminus of a line run as the south boundary of the State of Pennsylvania, and the first line running east and west should begin at the same point and extend through the whole territory. In these initial surveys only the exterior lines of the townships were surveyed, but the plats were marked by subdivisions into sections 1 mile square, numbered from 1 to 36, commencing with No. 1 in the southeast corner of the township, and running from south to north in each tier to No. 36 in the northwest corner of the township; mile corners were established on the township lines. The region embraced by the surveys under this law forms a part of the present State of Ohio, and is generally known as "the Seven Ranges."

The Federal Congress passed a law, approved May 18, 1796, in regard to surveying the public domain, which applied to "the territory northwest of the River Ohio, and above the mouth of the Kentucky River."[2]

Section 2 of said act provided for dividing such lands as had not been already surveyed or disposed of "by north and south lines run according to the true meridian, and by others crossing them at right angles, so as to form townships of 6 miles square," etc. It also provided that "one-half of said townships, taking them alternately, should be subdivided into sections containing, as nearly as may be, 640 acres each, by running through the same each way parallel lines at the end of every two miles; and by marking a corner on each of said lines at the end of every mile." The act also provided that "the sections shall be numbered, respectively, beginning with the number one in the northeast section, and proceeding west and east alternately through the township, with progressive numbers till the thirty-sixth be completed." This method of numbering sections is still in use.

An act amendatory of the foregoing, approved May 10, 1800, required the "townships west of te Muskingum, which are directed to be sold in quarter townships, to be subdivided into half sections of 320 acres each, as nearly as may be, by running parallel lines through the same from east to west, and from south to north, at the distance of one mile from each other, and marking corners, at the distance of each half mile on the lines running from east to west, and at the distance of each mile on those running from south to north. And the interior lines of townships intersected by the Muskingum, and of all townships lying east of that river, which have not been heretofore actually subdivided into sections, shall also be run and marked * * *. And in all cases where the exterior lines of the townships thus to be subdivided into sections or half sections, shall exceed or shall not extend six miles, the excess or deficiency shall be specially noted, and added to or deducted from the western or northern ranges of sections or half sections in such townships, according as the error may be in running the lines from east to west or from south to north." Said act also provided that the northern and western tiers of sections should be sold as containing only the quantity expressed on the plats, and all others as containing the complete legal quantity.[3]

The act approved June 1, 1796, "regulating the grants of land appropriated for military services," etc., provided for dividing the "United States Military Tract," in the State of Ohio, into townships 5 miles square, each to be subdivided into quarter townships containing 4,000 acres.[4]

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Section 6 of the act approved March 1, 1800, amendatory of the foregoing act, enacted that the Secretary of the Treasury was authorized to subdivide the quarter townships into lots of 100 acres, bounded as nearly as practicable by parallel lines 160 perches in length by 100 perches in width. These subdivisions into lots, however, were made upon the plats in the office of the Secretary of the Treasury, and the actual survey was only made at a subsequent time when a sufficient number of such lots had been located to warrant the survey. It thus happened, in some instances, that when the survey came to be made the plat and survey could not be made to agree, and that fractional lots on plats were entirely crowded out. A knowledge of this fact may explain some of the difficulties met with in the district thus subdivided.[5]

The act of Congress approved February 11, 1805, directs the subdivision of the public lands into quarter sections, and provides that all corners marked in the field shall be established as the proper corners of the sections or quarter sections which they were intended to designate, and that corners of half and quarter sections not marked shall be placed as nearly as possible "equidistant from those two corners which stand on the same line." This act further provides that "the boundary lines actually run and marked" (in the field) "shall be established as the proper boundary lines of the sections, or subdivisions, for which they were intended, and the length of such lines as returned by either of the surveyors aforesaid shall be held and considered as the true length thereof. And the boundary lines which shall not have been actually run and marked as aforesaid shall be ascertained by running straight lines from the established corners to the opposite corresponding corners, but in those portions of the fractional townships where no such opposite or corresponding corners have been or can be fixed, the said boundary lines shall be ascertained by running from the established corners due north and south, or east and west lines, as the case may be, to the water course, Indian boundary line, or other external boundary of such fractional township."[6]

The act of Congress approved April 24, 1820, provides for the sale of public lands in half-quarter sections, and requires that "in every case of the division of a quarter section the line

1. Ordinance of the Congress of the Confederation of May 20, 1785. U. S. Land Laws, p. 349. Edition 1828.

2. Act of May 18, 1796. U. S. Statutes at Large, vol. 1, p. 465. Section 2395, U. S. Revised Statutes.

3. Act of May 10, 1800. U. S. Statutes at Large, vol. 2, p. 73. Section 2395, U. S. Revised Statutes.

4. Act of June 1, 1796. U. S. Statutes at Large, vol. 1, p. 490.

5. Act of March 1, 1800. U. S. Statutes at Large, vol 2., p. 14.

6. Act of February 11, 1805. U. S. Statutes at Large, vol. 2, p 313. Section 2396, U. S. Revised Statutes.

for the division thereof shall run north and south," "and fractional sections, containing 160 acres and upwards, shall in like manner, as nearly as practicable, be subdivided into half quarter sections, under such rules and regulations as may be prescribed by the Secretary of the Treasury; but fractional sections containing less than 160 acres shall not be divided."[7]

The act of Congress approved May 24, 1824, provides "that whenever, in the opinion of the President of the United States, a departure from the ordinary mode of surveying land on any river, lake, bayou, or water course would promote the public interest, he may direct the surveyor-general in whose district such land is situated, and where the change is intended to be made, under such rules and regulations as the President may prescribe, to cause the lands thus situated to be surveyed in tracts of two acres in width, fronting on any river, bayou, lake, or water course, and running back the depth of forty acres."[8]

The act of Congress approved April 5, 1832, directed the subdivision of the public lands into quarter-quarter sections; that in every case of the division of a half-quarter section the dividing line should run east and west, and that fractional sections should be subdivided, under rules and regulations

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prescribed by the Secretary of the Treasury. Under the latter provision the Secretary directed that fractional sections containing less than 160 acres, or the residuary portion of a fractional section, after the subdivision into as many quarter-quarter sections as it is susceptible of, may be subdivided into lots, each containing the quantity of a quarter-quarter section as nearly as practicable, by so laying down the line of subdivision that they shall be 20 chains wide, which distances are to be marked on the plat of subdivision, as are also the areas of the quarter quarters and residuary fractions.[9]

These two acts last mentioned provided that the corners and contents of half-quarter and quarter-quarter sections should be ascertained as nearly as possible in the manner and on the principles prescribed in the act of Congress approved February 11, 1805.

GENERAL RULES.

From the foregoing synopsis of Congressional legislation it is evident—

1st. That the boundaries of the public lands established and returned by the duly appointed Government surveyors, when approved by the surveyors general and accepted by the Government, are *unchangeable.*

2d. That the original township, section, and quarter-section corners established by the Government surveyors must stand as the true corners which they were intended to represent, whether the corners be in place or not.

3d. That quarter-quarter corners not established by the Government surveyors must be placed on the straight lines joining the section and quarter-section corners and midway between them, except on the last half mile of section lines closing on the north and west boundaries of the township, or on other lines between fractional sections.

4th. That all subdivisional lines of a section running between corners established in the original survey of a township must be straight lines, running from the proper corner in one section line to its opposite corresponding corner in the opposite section line.

5th. That in a fractional section where no opposite corresponding corner has been or can be established, any required subdivision line of such section must be run from the proper original corner in the boundary line due east and west, or north and south, as the case may be, to the water course, Indian reservation, or other boundary of such section, with due parallelism to section lines.

From the foregoing it will be plain that extinct corners of the Government surveys must be restored to their original locations, whenever it is possible to do so; and hence resort should always be first had to the marks of the survey in the field. The locus of the missing corner should be first identified on the ground by the aid of the mound, pits, line trees, bearing trees, etc., described in the field notes of the original survey.

The identification of mounds, pits, and witness trees, or other permanent objects noted in the field notes of survey, affords the best means of relocating the missing corner in its original position. If this can not be done, clear and convincing testimony of citizens as to the locality it originally occupied should be taken, if such can be obtained. In any event, whether the locus of the corner be fixed by the one means or the other, such locus should always be tested and confirmed by measurements to *known* corners. No definite rule can be laid down as to what shall be sufficient evidence in such cases, and much must be left to the skill, fidelity, and good judgment of the surveyor in the performance of his work.

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EXCEPTIONAL CASES.

When new measurements are made on a single line to determine the position thereon for a restored lost corner (for example, a quarter-section corner on line between two original section corners), or when new measurements are made between original corners on two lines for the purpose of fixing by their intersection the position of a restored missing corner (for example, a corner common to four sections or four townships), it will almost invariably happen that discrepancies will be developed between the new measurements and the original measurements in the field notes. When these differences occur the surveyor will in all cases establish the missing corner by proportionate measurements on lines conforming to the original field notes and by the method followed in the original survey. From this rule there can be no departure, since it is the basis upon which the whole operation depends for accuracy and truth.

In cases where the relocated corner can not be made to harmonize with the field notes in all directions, and unexplained error in the first survey is apparent, it sometimes

7. Act of April 24, 1820. U. S. Statutes at Large, vol. 3, p. 566. Section 2397, U. S. Revised Statutes.

8. Act of May 24, 1824. U. S. Statutes at Large, vol. 4, p. 34.

9. Act of April 5 1832. U. S. Statutes at Large, vol. 4, p. 503. Section 2397, U. S. Revised Statutes.

becomes the task of the surveyor to place it according to the requirements of one line and against the calls of another line. For instance, if the line between sections 30 and 31, reported 78 chains long, would draw the missing corner on range line 1 chain eastward out of range with the other exterior corners, the presumption would be strong that the range line had been run straight and the length of the section line wrongly reported, because experience shows that west random lines are regarded as less important than range lines and more liable to error.

Again, where a corner on a standard parallel has been obliterated, it is proper to assume that it was placed in line with other corners, and if an anomalous length of line reported between sections 3 and 4 would throw the closing corner into the northern township, a surveyor would properly assume that the older survey of the standard line is to control the length of the later and minor line. The marks or corners found on such a line closing to a standard parallel fix its *location,* but its *length* should be limited by its actual intersection, at which point the lost closing corner may be placed.

The strict rule of the law that "all corners marked in the field shall be established as the corners which they were intended to designate," and the further rule that "the length of lines returned by the surveyors shall be held and considered as the true length thereof," are found insome cases to be impossible of fulfillment in all directions at once, and a surveyor is obliged to choose, in his own discretion, which of two or more lines must yield, in order to permit the rules to be applied at all.

In a case of an erroneous but existing closing corner, which was set some distance out of the true State boundary of Missouri and Kansas, it was held by this office that a surveyor subdividing the fractional section should preserve the boundary as a straight line, and should not regard said closing corner as the proper corner of the adjacent fractional lots. The said corner was considered as fixing the position of the line between two fractional sections, but that its length extended to a new corner to be set on the true boundary line. The surveyor should therefore preserve such an original corner as evidence of the line; but its erroneous position can not be allowed to cause a crook between mile corners of the original State boundary.

It is only in cases where it is manifestly impossible to carry out the literal terms of the law, that a surveyor can be justified in making such a decision.

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The principle of the preponderance of one line over another of less importance has been recognized in the rule for restoring a section corner common to two townships in former editions of this circular. The new corner should be placed on the township line; and measurements to check its position by distances to corners within the townships are useful to confirm it if found to agree well, but should not cause it to be placed off the line if found not to agree, if the general condition of the boundary supports the presumption that it was properly alined.

TO RESTORE LOST OR OBLITERATED CORNERS

1. *To restore corners on base lines and standard parallels.*—Lost or obliterated standard corners will be restored to their original positions on a base line, standard parallel, or correction line, by proportionate measurements on the line, conforming as nearly as practicable to the original field notes and joining the nearest identified original standard corners on opposite sides of the missing corner or corners, as the case may be.

(a) The term "standard corners" will be understood to designate standard township, section, quarter-section, and meander corners; and, in addition, closing corners, a follows: Closing corners used in the original survey to determine the position of a standard parallel, or established during the survey of the same, will, with the standard corners, govern the alinement and measurements made to restore lost or obliterated standard corners; but no other closing corners will control in any manner the restoration of standard corners on a base line or standard parallel.

(b) A lost or obliterated closing corner from which a standard parallel has been initiated or to which it has been directed will be reestablished in its original place by proportionate measurement from the corners used in the original survey to determine its position. Measurements from corners on the opposite side of the parallel will not control in any manner the relocation of said corner.

(c) A missing closing corner originally established during the survey of a standard parallel as a corner from which to project surveys south will be restored to its original position by considering it a standard corner and treating it accordingly.

(d) Therefore, paying attention to the preceding explanations, we have for the restoration of one or several corners on a standard parallel, and for general application to all other surveyed lines, the following proportion:

As the original field-note distance between the selected known corners is to the new measure of said distance, so is the original field-note length of any part of the line to the required new measure thereof.

The sum of the computed lengths of the several parts of a line must be equal to the new measure of the whole distance.

(e) As has been observed, existing original corners can not be disturbed; consequently, discrepancies between the new and the original field-note measurements of the line joining the selected original corners will not in any manner affect measurements beyond said corners, but the differences will be distributed proportionately to the several intervals embraced in the line in question.

(f) After having checked each new location by measurement to the nearest known corners, new corners will be established permanently and new bearings and measurements taken to prominent objects, which should be of as permanent a character as possible, and the same recorded for future reference.

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2. *Restoration of township corners common to four townships.*—Two cases should be clearly recognized: 1st. Where the position of the original township corner has been

made to depend upon measurements on two lines at right angles to each other. 2d. Where the original corner has been located by measurements on one line only; for example, on a guide meridian.

(a) For restoration of a township corner originally subject to the first condition: A line will first be run connecting the nearest identified original corners on the meridional township lines, north and south of the missing corner, and a temporary corner will be placed at the proper proportionate distance. This will determine the corner in a north and south direction only.

Next, the nearest original corners on the latitudinal township lines will be connected and a point thereon will be determined in a similar manner, independent of the temporary corner on the meridional line. Then through the first temporary corner run a line east (or west) and through the second temporary corner a line north (or south), as relative situations may suggest. The intersection of the two lines last run will define the position of the restored township corner, which may be permanently established.

(b) The restoration of a lost or obliterated township corner established under the second conditions, i.e., by measurements, on a single line, will be effected by proportionate measurements on said line, between the nearest identified original corners on opposite sides of the missing township corner, as before described.

3. *Reestablishment of corners common to two townships.*—The two nearest known corners on the township line, the same not being a base or a correction line, will be connected as in case No. 1, by a right line, and the missing corner established by proportionate distance as directed in that case; the location thus found will be checked upon by measurements to nearest known section or quarter-section corners north and south, or east and west, of the township line, as the case may be.

4. *Reestablishment of closing corners.*—Measure from the quarter-section, section, or township corner east or west, as the case may be, to the next preceding or succeeding corner in the order of original establishment, and reestablish the missing closing corner by proportionate measurement. The line upon which the closing corner was originally established should always be remeasured, in order to check upon the correctness of the new location. See pages 8, 12, and 13 for details.

5. *Reestablishment of interior section corners.*—This class of corners should be reestablished in the same manner as corners common to four townships. In such cases, when a number of corners are missing on all sides of the one sought to be reestablished, the entire distance must, of course, be remeasured between the nearest existing recognized corners both north and south, and east and west, in accordance with the rule laid down, and the new corner reestablished by proportionate measurement. The mere measurement in any one of the required directions will not suffice, since the direction of the several section lines running northward through a township, or running east and west, are only in the most exceptional cases true prolongations of the alinement of the section lines initiated on the south boundary of the township; while the east and west lines running through the township, and theoretically supposed to be at right angles with the former, are seldom in that condition, and the alinements of the closing lines on the east and west boundaries of the township, in connection with the interior section lines, are even less often in accord. Moreover, the alinement of the

section line itself from corner to corner, in point of fact, also very frequently diverges from a right line, although presumed to be such from the record contained in the field notes and so designated on the plats, and becomes either a broken or a curved line. This fact will be determined, in a timbered country, by the blazes which may be found upon trees on either side of the line, and although such blazed line will not strictly govern as to the absolute direction assumed by such line, it will assist very materially in determining its approximate direction, and should never be neglected in retracements for the reestablishment of lost corners of any description. Sight trees described in the field notes, together with the recorded distances to same, when fully identified, will, it has been held, in one or more States, govern the line itself, even when not in a direct or straight line between established corners, which line is then necessarily a broken line by passing through said sight trees. Such trees, when in existence and properly identified beyond a question of doubt, will very materially assist in evidencing the correct relocation of a missing corner. It is greatly to be regretted that the earlier field notes of survey are so very meager in the notation of the topography found on the original line, which might in very many instances materially lessen a surveyor's labors in retracement of lines and reestablishment of the required missing corner. In the absence of such sight trees and other evidence regarding the line, as in an open country, or where such evidence has been destroyed by time, the elements, or the progress of improvement, the line connecting the known corners should be run straight from corner to corner

6. *Reestablishment of quarter-section corners on township boundares.*—Only one set of quarter-section corners are actually marked in the field on township lines, and they are established at the time when the township exteriors are run. When double section corners are found, the quarter-section corners are considered generally as standing midway between the corners of their respective sections, and when required to be established or reestablished, as the case may be, they should be generally so placed; but great care should be exercised not to mistake the corners belonging to one township for those of another. After determining the proper section corners marking the line upon which the missing quarter-section corner is to be reestablished, and measuring said line, the missing quarter-section corner will be reestablished in accordance with the requirements of the original field notes of survey, by proportionate measurement between the section corners marking the line.

Where there are double sets of section corners on township and range lines, and the quarter-section corners for sections south of the township or east of the range lines are required to be established in the field, the said quarter-section corners should be so placed as to suit the calculation of areas of the quarter sections adjoining the township boundaries as expressed upon the official township plat, adopting proportionate measurements when the present measurement of the

north and west boundaries of the section differ from the original measurements.

7. *Reestablishment of quarter-section corners on closing section lines between fractional sections.*—This class of corners must be reestablished according to the original measurement of 40 chains from the last interior section corner. If the measurements do not agree with the original survey, the excess or deficiency must be divided proportionately between the two distances, as expressed in the field notes of original survey. The section corner started from and the corner closed upon should be connected by a right line, unless the retracement should

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develop the fact that the section line is either a broken or curved line, as is sometimes the case.

8. *Reestablishment of interior quarter-section corners.*—In some of the older surveys these corners are placed at variable distances, in which case the field notes of the original survey must be consulted, and the quarter-section corner reestablished at proportionate distances between the corresponding section corners, in accordance therewith. The later surveys being more uniform and in stricter accordance with law, the missing quarter-section corner must be reestablished equidistant between the section corners marking the line, according to the field notes of the original survey. The remarks made under section 5, in relation to section lines, apply with full force here also; the caution there given not to neglect sight trees is equally applicable, since the proper reestablishment of the quarter-section corner may in some instances very largely depend upon its observance, and avoid one of the many sources of litigation.

9. *Where double corners were originally established, one of which is standing, to reestablish the other.*—It being remembered that the corners established when the exterior township lines were run, belong to the sections in the townships north and west of those lines, the surveyor must first determine beyond a doubt to which sections the existing corner belongs. This may be done by testing the courses and distances to witness trees or other objects noted in the original field notes of survey, and by remeasuring distances to known corners. Having determined to which township the existing corner belongs, the missing corner may be reestablished in line north or south of the existing corner, as the case may be, at the distance stated in the field notes of the original survey, by proportionate measurement, and tested by retracement to the opposite corresponding corner of the section to which the missing section corner belongs. These double corners being generally not more than a few chains apart, the distance between them can be more accurately laid off, and it is considered preferable to first establish the missing corner as above, and check upon the corresponding interior corner, than to reverse the proceeding; since the result obtained is every way more accurate and satisfactory.

10. *Where double corners were originally established, and both are missing, to reestablish the one established when the township line was run.*—The surveyor will connect the nearest known corners on the township line by a right line, being careful to distinguish the section from the closing corners, and reestablish the missing corner at the point indicated by the field notes of the original survey by proportionate measurement. The corner thus restored will be common to two sections either north or west of the township boundary, and the section north or west, as the case may be, should be carefully retraced, thus checking upon the reestablished corner, and testing the accuracy of the result. It can not be too much impressed upon the surveyor that any measurements to objects on line noted in the original survey are means of determining and testing the correctness of the operation.

11. *Where double corners were originally established, and both are missing, to reestablish the one established when the township was subdivided.*—The corner to be reestablished being common to two sections south or east of the township line, the section line closing on the missing section corner should be first retraced to an intersection with the township line in the manner previously indicated, and a temporary corner established at the point of intersection. The township line will of course have been previously carefully retraced in accordance with the requirements of

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the original field notes of survey, and marked in such a manner as to be readily identified when reaching the same with the retraced section line. The location of the temporary corner planted at the point of intersection will then be carefully tested and verified by remeasurements to objects and known corners on the township line, as noted in the original field notes of survey, and the necessary corrections made in such relocation. A permanent corner will then be erected at the corrected location on the township line, properly marked and witnessed, and recorded for future requirements.

12. *Where triple corners were originally established on range lines, one or two of which have become obliterated, to reestablish either of them.*—It will be borne in mind that only two corners were established as actual corners of sections, those established on the range line not corresponding with the subdivisional survey east or west of said range line. The surveyor will, therefore, first proceed to identify the existing corner or corners, as the case may be, and then reestablish the missing corner or corners in line north or south, according to the distances stated in the original field notes of survey in the manner indicated for the reestablishment of double corners, testing the accuracy of the result obtained, as hereinbefore directed in other cases. If, however, the distances between the triple corners are not stated in the original field notes of survey, as is frequently the case in the returns of older surveys, the range line should be first carefully retraced, and marked in a manner sufficiently clear to admit of easy identification upon reaching same during the subsequent proceeding. The section lines closing upon the missing corners must then be retraced in accordance with the original field notes of survey, in the manner previously indicated and directed, and the corners reestablished in the manner directed in the case of double corners. The surveyor can not be too careful, in the matter of retracement, in following closely all the recorded indications of the original line, and nothing, however slight, should be neglected to insure the correctness of the retracement of the original line; since there is no other check upon the accuracy of the reestablishment of the missing corners, unless the entire corresponding section lines are

remeasured by proportional measurement and the result checked by a recalculation of the areas as originally returned, which, at best, is but a very poor check, because the areas expressed upon the margin of many plats of the older surveys are erroneously stated on the face of the plats, or have been carelessly calculated.

13. *Where triple corners were originally established on range lines, all of which are missing, to reestablish same.*—These corners should be reestablished in accordance with the foregoing directions, commencing with the corner originally established when the range line was run, establishing the same in accordance with previously given directions for restoring section and quarter-section corners; that is to say, by remeasuring between the nearest known corners on said township line, and reestablishing the same by proportionate measurement. The two remaining will then be reestablished in conformity with the general rules for reestablishment of double corners.

14. *Reestablishment of meander corners.*—Before proceeding with the reestablishment of missing meander corners, the surveyor should have carefuly rechained at least three of the section lines between known corners of the township within which the lost corner is to be relocated, in order to establish the proportionate measurement to be used. This requirement of preliminary remeasurement of section lines must in no case be omitted; since it gives the only data upon which the fractional

section line can be remeasured proportionately, the corner marking the terminus, or the meander corner, being missing, which it is intended to reestablish. The missing meander corner will be reestablished on the section or township line retraced in its original location, by the proportionate measurement found by the preceeding operations, from the nearest known corner on such township or section line, in accordance with the requirements of the original field notes of survey.

Meander corners hold the peculiar position of denoting a point on line between landowners, without usually being the legal terminus or corner of the lands owned. Leading judicial decisions have affirmed that meander lines are not strictly boundaries, and do not limit the ownership to the exact areas placed on the tracts, but that said title extends to the water, which, by the plat, appears to bound the land.

As such water boundaries are, therefore, subject to change by the encroachment or recession of the stream or lake, the precise location of old meanders is seldom important, unless in States whose laws prescribe that dried lake beds are the property of the State.

Where the United States has disposed of the fractional lots adjacent to shores, it claims no marginal lands left by recession or found by reason of erroneous survey. The lines between landowners are therefore regarded as extended beyond the original meander line of the shore, but the preservation or relocation of the meander corner is important, as evidence of the *position* of the section line.

The different rules by which division lines should be run between private owners of riparian accretions are a matter of State legislation, and not subject to a general rule of this office.

15. *Fractional section lines.*—County and local surveyors being sometimes called upon to restore fractional section lines closing upon Indian, military, or other reservations, private grants, etc., such lines should be restored upon the same principles as directed in the foregoing pages, and checked whenever possible upon such corners or monuments as have been placed to mark such boundary lines.

In some instances corners have been moved from their original position, either by accident or design, and county surveyors are called upon to restore such corners to their original positions, but, owing to the absence of any and all means of identification of such location, are unable to make the result of their work acceptable to the owners of the lands affected by such corner. In such cases the advice of this office has invariably been to the effect that the relocation of such corner must be made in accordance with the orders of a court of competent jurisdiction, the United States having no longer any authority to order any changes where the lands affected by such corner have been disposed of.

RECORDS.

The original evidences of the public-land surveys in the following States have been transferred, under the provisions of sections 2218, 2219, and 2220, United States Revised Statutes, to the State authorities, to whom application should be made for such copies of the original plats and field notes as may be desired, viz:

Alabama: Secretary of State, Montgomery.
Arkansas: Commissioner of State Lands, Little Rock.
Illinois: Auditor of State, Springfield.
Indiana: Auditor of State, Indianapolis.
Iowa: Secretary of State, Des Moines.
Kansas: Auditor of State and Register of State Lands, Topeka.

Michigan: Commissioner of State Land Office, Lansing.
Mississippi: Commissioner of State Lands, Jackson.
Missouri: Secretary of State, Jefferson City.
Nebraska: Commissioner of Public Lands and Buildings, Lincoln.
Ohio: Auditor of State, Columbus.
Wisconsin: Commissioners of Public Lands, Madison.

In other public-land States the original field notes and plats are retained in the offices of the United States surveyors general.

SUBDIVISION OF SECTIONS.

This office being in receipt of many letters making inquiry in regard to the proper method of subdividing sections of the public lands, the followng general rules have been prepared as a reply to such inquiries. The rules for subdivision are based upon the laws governing the survey of the public lands. When cases arise which are not covered by these rules, and the advice of this office in the matter is desired, the letter of inquiry should, in every instance, contain a description of the particular tract or corner, with reference to township, range, and section of the public surveys, to enable the office to consult the record; also a diagram showing conditions found:

1. *Subdivision of sections into quarter sections.*—Under the provisions of the act of Congress approved February 11, 1805, the course to be pursued in the subdivision of sections into quarter sections is to run straight lines from the established quarter-section corners, United States surveys, to the opposite corresponding corners. The point of intersection of the lines thus run will be the corner common to the several quarter sections, or, in other words, the legal center of the section.

(a) Upon the lines closing on the north and west boundaries of a township, the quarter-section corners are established by the United States deputy surveyors at 40 chains to the north or west of the last interior section corners, and the excess or deficiency in the measurement is thrown into the half mile next to the township or range line, as the case may be.

(b) Where there are double sets of section corners on township and range lines, the quarter corners for the sections south of the township lines and east of the range lines are not established in the field by the United States deputy surveyors, but in subdividing such sections said quarter corners should be so placed as to suit the calculations of the areas of the quarter sections adjoining the township boundaries as expressed upon the official plat, adopting proportionate measurements where the new measurements of the north or west boundaries of the section differ from the original measurements.

2. *Subdivision of fractional sections.*—Where opposite corresponding corners have not been or can not be fixed, the subdivision lines should be ascertained by running from the established corners due north, south, east, or west lines, as the case may be, to the water course, Indian boundary line, or other boundary of such fractional section.

(a) The law presumes the section lines surveyed and marked in the field by the United States deputy surveyors to be due north and south or east and west lines, but in actual experience this is not always the case. Hence, in order to carry out the spirit of the law, it will be necessary in running the subdivisional lines through fractional sections to adopt mean courses where the section lines are not due lines, or to run the subdivision line parallel to the east, south, west, or north boundary of the section, as conditions may require, where there is no opposite section line.

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3. *Subdivision of quarter sections into quarter quarters.*—Preliminary to the subdivision of quarter sections, the quarter-quarter corners will be established at points midway between the section and quarter-section corners, and between quarter corners and the center of the section, except on the last half mile of the lines closing on the north or west boundaries of a township, where they should be placed at 20 chains, proportionate measurement, to the north or west of the quarter-section corner.

(a) The quarter-quarter section corners having been established as directed above, the subdivision lines of the quarter section will be run straight between opposite corresponding quarter-quarter section corners on the quarter section boundaries. The intersection of the lines thus run will determine the place for the corner common to the four quarter-quarter sections.

4. *Subdivision of fractional quarter sections.*—The subdivision lines of fractional quarter sections will be run from properly established quarter-quarter section corners (paragraph 3) due north, south, east, or west, to the lake, water course, or reservation which renders such tracts fractional, or parallel to the east, south, west, or north boundary of the quarter section, as conditions may require. (See paragraph 2 (a).)

5. *Proportionate measurement.*—By "proportionate measurement." as used in this circular, is meant a measurement having the same ratio to that recorded in the original field notes as the length of chain used in the new measurement has to the *length of chain* used in the original survey, assuming that the original and new measurements have been correctly made.

For example: The length of the line from the quarter-section corner on the west side of sec. 2, T. 24 N., R. 14 E, Wisconsin, to the north line of the township, by the United States deputy surveyor's chain, was reported as 45.40 chains, and by the county surveyor's measure is reported as 42.90 chains; then the distance which the quarter-quarter section corner should be located north of the quarter-section corner would be determined as follows:

As 45.40 chains, the Government measure of the whole distance, is to 42.90 chains, the county surveyor's measure of the same distance, so is 20.00 chains, original measurement, to 18.90 chains by the county surveyor's measure, showing that by proportionate measurement in this case the quarter-quarter section corner should be set at 18.90 chains north of the quarter-section corner, instead of 20.00 chains north of such corner, as represented on the official plat. In this manner the discrepancies between original and new measurements are equitably distributed.

S. W. LAMOREUX,
Commissioner.

DEPARTMENT OF THE INTERIOR,
October 16, 1896.

Approved:

DAVID R. FRANCIS,
Secretary.

(This copy of the 1902 Manual is taken from an original volume now in the possession of the BLM, Oregon State Office, Portland.)

MANUAL OF SURVEYING INSTRUCTIONS FOR THE SURVEY OF THE PUBLIC LANDS OF THE UNITED STATES AND PRIVATE LAND CLAIMS.

Prepared in conformity with law under the direction of
THE COMMISSIONER OF THE GENERAL LAND OFFICE.

JANUARY 1, 1902.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1902.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D.C., January 1, 1902.

GENTLEMEN:

The following instructions, including full and minute directions for the execution of surveys in the field, are issued under the authority given me by sections 453, 456, and 2398, United States Revised Statutes, and must be strictly complied with by yourselves, your office assistants, and deputy surveyors.

All directions in conflict with these instructions are hereby abrogated.

In all official communications, this edition will be known and referred to as the Manual of 1902.

Very respectfully,

BINGER HERMANN,
Commissioner.

To SURVEYORS GENERAL OF THE UNITED STATES.

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(Pages 5 through 18 and half of page 19 are deleted. They contain the "History of Legislation" and Revised Statutes, identical to the 1894 Manual in content.)

SYSTEM OF RECTANGULAR SURVEYING.

[See Plates II and III.]

24. Existing law requires that in general the public lands of the United States "shall be divided by north and south lines run according to the true meridian, and by others crossing them at right angles so as to form townships six miles square," and that the corners of the townships thus surveyed "must be marked with progressive numbers from the beginning."

Also, that the townships shall be subdivded into thirty-six sections, each of which shall contain six hundred and forty acres, as nearly as may be, by a system of two sets of parallel lines, one governed by true meridians and the other by parallels of latitude, the latter intersecting the former at right angles, at intervals of a mile.

25. In the execution of the public surveys under existing law, it is apparent that the requirements that the lines of survey shall conform to true meridians, and that the townships shall be 6 miles square, taken together, involve a mathematical impossibility due to the convergency of the meridians.

Therefore, to conform the meridional township lines to the true meridians produces townships of a trapezoidal form which do not contain the precise area of 23,040 acres required by law, and which discrepancy increases with the increase in the convergency of the meridians, as the surveys attain the higher latitudes.

26. In view of these facts, and under the provisions of section 2 of the act of May 18, 1796, that sections of a mile square shall contain 640 acres, as nearly as may be, and also under those of section 3 of the act of May 10, 1800, that "in all cases where the exterior lines of the townships, thus to be subdivided into sections and half sections, shall exceed, or shall not extend 6 miles, the excess or deficiency shall be specially noted, and added to or deducted from the western or northern ranges of sections or half sections in such township, according as the error may be in running lines from east to west, or from south

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to north; the sections and half sections bounded on the northern and western lines of such townships shall be sold as containing only the quantity expressed in the returns and plats, respectively, and all others as containing the complete legal quantity," the public lands of the United States shall be surveyed under the methods of the system of rectangular surveying, which harmonizes the incompatibilities of the requirements of law and practice, as follows:

First. The establishment of a principal meridian conforming to the true meridian, and, at right angles to it, a base line conforming to a parallel of latitude.

Second. The establishment of standard parallels conforming to parallels of latitude, initiated from the principal meridian at intervals of 24 miles and extended east and west of the same.

Third. The establishment of guide meridians conforming to true meridians, initiated upon the base line and successive standard parallels at intervals of 24 miles, resulting in tracts of land 24 miles square, as nearly as may be, which shall be subsequently divided into tracts of land 6 miles square by two sets of lines, one conforming to true meridians, crossed by others conforming to parallels of latitude at interval of 6 miles, containing 23,040 acres, as nearly as may be, and designated townships.

Such townships shall be subdivided into thirty-six tracts, called sections, each of which shall contain 640 acres, as nearly as may be, by two sets of parallel lines, one set parallel to a true meridian and the other conforming to parallels of latitude, mutually intersecting at intervals of 1 mile and at right angles, as nearly as may be.

27. Any series of contiguous townships or sections situated north and south of each other constitutes a RANGE, while such a series situated in an east and west direction constitutes a TIER.

The accompanying diagram (Plate II), and the specimen field notes (page 147), pertaining to the same, will serve to illustrate the method of running lines to form tracts of land 24 miles square, as well as the method of running the exterior lines of townships, and the order and mode of subdividing townships will be found illustrated in the accompanying specimen field notes (page 159), conforming with the township plat (Plate III). The method here presented is designed to insure a full compliance with every practicable requirement, meaning, and intent of the surveying laws.

28. By the terms of the original law and by general practice, section lines were surveyed from south to north and from east to west, in order to uniformly place excess or deficiency of measurement on the north and west sides of the townships. But under modern conditions many cases arise in which a departure from this method is necessary. Where the west or the north boundary is sufficiently correct as to course, to

serve as a basis for rectangular subdivision, and the opposite line is defective, the section lines should be run by a reversed method.

For convenience the well-surveyed lines on which subdivisions are to be based, will be called governing boundaries of the township. The rules provided for thus securing rectangular work are given on pages 55 to 61.

29. The tiers of townships will be numbered, to the north or south, commencing with No. 1, at the base line; and the ranges of the townships, to the east or west, beginning with No. 1, at the principal meridian of the system.

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30. The thirty-six sections in to which a township is subdivided are numbered, commencing with number one at the northeast angle of the township, and proceeding west to number six, and thence proceeding east to number twelve, and so on, alternately, to number thirty-six in the southeast angle. In all cases of surveys of fractional townships, the sections will bear the same numbers they would have if the township was full; and where doubt arises as to which section numbers should be omitted, the proper section numbers will be used on the side or sides which are governing boundaries, leaving any deficiency to fall on the opposite sides.

31. Standard parallels (formerly called correction lines) shall be established at intervals of 24 miles, north and south of the baseline, guide meridians at intervals of 24 miles, east and west of the principal meridian; thus confining the errors resulting from convergence of meridians and inaccuracies in measurement within comparatively small areas.

INSTRUMENTS AND THEIR ADJUSTMENTS.

32. The surveys of the public lands of the United States, embracing the establishment of base lines, principal meridians, standard parallels, meander lines, and the subdvisions of townships, will be made with instruments provided with the accessories necessary to determine a direction with reference to the true meridian, independently of the magnetic needle.

33. Burt's improved solar compass, or a transit of approved construction, with or without solar attachment, will be used in all cases. When a transit without solar attachment is employed, Polaris observations and the retracements necessary to execute the work in accordance with existing law and the requirements of these instructions will be insisted upon. Observations every clear night will be necessary to secure accuracy in the direction of transit reference lines, when solar apparatus is not used. The method of connecting surveys with the stellar meridian should distinctly appear in the field notes, as evidence that the courses were not derived from the magnetic needle.

34. Deputies using instruments with solar apparatus will be required to make observations on the star Polaris at the beginning of every survey, and whenever necessary to test the accuracy of the solar apparatus.

Observations required to test the adjustments of the solar apparatus will be made at the corner where the survey begins, or at the camp of the deputy surveyor nearest said corner; and in all cases the deputy will fully state in the field notes the exact location of the observing station.

35. Deputy surveyors will examine the adjustments of their instruments, and take the latitude daily, weather permitting, while running all lines of the public surveys. (For directions see page 153.) They will make complete records in their field notes, under proper dates, of the making of all observations in compliance with these instructions, showing the character and condition of the instrument in use, and the precision attained in the survey, by comparing the direction of the line run with the meridian determined by observation.

36. On every survey executed with solar instruments, the deputy will, at least once on each working day, record in his field notes the proper reading of the latitude are; the declination of the sun, corrected

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for refraction, set off on the declination are; and note the correct local mean time of his observation, which, for the record, will be taken at least two hours from apparent noon.

In field inspection of contract surveys, the examiners are required to obtain the meridian, both by solar and stellar observations, testing their instruments fully before reporting on the courses of the deputy's lines. Hence no deputy should incur risk by omitting any of the safeguards here required as essential to accurate work.

37. The construction and adjustments of all surveying instruments used in surveying the public lands of the United States will be tested at least once a year, and oftener, if necessary, on the true meridian, established under the direction of the surveyor general of the district; and if found defective, the instruments shall undergo such repairs or modifications as may be found necessary to secure the closest possible approximation to accuracy and uniformity in all field work controlled by such instruments.

38. The instruments for measuring lines are the chain and pins. Each deputy will be provided with a standard steel chain or steel tape of approved style, precisely adjusted to the standard measures kept by the surveyor general. The deputy's standard measure will not be used on the field work, but be carefully preserved in camp and used for purposes of frequent comparison with his field chains or steel tapes, in order that changes due to constant use may be discovered at the beginning of each day's work. All his returns of distance will be made in miles, chains, and links, a chain of 100 links being equal to 66 feet. Engineers' chains reading by feet only are not to be used in public-land surveys. Distances of height or depth may be given in feet or inches. In these details the specimen field notes are to be observed.

39. The simple conditions imperatively demanded for all accurate measurements are specified in the chainman's oath, promising that he will level the chain upon even and uneven ground, will plumb the pins, either by sticking or dropping them, and will report the true distances. These brief rules, faithfully observed, will render chaining sufficiently exact to stand the test of inspection by strict examiners.

40. Before chainmen are entrusted with their actual duties, they should be exercised for practice and thoroughly instructed, under the eye of their employer, by chaining two or three times over one or more trial lines of hilly or moun-

tainous surface, to ascertain the accuracy and uniformity of the results. The methods used by competent surveyors to obtain true horizontal distance over steep slopes, are too important to be disregarded, yet too elementary to be given here. When using only a portion of the chain, on steep hillsides, especially in a strong wind, accuracy requires a plumbline or some equivalent means, to mark the vertical. The dropping of flag pins not loaded, too often in such cases leads to repeated and serious error, which may be avoided by dropping a more suitable object, such as a piece of metal carried in the pocket.

If any other methods of obtaining measuremens up or down hills or across ravines be resorted to, except that here authorized, the facts will be stated in the returns, and the distances must well sustain the tests of the field examiner.

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MARKING LINES BETWEEN CORNERS.

41. The marking of trees and brush along lines was required by law as positively as the erection of monuments, by the act of 1796, which is still in force. The old rules therefor are unchanged.

42. All lines on which are to be established the legal corner boundaries will be marked after this method, viz: Those trees which may be intersected by the line will have two chops or notches cut on the sides facing the line, without any other marks whatever. These are called sight trees or line trees. A sufficient number of other trees standing within 50 links of the line, on either side of it, will be blazed on two sides diagonally or quartering toward the line, in order to render the line conspicuous, and readily to be traced in either direction, the blazes to be opposite each other, coinciding in direction with the line where the trees stand very near it, and to approach nearer each other toward the line, the farther the line passes from the blazed trees. In early surveys, an opposite practice prevailed.

43. Due care will ever be taken to have the lines so well marked as to be readily followed, and to cut the blazes deep enough to leave recognizable scars as long as the trees stand. This can be attained only by blazing through the bark to the wood. Trees marked less thoroughly will not be considered sufficiently blazed. Where trees two inches or more in diameter occur along a line, the required blazes will not be omitted.

44. Lines are also to be marked by cutting away enough of the undergrowth of bushes or other vegetation to facilitate correct sighting of instruments. Where lines cross deep wooded valleys, by sighting over the tops, the usual blazing of trees in the low ground when accessible will be performed, that settlers may find their proper limits of land and timber without resurvey.

45. The practice of blazing a random line to a point some distance away from an objective corner, and leaving through timber a marked line which is not the true boundary, is unlawful, and no such surveys are acceptable. The decisions of some State courts make the marked trees valid evidence of the place of the legal boundary, even if such line is crooked, and has the quarter-section corner far off the blazed line.

46. On trial or random lines, therefore, the trees will not be blazed, unless occasionally, from indispensable necessity, and then it will be done so guardedly as to prevent the possibility of confounding the marks of the trial line with the true. But bushes and limbs of trees may be lopped, and stakes set on the trial or random line, at every ten chains, to enable the surveyor on his return to follow and correct the trial line and establish therefrom the true line. To prevent confusion, the temporary stakes set on the trial or random line will be removed when the surveyor returns to establish the true line.

47. The terms of each act making appropriation for compensation of surveys, allow increased pay for lines passing through lands "covered with dense undergrowth." The evident purpose of the increase is to compensate the surveyor for the additional labor and delay of cutting away brush and trees which obstruct the proper survey of the line, and also of blazing the line as required by law.

By dense undergrowth is meant thick bushes, boughs, or other vegetable growth of such height as to obstruct the use of the transit and

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require cutting away to obtain sights along line; also bushes, brush, or vines, that are of such character as to seriously impede the work of traversing and chaining the line.

48. Increased rates for heavy timber or dense undergrowth will not be allowed for lines on which no cutting away of brush is done or is necessary, or where blazing of timber is generally neglected, if these conditions shall be shown by field inspection.

INSUPERABLE OBJECTS ON LINE—WITNESS POINTS.

49. Under circumstances where the survey of a township or section line is obstructed by an impassable obstacle, such as a pond, swamp, or marsh (not meanderable), the line will be prolonged across such obstruction by making the necessary right-angle offsets (Plate III, sec. 22); or, if such proceeding be impracticable, a traverse line will be run, or some proper trigonometical operation employed to locate the line on the opposite side of the obstruction; and in case the line, either meridional or latitudinal, thus regained, is recovered beyond the intervening obstacle, said line will be surveyed back to the margin of the obstruction and all the particulars, in relation to the field operations, will be fully stated in the field notes.

50. As a guide in alinement and measurement, at each point where the line intersects the margin of an obstacle, a witness point will be established, except when such point is less than 20 chains distant from the true point for a legal corner which falls in the obstruction, in which case a witness will be established at the intersection. (See Plate III, section 22; also Witness Points and Witness Corners, page 52.)

51. In a case where all the points of intersection with the obstacle to measurement fall more than 20 chains from the proper place for a legal corner in the obstruction, and a witness corner can be placed on the offset line within 20 chains of the inaccessible corner point, such witness corner will be established. (See Plate III, south boundary of section 16.)

ESTABLISHING CORNERS.

52. To procure the faithful execution of this part of a surveyor's duty is a matter of the utmost importance. After true coursing and most exact measurements, the establishment of corners is the consummation of the field work. Therefore, if the corners be not perpetuated in a permanent and workmanlike manner, the principal object of surveying operations will not have been attained.

The points at which corners will be established are fully stated in the several articles: "Base Lines," "Principal Meridians," "Standard Parallels," etc., following the title "Initial Points," page 55.

53. All marking of letters and figures should be done neatly, distinctly, and durably, using the tools best adapted to the purpose, and keeping them in good order. These tools are the chisel and hammer for marking stones, and the scribing tool or gouge for surfaces of wood. Since the greatest permanency requires stone corner monuments, and the perishable nature of wood prohibits its use where stones can be found or brought, the deputy should be provided with good chisels, to enable him to mark neatly and expeditiously, using arabic figures for all numbers.

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SURVEYING MONUMENTS.

54. These consist of what is called the corner, and its accessories. The corner itself should be durable and firmly imbedded. It may consist of an iron monument, rod, or pipe, a cross cut on a ledge, or a marked stone; or in case these can not be obtained, then a post of durable timber. Where a stone corner has to be set upon a ledge of surface rock, it should be of large size and supported in a well-built stone mound, with its marks well shown; in addition to which, the usual witness mound will be separately built.

55. The accessories are needed to witness and identify the corner as a monument of public survey, and may consist of the following, mentioned in the order of their value and desirability:

Bearing objects, such as notable cliffs, rocks, boulders, etc., marked with a cross, the letters B. O, and a section number.

Memorials, buried 12 to 24 inches under the surface at the corner, such as glass or stone ware, potsherds, marked stones, cast iron, charcoal, or charred stake.

Pits of proper size and arrangement.

Mound of stones, at proper position and distance from the corner.

Bearing trees, blazed and marked as required.

Stake in pit, with letters and figures necessary.

Mound of earth, which in many regions is the least durable and useful of all accessories.

DESCRIPTIONS OF CORNERS.

56. The form and language used in the following articles, in describing, for each one of the thirteen classes of corners, eight specific constructions and markings, with the stated modifications in certain cases, will be carefully followed by deputy surveyors in their field notes; and their field work will strictly comply with the requirements of the descriptions.

57. When pits and mounds of earth are made accessories to corners, the pits will always have a rectangular plan; while the mounds will have a conical form, with circular base; and in all cases both pits and mounds will have dimensions at least as great as those specified in the descriptions. Deputy surveyors will strictly adhereto these provisions, and no departure from the stated requirements will be permitted, either in instructions or practice in the field. (See Plates IV and V.)

58. Referring to the numbered paragraphs, the corners described in "3" will be preferred to those described in either "1" or "2", when corners are established in loose, sandy soil, and good bearing trees are available; under similar conditions, the corners described in "5" and "8" will be preferred to those described in "4" and "7", respectively.

59. The selection of the particular construction to be adopted in any class will be left, as a matter of course, to the judgment and discretion of the deputy, who will assign the greatest weight to the durability of the corner materials and permanency of the monuments.

ABBREVIATIONS ALLOWED IN RETURNS.

60. Dimensions of stones, posts, and pits should for brevity be expressed in a regular manner, in consecutive order of length, breadth,

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and thickness, as shown in specimens; for instance, "a stone 23 x 10 x 8 ins." To describe a mound, the material, the altitude, and diameter of base will be given, as "mound of earth 4 ft. base, 2½ ft. high."

The following contractions are authorized to be used in the preparation of field notes, transcripts, inspection reports and similar records, and no others should be introduced. The arrangement of lines, blanks, spaces, numbers, and the general form of the specimen notes should be observed:

A.	for acres.	mag.	" magnetic.
a. m.	" forenoon.	M. C.	" Meander corner.
A. M. C.	" aux. meander corner.	mer.	" meridian.
asc.	" ascend.	mkd.	" marked.
astron.	" astronomical.	N.	" north.
bdy.	" boundary.	NE.	" northeast.
bdrs.	" boundaries.	NW.	" northwest.
bet.	" between.	obs.	" observe.
B. O.	" bearing object.	obsn.	" observation.
B. T.	" bearing tree.	p. m.	" afternoon.
C. C.	" closing corner.	Pol.	" Polaris.
chs.	" chains.	Pr. Mer.	" principal meridian.
cor., cors.	" corner, corners.	Pt. of Tr.	" point of triangulation.
corr.	" correction.	¼ sec.	" quarter section.
decl.	" declination.	R., Rs.	" range, ranges.
dep.	" departure.	red.	" reduce, reduction.
desc.	" descend.	S.	" south.
dia.	" diameter.	S. C.	" standard corner.
diff.	" difference.	SE.	" southeast.
dist.	" distance.	sec., secs.	" section, sections.
D. S.	" deputy surveyor.	S. M. C.	" special meander corner.
E.	" east.	sq.	" square.
elong.	" elongation.	St. Par.	" standard parallel.
frac.	" fractional.	SW.	" southwest.

ft.	" foot, feet.	T., or Tp.	" township.
G. M.	" guide meridian.	Ts., or Tps.	" townships.
h., hrs.	" hour, hours.	temp.	" temporary.
ins.	" inches.	U. C.	" upper culmination.
lat.	" latitude.	var.	" variation.
L. C.	" lower culmination.	W.	" west.
lks.	" links.	W. C.	" witness corner.
l. m. t.	" local mean time.	w. corr.	" watch correction.
long.	" longitude.	W. P.	" witness point.
m.	" minutes.	w. t.	" watch time.

AUTHORIZED FORM AND DESCRIPTIONS OF CORNERS.

61. The forms given below will guide the surveyor in the choice and erection of monuments and accessories, and the same forms will be followed in preparing field notes. In case a deputy is compelled to choose another style of corner, he should state in his notes the reasons that made it necessary to depart from the rules, and should erect a monument of equal or greater permanence than the one prescribed.

62. The punctuation marks heretofore shown in former editions, to be used with letters and figures on stones, posts, and trees, are now omitted, for the reason that they are neither made, nor desired to be made, in the actual field work, and hence should not be inserted in the official returns.

63. The stated dimensions of posts are minimum; if posts are longer than 3 feet, the extra length will be placed in the ground; the posts will in no case project more than 12 ins. above the natural surface of the earth.

STANDARD TOWNSHIP CORNERS.

[See Plates II and IV.]

64. *When more than one-half of all the standard township and section corners on any 6 miles of a base line or standard parallel are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described are established, will be modified as follows:* Strike out "S C on N." After "marked," insert the words:

"S C 13 N on N.,
22 E on E., and
21 E on W. face."

When under the conditions above specified the corner described in paragraph 1 is established, a stake may be driven in the east pit and marked instead of the stone, and described as exemplified in the last clause of paragraph 6, page 28.

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for standard cor. of Tps. 13 N., Rs. 21 and 22 E., marked S C on N.; with 6 grooves on N., E., and W. faces; dig pits, 30 X 24 X 12 ins., crosswise on each line, E. and W., 4 ft., and N. of stone, 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, N. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for standard cor. of Tps. 13 N., Rs. 21 and 22 E., marked S C on N.; with 6 grooves on N., E., and W. faces; and raise a mound of stone[1], 2 ft. base, 1½ ft. high, N. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for standard cor. of Tps. 13 N., Rs. 21 and 22 E., marked S C on N.; with 6 grooves on N., E., and W. faces; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked[2]

T 13 N R 22 E S 31 B T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T 13 N R 21 E S 36 B T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for standard cor. of Tps. 13 N., Rs. 22 and 23 E., marked

S C T 13 N on N.,
R 23 E S 31 on E., and
R 22 E S 36 on W. face; with 6 grooves on N., E., and W. faces; dig pits, 30 X 24 X 12 ins., crosswise on each line, E. and W., 4ft., and N. of post, 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, N. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins sq., 24 ins. in the ground, for standard cor. of Tps. 13 N., Rs. 22 and 23 E., marked

S C T 13 N on N.,
R 23 E S 31 on E., and
R 22 E S 36 on W. face; with 6 grooves on N., E., and W. faces, from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

T 13 N R 23 E S 31 B T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T 13 N R 22 E S 36 B T.

6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposit a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for standard cor. of Tps. 13 N., Rs. 22 and 23 E.; dig pits, 30 X 24 X 12 ins., crosswise on each line, N., E., and W. of cor., 5 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, over deposit.

In E. pit drive a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked

S C T 13 N on N.,
R 23 E S 31 on E., and

1. Mound of stone will consist of not less than four stones, and will be at least 1½ ft. high, with 2 ft. base.

2. All bearing trees will be marked with the township, range, and section in which they stand.

R 22 E S 36 on W. face; with 6 grooves on N., E., and W. faces.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins . diam., for standard cor. of Tps. 13 N., Rs. 22 and 23 E., I mark
S C T 13 N. on N.,
R 23 E S 31 on E., and
R 22 E S 36 on W. side, with 6 notches on N., E., and W. sides; dig pits, 24 X 18 X 12 ins., crosswise on each line, N., E., and W. of cor., 5 ft. dist.; and raise a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for standard cor. of Tps. 13 N., Rs. 22 and 23 E., I mark
S C T 13 N on N.,
R 23 E S31 on E., and
R 22 E S 36 on W. side; with 6 notches on N., E., and W. sides; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T 13 N R 23 E S 31 B T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T 13 N R 22 E S 36 B T.

CLOSING TOWNSHIP CORNERS.

[See Plates IV and V.]

65. *When more than one-half of all the township corners are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described are established, will be modified, as follows:* Strike out "C C on S.;". After "marked", insert the words
"C C 3 N on S.,
2 W on E., and
3 W on W. face."

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When, under the conditions above specified, the corner described in paragraph 1 is established, a stake may be driven in the east pit, and marked instead of the stone, and described as exemplified in the last cause of paragraph 6, below.

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for closing cor. of Tps. 4 N. Rs. 2 and 3 W., marked C C on S.; with 6 grooves on S., E., and W. faces; dig pits,30 X 24 X 12 ins., crosswise on each line, E. and W., 4 ft., and S. of stone, 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, S. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ X _____ X _____ ins., _____ is. in the ground, for closing cor. of Tps. 4 N., Rs. 2 and 3 W., marked C C on S.; with 6 grooves on S., E., and W. faces; and raise a mound of stone. 2 ft. base, 1½ ft. high, S. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for closing cor. of Tps. 4 N., Rs. 2 and 3 W., marked C C on S.; with 6 grooves on S., E., and W. faces; from which
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked
T 4 N R 2 W S 6 B T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T 4 N R 3 W S 1 B T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the gound, for closing cor. of Tps. 4 N., Rs. 2 and 3 W., marked
C C T 4 N on S.,
R 2 W S 6 on E., and
R 3 W S 1 on W. face; with 6 grooves on S., E., and W. faces; dig pits, 30 X 24 X 12 ins., crosswise on each line, E. and W., 4 ft., and S. of post 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ feet high, S. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for closing cor. of Tps. 4 N., Rs. 2 and 3 W., marked
C C T 4 N on S.,
R 2 W S 6 on E., and
R 3 W S 1 on W. face; with 6 grooves on S., E., and W. faces; from which
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked
T 4 N R 2 W S 6 B T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T 4 N R 3 W S 1 B T.

6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposit a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for closing cor. of Tps. 4 N., Rs. 2 and 3 W.; dig pits, 30 X 24 X 12 ins., crosswise on each line, S., E., and W. of cor., 5 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, over deposit.

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In E. pit, drive a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
C C T 4 N on S.,
R 2 W S 6 on E., and
R 3 W S 1 on W. face; with 6 grooves on S., E., and W. faces.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for closing cor. of Tps. 4 N., Rs. 2 and 3 W., I mark

C C T 4 N on S.,
R 2 W S 6 on E., and
R 3 W S 1 on W. side, with 6 notches on S., E., and W. sides; dig pits, 24 X 18 X 12 ins., crosswise on each line, S., E., and W. of cor., 5 ft. dist.; and raise a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for closing cor. of Tps. 4 N., Rs. 2 and 3 W., I mark
C C T 4 N on S.,
R 2 W S 6 on E., and
R 3 W S 1 on W. side, with 6 notches on S., E., and W. sides; from which
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked
T 4 N R 2 W S 6 B T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T 4 N R 3 W S 1 B T.

66. *Connecting Lines.*

All closing township corners on base lines or standard parallels, will be connected, by course and distance, with the nearest standard corner thereon; closing corners on all other lines, will be connected, in a similar manner, with the nearest township, section, or quarter section corner, or mile or half-mile monument, as existing conditons may require.

67. *Relative positions of Closing Corners, Pits, Mounds, and Bearing Trees.*

Any line, which by intersection with another surveyed line, determines the place for a closing corner, will be called a closing line; then in general, the mound and one pit of a closing corner will be placed on such "closing line," N., S., E., or W. of the closing corner, as prevailing conditions may require; while said mound and pit, with the two bearing trees (if used), will always be located on the same side of the line closed upon, and on which the other pits will be established, as directed in the foregoing descriptions, and illustrated on Plate V.

68. *Positions and Dimensions of Pits of Closing Corners on irregular boundaries.*

When a closing line intersects an irregular boundary at an angle less than 75°, and stone or post closing corners are established, the pit on the boundary adjoining the acute angle will be omitted, and the pit on the opposite side of the closing corner will have its dimensions increased, as follows: For a closing township corner, the enlarged pit will measure 42 X 36 X 12 ins.; for a closing section corner it will be 30 X 24 X 12 ins. (See Plate V, figs. 2 and 3.)

69. *Township or Section interfering Closing Corners.*

When two closing lines, at right angles to each other, intersect an irregular boundary at points less than 8 feet apart, and stone or post

corners are established, the pits, that under ordinary circumstances would be placed on the boundary, will be omitted, and the pits on the closing lines will have their dimensions increased to 36 X 36 X 12 ins. (See Plate V, fig. 4, at a and b.)

70. *Positions and Dimensions of Pits and Mounds of interfering Closing Corners.*

When, under the conditions stated in paragraphs 68 and 69, the corners "Mound of Earth, with Deposit and Stake in Pit" are established, the pits on the boundary line will be omitted when the distance between the closing corners is less than 10 feet and greater than 4 feet, and the dimensions of the pits on the closing lines will be increased as directed in said paragraphs.

In case the distance between the closing corners is less than 4 feet, one mound, 5 ft. base, 2½ ft. high, will cover the deposits of both closing corners. (See Plate V,fig. 4, at c, d, and e.)

CORNERS COMMON TO FOUR TOWNSHIPS.

[See Plate IV.]

71. *When more than one-half of all the corners of a township are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described are established , will be modified as follows:* After "marked", insert the words
"3 N on NE.,
2 W on SE.,
2 N on SW., and
3 W on NW. face;"

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for cor. of Tps. 2 and 3 N., Rs. 2 and 3 W., marked with 6 notches on each edge; dig pits, 24 X 24 X 12 ins., on each line, N., E., and W., 4 ft., and S. of stone, 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, S. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for cor. of Tps. 2 and 3 N., Rs. 2 and 3 W., marked with 6 notches on each edge, and raise a mound of stone, 2 ft. base, 1½ ft. high, S. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for cor. of Tps. 2 and 3 N., Rs. 2 and 3 W., marked with 6 notches on each edge, from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T 3 N R 2 W S 31 B T.
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

T 2 N R 2 W S 6 B T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T 2 N R 3 W S 1 B T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T 3 N R 3 W S 36 B T.

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4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for cor. of Tps. 2 and 3 N., Rs. 2 and 3 W., marked
T 3 N S 31 on NE.,
R 2 W S 6 on SE.,
T 2 N S 1 on SW., and
R 3 W S 36 on NW. face, with 6 notches on each edge; dig pits, 24 X 24 X 12 ins., on each line, N., E., and W., 4 ft., and S. of post, 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, S. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for cor. of Tps. 2 and 3 N., Rs. 2 and 3 W., marked
T 3 N S 31 on NE.,
R 2 W S 6 on SE.,
T 2 N S 1 on SW., and
R 3 W S 36 on NW., face., with 6 notches on each edge; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T 3 N R 2 W S 31 B T.
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked
T 2 N R 2 W S 6 B T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T 2 N R 3 W S 1 B T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T 3 N R 3 W S 36 B T.

6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposit a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for cor. of Tps. 2 and 3 N., Rs. 2 and 3 W.; dig pits 24 X 24 X 12 ins., on each line, N., S., E., and W. of cor., 5 ft. dist.; and raise a mound of earth, 5ft. base, 2½ ft. high, over deposit.
In E. pit drive a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
T 3 N S 31 on NE.,
R 2 W S 6 on SE.,
T 2 N S 1 on SW., and
R 3 W S 36 on NW. face, with 6 notches on each edge.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for cor. of Tps. 2 and 3 N., Rs. 2 and 3 W., I mark
T 3 N S 31 on NE.,
R 2 W S 6 on SE.,
T 2 N S 1 on SW., and
R 3 W S 36 on NW. side, with 6 notches facing each cardinal point; dig pits, 24 X 18 X 12 ins., on each line, N., S., E., and W. of cor., 5 ft. dist.; and raise a mound of earth around tree.

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8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for cor. of Tps. 2 and 3 N., Rs. 2 and 3 W., I mark
T 3 N S 31 on NE.,
R 2 W S 6 on SE.,
T 2 N S 1 on SW., and
R 3 W S 36 on NW. side, with 6 notches facing each cardinal point; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T 3 N R 2 W S 31 B T.
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked
T 2 N R 2 W S 6 B T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T 2 N R 3 W S 1 B T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T 3 N R 3 W S 36 B T.

CORNERS COMMON TO TWO TOWNSHIPS ONLY.

[See Plates IV and VIII.]

72. *When more than one-half of all the corners of a township are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described are established, will be modified as follows:*
After "marked", insert the words:
"2 N on SW., and
7 W on NW. face."
When, under the conditions above specified, the corner described in paragraph 1 is established, a stake may be driven in the south pit and marked instead of the stone, and described as exemplified in the last clause of paragraph 6, page 34.

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for cor. of Tps. 2 and 3 N., R. 7 W., on W. bdy. Tp. 3 N., R. 6 W., marked with 6 notches on N. and W. edges; dig pits 30 X 24 X 12 ins., on each line, N. and S., 4 ft., and W. of stone, 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, W. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for cor. of Tps. 2 and 3 N., R. 7 W., on W. bdy. Tp. 3 N., R. 6 W., marked with 6 notches on N. and W. edges; and raise a mound of stone, 2 ft. base, 1½ ft. high, W. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for cor. of Tp. 2 N., R. 5 W., and Tp. 3 N., R. 6 W., on N. bdy. Tp. 2 N., R. 6 W., marked with 6 notches on N. and W. edges; from which

A _____, ins. diam., bears N. _____° E., _____ lks. dist., marked

T 2 N R 5 W S 6 B T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T 3 N R 6 W S 36 B T.

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4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for cor. of Tp. 2 N., R. 5 W., and Tp. 3 N., R. 6 W., on N. bdy. Tp. 2 N., R. 6 W., marked

T 2 N R 5 W S 6 on NE., and

T 3 N R 6 W S 36 on NW. face, with 6 notches on N. and W. edges; dig pits 30 X 24 X 12 ins., on each line, E. and W., 4 ft., and N. of post, 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, N. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for cor. of Tps. 2 and N., R. 7 W., on W. bdy. Tp. 3 N., R. 6 W., marked

T 2 N R 7 W S 1 on SW., and

T 3 N R 7 W S 36 on NW. face, with 6 notches on N. and W. edges; from which

A _____, _____ ins. diam. bears S. _____° W., _____ lks. dist., marked

T 2 N R 7 W S 1 B T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T 3 N R 7 W S 36 B T.

6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposit a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for cor. of Tps. 2 and 3 N., R. 7 W., on W. bdy. Tp. 3 N., R. 6 W.: dig pits, 30 X 24 X 12 ins., on each line, N. and W. of cor., 5 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, over deposit.

In W. pit drive a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked

T 2 N R 7 W S 1 on SW., and

T 3 N R 7 W S 36 on NW. face, with 6 notches on N. and W. edges.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for cor. of Tps. 3 and 4 N., R. 5 W., on E. bdy. Tp. 4 N., R. 6 W., I mark

T 4 N R 5 W S 31 on NE., and

T 3 N R 5 W S 6 on SE. side; with 6 notches facing N. and E.; dig pits 24 X 18 X 12 ins., crosswise on each line, N. and E. of cor., 5 ft. dist.; and raise a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for cor. of Tps. 2 and 3 N., R. 7 W., on W. bdy. Tp. 3 N., R. 6 W., I mark

T 2 N R 7 W S 1 on SW., and

T 3 N R 7 W S 36 on NW. side, with 6 notches facing N. and W.; from which

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T 2 N R 7 W S 1 B T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T 3 N R 7 W S 36 B T.

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CORNERS REFERRING TO ONE TOWNSHIP ONLY

[See Plates IV and VIII.]

73. *When more than one-half of all corners of a township are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described are established, will be modified as follows:* After "marked" insert the words:

"2 N 6 W. on SW. face."

When, under the conditions above specified, the corner described in paragraph 1 is established, a stake may be driven in the south pit, and marked instead of the stone, and described as exemplified in the last clause of paragraph 6, page 36.

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for NE. cor. of Tp. 2 N., R. 6 W., marked with 6 notches on S. and W. edges; dig pits, 36 X 36 X 12 ins., on each line, S. and W. of stone, 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, SW. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for NE. cor. of Tp. 2 N., R. 6 W., marked with 6 notches on S. and W. edges; and raise a mound of stone, 2 ft. base, 1½ ft. high, SW. of cor. Pits impracticable.

3. *Stone, with Bearing Tree.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground for NE. cor. of Tp. 2 N., R. 6 W., marked with 6 notches on S. and W. edges; from which

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T 2 N R 6 W S 1 B T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for NE. cor. of Tp. 2 N., R. 6 W., marked

T 2 N R 5 W S 6 on NE.,

S 6 on SE.,

T 2 N R 6 W S 1 on SW., and

S 6 on NW. face, with 6 notches on S. and W. edges; dig pits,

36 X 36 X 12 ins., on each line, S. and W. of post, 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, SW. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for SW. cor. of Tp. 3 N., R. 6 W., marked
T 3 N R 6 W S 31 on NE.,
S 1 on SE.,
T 2 N R 7 W S 1 on SW., and
S 1 on NW. face, with 6 notches on N. and E. edges; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T 3 N R 6 W S 31 B T.

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6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposit a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for SW. cor. of T. 3 N., R. 6 W.; dig pits, 36 X 36 X 12 ins., on each line, N. and E. of cor., 5 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, over deposit.
In E. pit drive a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
T 3 N R 6 W S 31 on NE.,
S 1 on SE.,
T 2 N R 7 W S 1 on SW., and
S 1 on NW. face, with 6 notches on N. and E. edges.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for SW. cor. of Tp. 3 N., R. 6 W., I mark
T 3 N R 6 W S 31 on NE.,
S 1 on SE.,
T 2 N R 7 W S 1 on SW., and
S 1 on NW side, with 6 notches facing N. and E.; dig pits, 30 X 24 X 12 ins., crosswise on each line, N. and E. of cor., 5 ft. dist.; and raise a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for SE. cor. of Tp. 4 N., R. 6 W., I mark
S 6 on NE.,
T 3 N R 5 W S 6 on SE.,
S 6 on SW., and
T 4 N R 6 WS 36 on NW. side, with 6 notches facing N. and W.; from which
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T 4 N R 6 W S 36 B T.

STANDARD SECTION CORNERS.

[See Plates II and IV.]

74. 1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for standard cor. of secs. 31 and 32, marked S C on N.; with 5 grooves on E., and 1 groove on W. face; dig pits, 24 X 18 X 12 ins., crosswise on each line, E. and W., 3 ft., and N. of stone, 7 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, N. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for stand. cor. of secs. 35 and 36, marked S C on N.; with 1 groove on E. and 5 grooves on W. face; and raise a mound of stone, 2 ft. base 1½ ft. high, N. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for standard cor. of secs. 33 and 34, marked S C on N.; with 3 grooves on E. and W. faces; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T 13 N R 21 E S 34 B T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T 13 N R 21 E S 33 B T.

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4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for standard cor. of secs. 32 and 33, marked
S C T 13 N R 21 E on N.,
S 33 on E., and
S 32 on W. face, with 4 grooves on E., and 2 grooves on W. face; dig pits, 24 X 18 X 12 ins., crosswise on each line, E. and W., 3 ft., and N. of post, 7 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, N. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for standard cor. of secs. 34 and 35, marked
S C T 13 N R 21 E on N.,
S 35 on E., and
S 34 on W. face, with two grooves on E., and 4 grooves on W. face; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist. marked
T 13 N R 21 E S 35 B T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T 13 N R 21 E S 34 B T.

6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposit a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for standard cor. of secs. 33 and 34; dig pits, 24 X 18 X 12 ins., crosswise on each line, N., E., and W. of cor., 5 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, over deposit.

In E. pit drive a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
S C T 13 N R 22 E on N.,
S 34 on E., and
S 33 on W. face; with 3 grooves on E. and W. faces.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for standard cor. of secs. 31 and 32, I mark
S C T 13 N R 22 E on N.,
S 32 on E., and S 31 on W. side, with 5 notches on E., and 1 notch on W. side; dig pits, 18 X 18 X 12 ins., N., E., and W. of cor., 4 ft. dist.; and raise a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for standard cor. of secs. 35 and 36, I mark
S C T 13 N R 22 E on N.,
S 36 on E., and
S 35 on W. side, with 1 notch on E., and 5 notches on W. side; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T 13 N R 22 E S 36 B T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T 13 N R 22 E S 35 B T.

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CLOSING SECTION CORNERS.

[See Plates IV and V.]

75. 1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for closing cor. of secs. 1 and 2, marked C C on S.; with 1 groove on E., and 5 grooves on W. face; dig pits, 24 X 18 X 12 ins. crosswise on each line, E. and W., 3 ft., and S. of stone, 7 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, S. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for closing cor. of secs. 3 and 4, marked C C on S.; with 3 grooves on E. and W. faces; and raise a mound of stone, 2 ft. base, 1½ ft. high, S. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for closing cor. of secs. 1 and 2, marked C C on S.; with 1 groove on E., and 5 grooves on W. face; from which
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked
T 4 N R 3 W S 1 B T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T 4 N R 3 W S 2 B T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for closing cor. of secs. 1 and 2, marked
C C T 4 N R 3 W on S.,
S 1 on E., and
S 2 on W. face, with 1 groove on E., and 5 grooves on W. face; dig pits, 24 X 18 X 12 ins., crosswise on each line, E. and W., 3 ft., and S. of post, 7 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, S. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for closing cor. of secs. 1 and 2, marked
C C T 4 N R 3 W on S.,
S 1 on E., and
S 2 on W. face, with 1 groove on E., and 5 grooves on W. face; from which
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked
T 4 N R 3 W S 1 B T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T 4 N R 3 W S 2 B T.

6. *Mound of Earth, with Deposit, and Stake in Pit.*

Deposit a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for closing cor. of secs. 3 and 4; dig pits, 24 X 18 X 12 ins., crosswise on each line, S., E., and W. of cor., 4 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, over deposit.

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In E. pit drive a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
C C T 4 N R 3 W on S.,
S 3 on E., and
S 4 on W. face, with 3 grooves on E. and W. faces.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for closing cor. of secs. 1 and 2, I mark
C C T 4 N R 3 W on S.,
S 1 on E., and
S 2 on W. side, with 1 notch on E., and 5 notches on W. side; dig pits, 18 X 18 X 12 ins., S., E., and W. of cor., 5 ft. dist.; and raise a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for closing cor. secs. 1 and 2, I mark
C C T 4 N R 3 W on S.,
S 1 on E., and
S 2 on W. side, with 1 notch on E., and 5 notches on W. side; from which

A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

T 4 N R 3 W S 1 B T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T 4 N R 3 W S 2 B T.

9. All closing section corners, on base lines or standard parallels, will be connected by course and distance with the nearest standard corner thereon. (See section 143.)

CORNERS COMMON TO FOUR SECTIONS.

[See Plates IV and V.]

76. *When more than one-half of all the corners in a township are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described are established for cor. of secs. 15, 16, 21 and 22, will be modified as follows:* after "marked," insert the words

"4 N on NE., and

3 W on SE. face."

When, under the conditions above specified, the corner described in paragraph 1 is established, a stake may be driven in the southeast pit, and marked instead of the stone, and described as exemplified in the last clause of paragraph 6, page 40.

1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for cor. of secs. 14, 15, 22, and 23, marked with 3 notches on S. and 2 notches on E. edge; dig pits, 18 X 18 X 12 ins., in each sec. 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for cor. of secs. 14, 15, 22, and 23, marked with 3 notches on S. and 2 notches on E. edge; and raise a mound of stone, 2 ft. base, 1½ ft. high, W. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for cor. of secs. 9, 10, 15, and 16, marked with 4 notches on S., and 3 notches on E; edge; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

T 2 N R 2 W S 10 B T.

A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

T 2 N R 2 W S 15 B T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T 2 N R 2 W S 16 B T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T 2 N R 2 W S 9 B T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for cor. of secs. 15, 16, 21, and 22, marked

T 2 N S 15 on NE.,

R 2 W S 22 on SE.,

S 21 on SW., and

S 16 on NW. face with 3 notches on S. and E. edges; dig pits, 18 X 18 X 12 ins., in each sec., 5½ ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground for cor. of secs. 25, 26,35 and 36, marked

T 2 N S 25 on NE.,

R 2 W S 36 on SE.,

S 35 on SW., and

S 26 on NW face, with 1 notch on S. and E. edges; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

T 2 N R 2 W S 25 B T.

A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

T 2 N R 2 W S 36 B T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

T 2 N R 2 W S 35 B T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

T 2 N R 2 W S 26 B T.

6. *Mound, with Deposit, and Stake in Pit.*

Deposit a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for cor. of secs. 25, 26, 35 and 36; dig pits, 18 X 18 X 12 ins., in each sec., 4 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, over deposit.

In SE. pit drive a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked

T 2 N S 25 on NE.,

R 2 W S 36 on SE.,

S 35 on SW., and

S 26 on NW. face, with 1 notch on S. and E. edges.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for cor. of secs. 29, 30, 31, and 32, I mark

T 2 N S 29 on NE.,

R 2 W S 32 on SE.,

S 31 on SW., and

S 30 on NW. side, with 1 notch on S., and 5 notches on E. side; dig pits 18 X 18 X 12 ins., in each sec., 5 ft. dist.; and raise a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for cor. of secs 5, 6, 7, and 8, I mark
T 2 N S 5 on NE.,
R 2 W S 8 on SE.,
S 7 on SW., and
S 6 on NW. side, with 5 notches on S. and E. sides; from which
A _____, _____ ins. diam. bears N. _____° E., _____ lks. dist., marked
T 2 N R 2 W S 5 B T.
A _____, _____ ins. diam., bears S. _____° E. _____ lks. dist., marked
T 2 N R 2 W S 8 B T.
A _____, _____ ins. diam., bears S. _____° W. _____ lks. dist., marked
T 2 N R 2 W S 7 B T.
A _____, _____ ins. diam., bears N. _____° W. _____ lks. dist., marked
T 2 N R 2 W S 6 B T.

SECTION CORNERS COMMON TO TWO SECTIONS ONLY.

[See Plates IV and VIII.]

77. *When more than one-half of all the corners in a township are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described are established near cor. of secs. 15, 16, 21, and 22, will be modified, as follows:*
After "marked", insert the words
"3 N on SW., and
7 W on NW. face."
When, under the conditions above specified, the corner described in paragraph 1 is established, a stake may be driven in the southwest pit, and marked instead of the stone, and described as exemplified in the last clause of paragraph 6, page 42.

1. *Stone, with Pits and Mound of Earth.* (Tp. 3 N., R. 7 W.)

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground for cor. of secs. 25 and 36[3] marked with 5 notches on N., and 1 notch on S. edge; digs 24 X 24 X 12 ins., in each sec., 6 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.

2. *Stone, with Mound of Stone.* (Tp. 3 N., R. 7 W.)

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for cor. of secs. 15 and 22 marked with 3 notches on N. and S. edges; and raise a mound of stone, 2 ft base, 1½ ft. high, W. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.* (Tp. 3 N., R. 7 W.)

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for cor. of secs. 28 and 29, marked with 4 notches on E. edge; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T 3 N R 7 W S 28 B T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T 3 N R 7 W S 29 B T.

4. *Post, with Pits and Mound of Earth.* (Tp. 2 N., R. 6 W.)

Set a _____ post, 3 ft. long, 4 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for cor. of 33 and 34 marked
T 2 N S 34 on NE., and
R 6 W S 33 on NW. face, with three notches on E. and W. edges; dig pits 24 X 24 X 12 ins., in each sec., 6 ft. dist., and raise a mound of earth, 4 ft. base, 2 ft. high, N. of cor.

5. *Post, with Bearing Trees.* (Tp. 3 N., R. 5 W.)

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for cor. of secs. 24 and 25, marked
T 3 N S 25 on SW., and
R 5 W S 24 on NW. face, with 4 notches on N., and 2 notches on S. edge; from which
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T 3 N R 5 W S 25 B T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T 3 N R 5 W S 24 B T.

6. *Mound of Earth with Deposit and Stake in Pit.* (Tp. 2 N., R. 6 W.)

Deposit a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for cor. of secs. 13 and 24; dig pits 24 X 24 X 12 ins., in each sec., 4 ft., dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, over deposit.
In SW. pit drive a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
T 2 N S 24 on SW., and
R 6 W S 13 on NW. face, with 3 notches on N. and S. edges.

7. *Tree Corner with Pits and Mound of Earth.* (Tp. 3 N., R. 6 W.)

A _____, _____ ins. diam., for cor. of secs. 24 and 25, I mark
T 3 N S 25 on SW. and
R 6 W S 24 on NW. side, with 4 notches on N. and 2 notches on S. side; dig pits, 18 X 18 X 12 ins., in each sec., 5 ft. dist.; and raise a mound of earth around tree.

8. *Tree Corner with Bearing Trees.* (Tp. 3 N., R. 7 W.)

A _____, _____ ins. diam., for cor. of secs. 22 and 27 I mark
T 3 N S 27 on SW., and
R 7 W S 22 on NW. side, with 4 notches on N., and 2 notches on S. side; from which
A _____, _____ ins. diam., bears S. _____° W.,

3. The corner established on the range line and described in paragraph 1, will have notches to indicate the distances to the NE. and SE. corners of the township. See Plate IV, fig. 18; and Plate VIII, Tp. 3 N., R. 7 W.

_____ lks. dist., marked
T 3 N R 7 W S 27 B T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
T 3 N R 7 W S 22 B T.

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SECTION CORNERS REFERRING TO ONE SECTION ONLY.

[See Plates IV and VIII.]

78. *When more than one-half of all corners in a township are stone corners, the descriptions in paragraphs 1 and 2, if the corners therein described, are established near the place for cor. of secs. 15, 16, 21, and 22, will be modified, as follows:* After "marked" insert the words:
"2 N 5 W on NE. face;"
When, under the conditions above specified, the corner described in paragraph 1 is established, a stake may be driven in the pit, and marked instead of the stone, and described as exemplified in the last clause of paragraph 6, below.

1. *Stone, with Pit and Mound of Earth.* (Tp. 2 N., R. 5 W.)

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for SW. cor. of sec. 12, marked with 1 notch on E. edge; dig a pit, 36 X 36 X 12 ins., in the sec., 8 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, NE. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ X _____ X _____ ins. in the ground, for SW. cor. of sec. 12, marked with one notch on E. edge; and raise a mound of stone, 2 ft. base, 1½ ft. high, NE. of cor.

3. *Stone, with Bearing Tree.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for SW. cor. of sec. 12, marked with 1 notch on E. edge; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T 2 N R 5 W S 12 B T.

4. *Post, with Pit and Mound of Earth.* (Tp. 3 N., R. 5 W.)

Set a _____ post, 4 ft. long, 3 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the gound, for NW. cor. of sec. 10; marked
T 3 N S 9 on NE.
R 5 W S 10 on SE.
S 9 on SW., and
S 9 on NW. face, with 5 notches on S. and 3 notches on E. edge; dig a pit, 36 X 36 X 12 ins., in the sec., 8 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high, SE. of cor.

5. *Post, with Bearing Tree.* (T. 2 N., R. 5 W.)

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for SW. cor. of sec. 12; marked
T 2 N S 12 on NE.,
R 5 W S 13 on SE.,
S 13 on SW., and
S 13 on NW. face, with 1 notch on E. edge; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T 2 N R 5 W S 12 B T.

6. *Mound of Earth, with Deposit, and Stake in Pit.* (Tp. 3 N., R. 5 W.)

Deposit a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for NW. cor. of sec. 10; dig a pit, 36 X 36 X 12 ins. in the sec., 5 ft. dist.; and raise a mound of earth, 4 ft. base, 2 ft. high over deposit.

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In the pit drive a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
T 3 N S 9 on NE.,
R 5 W S 10 on SE.,
S 9 on SW., and
S 9 on NW. face, with 5 notches on S., and 3 notches on E. edge.

7. *Tree Corner, with Pit and Mound of Earth.* (Tp. 2 N., R. 5 W.)

A _____, _____ ins. diam., for SW. cor. of sec. 12, I mark
T 2 N S 12 on NE.,
R 5 W S 13 on SE.,
S 13 on SW., and
S 13 on NW. side, with 1 notch on E. side; dig a pit, 24 X 24 X 12 ins., in the sec., 5 ft. dist.; and raise a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.* (Tp. 3 N., R. 5 W.)

A _____, _____ ins. diam., for NW. cor. of sec. 10, I mark
T 3 N S 9 on NE.,
R 5 W S 10 on SE.,
S 9 on SW., and
S 9 on NW., side, with 5 notches on S., and 3 notches on E. side; from which
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked
T 3 N R 5 W S 10 B T.

QUARTER SECTION CORNERS.

[See Plates IV and V.]

79. 1. *Stone, with Pits and Mound of Earth.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for ¼ sec. cor. marked ¼ on N. face; dig pits, 18 X 18 X 12 ins., E. and W. of stone, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ 2 ft. high, N. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for 1¼ sec. cor. marked ¼ on W. face; and raise a mound of stone, 2 ft. base, 1½ ft. high, W. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for ¼ sec. cor. marked ¼ on W. face; from which

A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked

¼ S 16 B T.

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

¼ S 17 B T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 3 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for ¼ sec. cor. marked ¼ S 4 on N. face and 9 on S. face; dig pits 18 X 18 X 12 ins., E. and W. of post, 3 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, N. of cor.

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5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 3 ins. sq., 24 ins. in the ground, for ¼ sec. cor., marked ¼ S 21 on W. face and 22 on E. face; from which

A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked

¼ S 22 B T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

¼ S 21 B T.

6. *Mound, with Deposit and Stake in Pit.*

Deposit a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for ¼ sec. cor.; dig pits, 18 X 18 X 12 ins , E. and W. of cor., 4 ft. dist.; and raise a mound of earth, 3½ ft. base, 1½ ft. high, over deposit.

In E. pit drive a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked

¼ S 21 on N. face and 28 on S. face.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for ¼ sec. cor. I mark ¼ S 7 on W. side and 8 on E. side; dig pits, 18 X 18 X 12 ins., N. and S. of cor., 4 ft. dist.; and raise a mound of earth around tree.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for ¼ sec. cor. I mark ¼ S 20 on N. side and 29 on S. side; from which

A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked

¼ S 20 B T.

A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked

¼ S 29 B T.

80. *Pits and Mounds of Quarter Section Corners.*

On meridional lines, the pits will be dug N. and S., and the mound will be placed on the west side of the corner; on latitudinal lines, the pits will be located E. and W., and the mound will be built on the north side of the corner. See Plate V.

81. *Markings on Quarter Section Corners.*

On meridional lines, the marks will be placed on the west side, and on latitudinal lines, on the north side of the stone, post, or other corner.

82. *Stakes in Pits of Quarter Section Corners.*

On meridional lines the stakes will be driven in the S. pit, and on latitudinal lines, in the E. pit.

STANDARD QUARTER SECTION CORNERS.

[See Plates IV and V.]

83. All standard quarter-section corners, on base lines or standard parallels, will have the letters S C (for standard corner), precede the marking ¼ or ¼ S, as the case may be; such corners will be established in all other respects like other quarter-section corners.

When bearing trees are described for standard quarter-section corners, each tree will be marked, S C ¼ S B T.

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QUARTER SECTION CORNERS COMMON TO TWO QUARTERS OF ONLY ONE SECTION.

84. These corners will be similar in all respects to those that are common to four quarters of two sections. See notes on Plates VI and VII.

MEANDER CORNERS.

[See Plates III, IV, and V.]

85. 1. *Stone, with Pit and Mound of Earth.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground for meander cor. of fracl. secs. 26 and 35, marked

M C on E. face, with 1 groove on S. face; dig a pit 36 X 36 X 12 ins., 8 ft. W. of stone; and raise a mound of earth, 4 ft. base, 2 ft. high, W. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for meander cor. of fracl. secs. 17 and 18, marked

M C on S. face. with 5 grooves on E. face; and raise a mound of stone, 2 ft. base, 1½ ft. high, N. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone _____ X _____ X _____ ins., _____ ins. in the ground, for meander cor. of fracl. secs. 26 and 35, with 1 groove on S. face, marked
M C on W. face; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
T 15 N R 20 E S 26 M C B T.
A _____, _____ ins., diam., bears S. _____° E., _____ lks., dist., marked
T 15 N R 20 E S 35 M C B T.

4. *Post, with Pit and Mound of Earth.*

Set a _____ post, 3 ft. long, 4 ins., sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground for meander cor. of fracl. secs. 19 and 20, marked
M C on N.,
T 15 N on S.,
R 20 E S 20 on E., and
S 19 on W. face, dig a pit, 36 X 36 X 12 ins., 8 ft. S. of post; and raise a mound of earth, 4 ft. base, 2 ft. high, S. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 4 ins. sq., 24 ins. in the ground, for meander cor. of fracl. secs. 25 and 26, marked
M C on N.,
T 15 N on S.,
R 20 E S 25 on E., and
S 26 on W. face; from which
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked
T 15 N R 20 E S 25 M C B T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T 15 N R 20 E S 26 M C B T.

6. *Mound with Deposit, and Stake in Pit.*

Deposit a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for meander cor. of fracl. secs. 25 and 26; dig a

pit, 36 X 36 X 12 ins., 5 ft. N. of cor.; and raise a mound of earth, 4 ft. base, 2 ft. high, over deposit.
In the pit drive a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked
M C on S.,
T 15 N on N.,
R 20 E S 26 on W., and
S 25 on E. face

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for meander cor. of fracl. secs. 17 and 20, I mark
M C on W.,
T 15 N on E.,
R 20 E S 17 on N., and
S 20 on S. side; dig a pit, 36 X 36 X 12 ins., 8 ft. E. of tree; and raise a mound of earth, 4 ft. base, 2 ft. high, E. of cor.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for a special meander cor. of fracl. E. and W. halves of sec. 33, I mark
S M C on N.,
T 15 Non S.,
R 20 E S 33 on E., and
S 33 on W. side; from which
A _____, _____ ins. diam., bears S. _____° E. _____ lks. dist., marked
T 15 N R 20 E S 33 S M C B T.
A _____, _____ ins. diam., bears S. _____ W., _____ lks. dist., marked
T 15 N R 20 E S 33 S M C T.

86. *Pits and Mounds of Meander Corners.*

When a pit is dug as an accessory to a meander corner, it will be located on line and 8 feet from such corner (except as otherwise provided for in paragraph 6), on the side opposite the stream or lake meandered; while the mound will be placed midway between the corner and nearest side of the pit.

87. *Markings on Meander Corners.*

On all meander corners, the letters M C (for meander corner) will be cut into the side facing the stream or lake to be meandered. On post or tree meander corners, within township exteriors, additional marks will be placed, as follows: the township number will be marked on the side opposite M C; the proper range and section number will be placed on the right-hand side (when looking along line toward the stream or lake), and the appropriate section number on the opposite side.

All meander corners on base lines or standard parallels will be further marked S C on north side or face.

On principal or guide meridians, and on meridional township lines, the letters M C will be placed as above directed; the township number will be marked on the opposite side; while the proper range and section numbers will be marked on the sides facing the east and west cardinal points.

On base lines or standard parallels and on latitudinal township lines, the township and section numbers will be marked on the sides facing

the north and south cardinal points; while the range numbers will be placed on the side opposite the marking M C.

In all the markings provided for in this paragraph, the numbers indicating township, range, and section, will be preceded by the initial letters T R and S, respectively.

88. *Descriptions will be modified in certain cases.*

When a tree is marked for a regular meander corner, the descriptions in paragraph 8 will be modified, as follows:

strike out "special"; in place of "E. and W. halves of sec. 33", write "secs. _____ and _____,"; and omit the letter S, preceding M C, in the marking on corner and bearing trees.

The descriptions in paragraphs 1 to 7, inclusive, will be modified to describe special meander corners, as illustrated in paragraph 8, by writing "special" before meander cor. and S before M C when conditions require the change.

89. *Special Meander Corners and Auxiliary Meander Corners.*

Regular meander corners are those established on standard, township, or section lines. See Plate IV, for plans of meander corners, and the specimen plat, Plate III, sections 17, 18, 19, 20, 25, 26, and 35, for locations of meander corners described in Specimen Field Notes, pages 179 and 180.

The meander corners on lines of legal subdivisions, other than standard, township, or section lines, will be designated special meander corners, e. g., those located on the Specimen Plat, Plate III, in section 33.

Meander corners, not on a line belonging to the system of rectangular surveying, will be called auxiliary meander corners, e.g., the meander corner on Diamond Rock, in section 18.

90. *Meander Corners on unsafe ground will be witnessed.*

When a Meander Corner falls at a point where prevailing conditions would threaten its destruction by natural causes, a witness corner to such meander corner will be established, as provided for in the article Witness Corners, page 52.

91. CORNERS ON RESERVATION OR OTHER BOUNDARIES NOT CONFORMING TO THE RECTANGULAR SYSTEM.

[See Plate V.]

Stones for corners on Indian Reservation or other boundaries will not be less than 20 ins. long, or less than 6 ins. thick, and will measure at least one cubic foot in volume; consequently, a stone 20 X 14½ X 6 ins., will be about minimum size, and 32 X 9 X 6 ins., represents satisfactory proportions. N. P. for Nez Perces (Indian Reservation), on the east, and P. L. for Public Land (unsurveyed), on the west, applies to paragraph 1 only.

1. *Stone, with Mound of Earth.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for the 17-mile cor., marked
17 M on S.,
N P on E., and
P L on W. face; dig pits 36 X 36 X 12 ins., E. and W. of stone, 4 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, S. of cor.

2. *Stone, with Mound of Stone.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for the 38-mile cor., marked
38 M on NE.,
N P on NW., and
P L on SE. face, and raise a mound of stone, 3 ft. base, 2 ft. high,[4] N. E. of cor. Pits impracticable.

3. *Stone, with Bearing Trees.*

Set a _____ stone, _____ X _____ X _____ ins., _____ ins. in the ground, for the 35-mile cor., marked
35 M on E.,
N P on N. and
8 W on S. face; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
N P I R 35 M B T.
A _____, _____ ins. diam., bears S. _____° E.,[5] _____ lks. dist., marked
T 6 N R 8 W S 9 35 M B T.
A _____, _____ ins. diam., bears S. _____° W.,[5] _____ lks. dist., marked
T 6 N R 8 W S 8 35 M B T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
N P I R 35 M B T.

4. *Post, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 5 ins. sq., with marked stone (charred stake or quart of charcoal), 24 ins. in the ground, for the 17 mile cor., marked
17 M on S.,
N P I R on E., and
P L on W. face; dig pits, 36 X 36 X 12 ins., E. and W. of post, 4 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, S. of cor.

5. *Post, with Bearing Trees.*

Set a _____ post, 3 ft. long, 5 ins. sq., 24 ins. in the ground, for the 35-mile cor., marked
35 M on E.,
N P I R on N., and
T 6 N R 8 W S 9 on S.; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
N P I R 35 M B T.
A _____, _____ ins. diam, bears S. _____° E., _____ lks. dist., marked
T 6 N R 8 W S 9 35 M B T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T 6 N R 8 W S 8 35 M B T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
N P I R 35 M B T.

6. *Mound, with Deposit and Stake in Pit.*

4. The above are minimum dimensions for mounds of stone on reservation boundaries.

5. The bearing trees, "S. _____° E." and "S. _____° W." from the corner, are supposed to stand on surveyed land, near the line between sections 8 and 9.

Deposit a marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for the 33-mile cor.; dig pits, 36 X 36 X 12 ins., NE. and

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SW. of cor., 5 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, over deposit.

In NE. pit drive a _____ stake, 2 ft. long, 2 ins. sq., 12 ins. in the ground, marked

33 M on SE.,
N P I R on NE., and
T 6 N R 8 W S 15 on SW. face.

7. *Tree Corner, with Pits and Mound of Earth.*

A _____, _____ ins. diam., for the 29-mile cor., I mark
29 M on E.,
N P I R on N., and
T 5 N R 7 W S 8 on S. side; dig pits, 36 X 36 X 12 ins., N. and S. of tree, 5 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, E. of cor.

8. *Tree Corner, with Bearing Trees.*

A _____, _____ ins. diam., for the 35-mile cor., I mark
35 M on E.,
N P I R on N., and
T 6 N R 8 W S 9 on S. side; from which
A _____, _____ ins. diam., bears N. _____° E., _____ lks. dist., marked
N P I R 35 M B T.
A _____, _____ ins. diam., bears S. _____° E., _____ lks. dist., marked
T 6 N R 8 W S 9 35 M B T.
A _____, _____ ins. diam., bears S. _____° W., _____ lks. dist., marked
T 6 N R 8 W S 8 35 M B T.
A _____, _____ ins. diam., bears N. _____° W., _____ lks. dist., marked
N P I R 35 M B T.

9. *Corner Monument of Stone, with Deposit.*

Deposit a marked stone (charred stake, quart of charcoal, or vial with record[6] inclosed), 12 ins. in the ground, for the SW. cor. of the Nez Perces Indian Reservation; and build a monument of stone, 3 ft. sq. at base, 2 ft sq. on top, 3 ft. high, over deposit; marked

SW cor N P I R on NE.,[7]
P L _____[8] M _____[8] chs on SE.,
P L _____[9] on SW., and
P L on NW. face.

10. *A Post for Corner Monument, with Pits and Mound of Earth.*

Set a _____ post, 3 ft. long, 5 ins. sq., 24 ins. in the ground, for the NW. cor. of the Nez Perces Indian Reservation, marked

P L on SE.,
NW cor N P I R on SE.,
P L _____[8] M _____[8] chs on SW., and
P L _____[9] on NW. face; dig pits, 36 X 36 X 12 ins., S. and NE. of post, 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, SE. of cor.

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11. *A Stone for Corner Monument, with Pits and Mound of Earth.*

Set a _____ stone, 36 X 10 X 7 ins., 27 ins. in the ground, for the NE. cor. of the Nez Perces Indian Reservation, marked

P L on NE.,
P L on SE.,
NE cor N P I R on SW., and
P L on NW. face; dig pits 36 X 36 X 12 ins., S. and W. of stone, 8 ft. dist.; and raise a mound of earth, 5 ft. base, 2½ ft. high, SW. of cor.

92. *Modifications of descriptions.*

When a stone or post is established for a corner monument, i. e., at a corner of a reservation, and four bearing trees are available, the descriptions of paragraphs 10 and 11 will be modified, as follows: Replace all that refers to pit and mound of earth, by correct descriptions of four properly marked bearing trees, for each corner.

The dimensions and arrangement of pits and mounds, described in the last two paragraphs, are similar to those described for "Corners referring to one township only."

93. The following table will be convenient for reference to the rules of the above descriptions, so far as they apply to pits and mounds.

TABLE I.—*Size, position, and distance of pits and mounds.*

Part 1.—Requirements as to size and position of pits.

Kind of corner.	Size at tree corner.	Size at other corners.	Position from corner.
Standard tp. cor....	24 x 18 x 12	30 x 24 x 12	Across N., E., and W. lines.
Closing tp. cor	24 x 18 x 12	30 x 24 x 12	Across E., W., and S. lines.
Cor. of 4 tps	24 x 18 x 12	24 x 24 x 12	On lines N., E., S., and W.
Cor. of 2 tps	24 x 18 x 12	30 x 24 x 12	On each line.
Cor. of 1 tp	30 x 24 x 12	36 x 36 x 12	Do.
Standard sec. cor...	18 x 18 x 12	24 x 18 x 12	Across E., W., and N. lines.
Closing sec. cor	18 x 18 x 12	24 x 18 x 12	Across E., W., and S. lines.
Cor. of 4 secs	18 x 18 x 12	18 x 18 x 12	In each sec. NE., etc.
Cor. of 2 secs	18 x 18 x 12	24 x 24 x 12	In both secs.
Cor. of 1 sec	24 x 24 x 12	36 x 36 x 12	In the sec.
Quarter sec. cor....	18 x 18 x 12	18 x 18 x 12	On line each side.
Meander cor	36 x 36 x 12	36 x 36 x 12	On line, rear of cor.
On res'n line.....	36 x 36 x 12	36 x 36 x 12	See Manual.

6. The record will consist of a brief description of the corner, with the date of its construction.

7. The markings will be cut into large stones, inserted in the middle of the lowest course of each side of the monument.

8. The proper number of miles and chains, from the initial point, will be stated.

9. The year in which the monument is established will be placed in the blank.

Part 2.—Distance of pits and requirements as to mounds.

Kind of corner.	Distance of pits at—			Mounds.		
	Post corner.	Mound of earth corner.	Tree corner.	Size (in feet). Stone.	Size (in feet). Earth.	Position from corner.
		Feet.	Feet.			
Standard tp. cor.	E. and W. 4 feet, N. 8 feet	5	5	2 x 1½	5 x 2½	N.
Closing tp. cor	E. and W. 4 feet, S. 8 feet	5	5	2 x 1½	5 x 2½	S.
Cor. of 4 tps	N., E., and W. 4 feet, S. 8 feet	5	5	2 x 1½	5 x 2½	S.
Cor. of 2 tps	E. and W. 4 feet, N. 8 feet	5	5	2 x 1½	5 x 2½	Various.
Cor. of 1 tp	8 feet	5	5	2 x 1½	5 x 2½	Do.
Standard sec. cor.	E. and W. 3 feet, N. 7 feet	5	4	2 x 1½	4 x 2	N.
Closing sec. cor	E. and W. 3 feet, S. 7 feet	4	5	2 x 1½	4 x 2	S.
Cor. of 4 secs	5½ feet	4	5	2 x 1½	4 x 2	W.
Cor. of 2 secs	6 feet	4	5	2 x 1½	4 x 2	W.
Cor. of 1 sec	8 feet	5	5	2 x 1½	4 x 2	Various.
Quarter sec. cor.	3 feet	4	4	2 x 1½	3½ x 1½	Do.
Meander cor	8 feet	5	8	2 x 1½	4 x 2	With pit.
On res'n line	4 feet	5	5	3 x 2	5 x 2½	Various.

WITNESS CORNERS.

94. *Witness Corners will be established in certain cases.*

When the true point for any corner described in these instructions falls where prevailing conditions would insure its destruction by natural causes, a witness corner will be established in a secure position, on a surveyed line if possible, and within twenty chains of the corner point thus witnessed.

95. *Markings on Witness Corners.*

A witness corner will bear the same marks that would be placed upon the corner for which it is a witness, and in addition, will have the letters, W C (for witness corner), conspicuously displayed above the regular markings on the NE. face when witnessing a township or section corner; such witness corners will be established, in all other respects, like a regular corner, marking bearing trees with the proper numbers for the sections in which they stand.

96. *Markings on Bearing Trees of Witness Corners.*

When bearing trees are described as accessories to a witness corner, the prescribed markings on each tree will be preceded by the letters W C distinctly cut into the wood.

The true bearing and distance of witness corners, from the true point for the corner, will always be clearly stated in the field notes.

97. *Witness Corners to corner points falling in roads, etc.*

The point for a corner falling on a railroad, street, or wagon road, will be perpetuated by a marked stone (charred stake or quart of charcoal), deposited 24 inches in the ground, and witnessed by two witness corners, one of which will be established on each limiting line of the highway.

In case the point for any regular corner falls at the intersection of two or more streets or roads, it will be perpetuated by a marked stone (charred stake or quart of charcoal), deposited 24 inches in the ground, and witnessed by two witness corners established on opposite sides of the corner point, and at the mutual intersections of the lines limiting the roads or streets, as the case may be.

WITNESS POINTS.

98. Witness points will be perpetuated by corners similar to those described for quarter section corners, with the marking W P (for witness point), inplace of ¼, or ¼ S, as the case may be.

If bearing trees are available as accessories to witness points, each tree will be marked W P B T. (See "Insuperable objects on line—Witness Points," page 24.)

MISCELLANEOUS.

99. *Corners on Rock in place, or on Boulders.*

When a corner falls on rock in place, or on a boulder, a cross (X), will be made at the exact corner point, and witnessed by the proper number of bearing trees, if they are available; in the absence of suitable trees, a mound of stones will be raised, or of earth if stones are not found and pits are available. Owing to the difficulty of identify-

ing the corner coming upon a flat rock in place, when only a cross is cut thereon, it is imperative that some adequate witness be used and marked.

100. *Location of Mounds.*

When mounds of earth or other material are raised as accessories to corners, they will be placed as specified in the foregoing Description of Corners, and in every case the direction of the mound from the corner will be carefully stated. The use of the indefinite description "alongside" will not be approved.

In case the character of the land is such that the mound can not be placed as hereinbefore described, the deputy will state in his notes, by bearing and distance, exactly where the mound is located with reference to the corner, and will give his reasons for placing it as described.

101. *Mounds of Stone, covered with Earth.*

In a case where pits are practicable and the deputy prefers raising a mound of stone, or a mound of stone covered with earth, he will use the form given for "Stone with mound of stone," omitting "pits impracticable," when the corner thus described is established; but when the corner "Stone, with mound of stone covered with earth," is constructed, the description will be modified as follows: strike out the words "Pits impracticable"; in place of "mound of stone, 2 ft. base, 1½ ft. high," write "mound of stone covered with earth, _____ ft. base, _____ ft. high," inserting in the blank spaces the dimensions of the mound given in paragraph 1, following the designation of each class of corners, pages 27 to 50. Mounds of stone, or of stone covered with earth must never be built around the corner stone, but separate. When stones are necessary to hold the corner stone upright and firm, they should be in addition to the witness mound, and not a part of it.

102. *Bearing Trees.*

Bearing trees marked as accessories to standard corners, either township, section, or quarter section, will be selected on the north side of base lines or standard parallels, and bearing trees referring to the closing corners on said lines, will be located on the south side; in general, the bearing trees referring to any particular closing corner, together with one pit and the mound belonging to such corner, will be located on the same side of the line closed upon, and on the side from which the surveys have been closed.

When the requisite number of trees can be found within 300 links of the corner point, two bearing trees will be marked and described for every standard or closing township or section corner, or corner common to two townships or sections, only; four for every corner common to four townships or four sections; one for a corner referring to one township or one section, only; two for every quarter section corner or meander corner, and four for each mile or half mile corner, or corner monument on a reservation or other boundary, not conforming to the system of rectangular surveying.

103. The limit of 300 links will not be held to prohibit the use of bearing trees or rocks beyond that distance. Where such objects are few but accessible, they are too useful as evidences of corners to be disregarded by a faithful deputy, even when several chains distant. In the surveys of 50 or 60 years ago, corners were often witnessed by trees 8 or 10 chains distant, with great advantage to subsequent retracements.

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In case the prescribed number of trees can not be found within practicable distance, the deputy will state in his field notes, after describing those marked, "no other trees within limits," and add "dig pits _____ X _____ X _____ ins.," etc., or "raise a mound of stone, _____ ft. base, _____ ft. high, _____ of cor.," as prevailing conditions may require.

104. Bearing trees, being important accessories to the corners, will have their exact bearings from the true meridian taken with the instrument used in running the lines of survey; and the distance from the middle of each bearing tree to the middle point of the corner will be carefully measured, and recorded in the field notes.

105. As to the height or position of marks placed on bearing trees, practice differs in various localities. The custom of placing these important evidences high enough to insure their destruction when some woodman, ignorant or careless of the penalty of the law, cuts down the tree, is a direct violation of rules. A tree will be so marked that if inadvertently cut down its stump will retain evidence of its importance. Many surveyors have adopted the plan of placing all the marks at the height of 4 or 5 feet, except the letters B T, which are made on another blaze about one foot above the ground. The intent is commendable; but as a better rule, applicable to trees of every size, the following is now adopted: Place all figures and letters on that part of the tree which would probably remain as the stump; and make one plain blaze high on the same side, to attract notice in case of snow or dense undergrowth.

106. No tree less than 4 inches in diameter should be chosen for a witness, if larger ones are convenient; and if none over 3 inches are found, pits will be dug to witness the corner.

107. *Stones for corners.*

Stones 18 ins. long, or less, will be set with two-thirds of their length in the ground, and those more than 18 ins. long will have three-fourths of their length in the ground.

No stones measuring less than 504 cubic inches, or less than 12 ins. in length or three inches in thickness will be used for corners.

108. *Lines discontinued at Legal Corners.*

No mountainous lands, or lands not classed as surveyable, will be meandered, and all lines approaching such lands will be discontinued at the section or quarter-section corner nearest the unsurveyed land.

109. *Marks to be cut.*

All letters and figures on posts, trees, or stones, etc., will be cut into the object upon which they are placed. Arabic figures and plain letters will be used for all markings.

110. *Orientation of Corners.*

Corners referring to one, two, or four townships or sections, not identical with standard or closing corners, will be set with their faces directed NE. and SW., and NW. and SE., while all other corners will be set with their sides facing the cardinal points; except corners on boundaries of reservations and private land claims, which will be set squarely on line.

111. *Size of Posts, Mounds, etc.*

The sizes of wooden posts, mounds, and pits, noted in the foregoing descriptions, will be regarded as minimum, and their dimensions will be increased whenever practicable, except as to height of posts out of ground.

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112. *Corner Materials.*

In establishing corners, the first preference will be given to durable stones when obtainable; then, posts; and lastly, mounds with stake in pit.

Wood of a perishable nature will not be used for posts or stakes.

113. *Instructions to be studied.*

Deputy surveyors will carefully read, study, and familiarize themselves with all instructions contained in this volume, and will instruct their assistants as to their duties before commencing work. An extra copy of this Manual may be furnished each deputy, for the use of his assistants.

INITIAL POINTS.

114. Initial points from which the lines of the public surveys are to be extended will be established whenever necessary, under such special instructions as may be prescribed in

each case by the Commissioner of the General Land Office. The locus of such initial points will be selected with great care and due consideration for their prominence and easy identification, and must be established astronomically.

An initial point should have a conspicuous location, visible from distant points on lines; it should be perpetuated by an indestructible monument, preferably a copper bolt firmly set in a rock ledge; and it should be witnessed by rock bearings, without relying on anything perishable like wood.

115. The initial point having been established the lines of public-land surveys will be extended therefrom. They are classified as follows:

Class 1. Base lines and standard parallels.

Class 2. Principal and guide meridians.

Class 3. Township exteriors (or meridional and latitudinal township boundaries).

Class 4. Subdivision and meander lines.

Only the base line and principal meridian can pass through the initial point.

BASE LINE.

116. From the initial point the base line will be extended east and west on a true parallel of latitude, by the use of transit or solar instruments, as may be directed by the surveyor general in his written special instructions. The transit will be used for the alinement of all important lines.

117. The direction of base lines will conform to parallels of latitude and will be controlled by true meridians; consequently the correct determination of true meridians by observations on Polaris at elongation is a matter of prime importance.

118. Certain reference lines, called tangents and secants, having a known position and relation to the required parallel of latitude, will be prolonged as straight lines. Two back and two fore sights are taken at each setting of the instrument, the horizontal limb being revolved 180° in azimuth between the observations, in one method, taking the mean of observations. Another method, called double back and fore sights, is still more exact, and therefore preferable. In this process the vertical cross-wire is fixed upon two transit points at some distance apart, in the rear, and then reversed to set one or two new points in

advance. This not only insures a straight line, if the transit is leveled, but also detects the least error of collimation.

119. Where solar apparatus is used in connection with a transit, the deputy will test the instrument, whenever practicable, by comparing its indications with a meridian determined by Polaris observations; and in all cases where error is discovered he will make the necessary corrections of his line before proceeding with the survey. All operations will be fully described in the field notes.

120. The proper township, section, and quarter-section corners will be established at lawful intervals, and meander corners at the intersection of the line with all meanderable streams, lakes, or bayous.

121. In order to detect errors and insure accuracy in measurement, two sets of chainmen will be employed; one to note distances to intermediate points and to locate topographical features, the other to act as a check. Each will measure 40 chains, and in case the difference is inconsiderable, the proper corner will be placed midway between the ending points of the two measurements; but if the discrepancy exceed 8 links on even ground, or 25 links on mountainous surface, the true distance will be found by careful re-chaining by one party or both.

122. The deputy will be present when each corner is thus established, and will record in the body of his field notes the distances to the same, according to the measurement by each set of chainmen.

To obviate collusion between the sets of chainmen, the second set should commence at a point in advance of the beginning corner of the first set, the initial difference in measurement thus obtained being known only to the deputy.

PRINCIPAL MERIDIAN.

123. This line shall conform to a true meridian and will be extended from the initial point, either north or south, or in both directions, as the conditions may require, by the use of transit or solar instruments, as may be directed by the surveyor general in his special written instructions. The methods used for determination of directions, and the precautions to be observed to secure accuracy in measurement, are fully stated above under the title "Base Line," and will be complied with in every particular.

124. In addition to the above general instructions, it is required that in all cases where the establishment of a new principal meridian seems to be necessary to the surveyor general, he shall submit the matter, together with his reasons therefor, to the Commissioner of the General Land Office, and the survey of such principal meridian shall not be commenced until written authority, together with such special instructions as he may deem necessary, shall have been received from the Commissioner.

STANDARD PARALLELS.

125. Standard parallels, which are also called correction lines, shall be extended east and west from the principal meridian, at intervals of 24 miles north and south of the base line, in the manner prescribed for running said line, and all requirements under the title "Base Line" will be carefully observed. (See page. 55.)

126. Where standard parallels have been placed at intervals of 30 or 36 miles, regardless of existing instructions, and where gross irreg-

ularities require additional standard lines, from which to initiate new, or upon which to close old surveys, an intermediate correction line should be established to which a local name may be given, e. g., "Cedar Creek Correction Line;" and the same will be run, in all respects, like the regular standard parallels.

GUIDE MERIDIANS.

127. Guide meridians shall be extended north from the base line, or standard parallels, at interval of 24 miles east and west from the principal meridian, in the manner prescribed for running the principal meridian, and all the provisions for securing accuracy of alinement and measurement, found or referred to under the titles Base Line and Principal Meridian, will apply to the survey of said guide meridians. (See page 55.)

128. When existing conditions require that such guide meridians shall be run south from the base or correction lines, they will be initiated at properly established corners on such lines, marked as closing corners.

129. Where guide meridians have been improperly placed at intervals greatly exceeding the authorized distance of 24 miles, and standard lines are required to limit errors of old, or govern new surveys, a new guide meridian may be run from a standard, or properly established closing corner, and a local name may be assigned to the same, e. g., "Grass Valley Guide Meridian". These additional guide meridians will be surveyed in all respects like regular guide meridians.

TOWNSHIP EXTERIORS.

130. Whenever practicable, the township exteriors in a block of land 24 miles square, bounded by standard lines, will be surveyed successively through the block, beginning with those of the southwestern township.

131. The meridional boundaries of townships will have precedence in the order of survey and will be run from south to north on true meridians, with permanent corners at lawful distances; the latitudinal boundaries will be run from east to west on random or trial lines, and corrected back on true lines.

The falling of a random, north or south of the township corner to be closed upon, will be carefully measured, and, with the resulting true return course, will be duly recorded in the field notes.

132. Should it happen, however, that such random intersects the meridian of the objective corner, north or south of said corner, or falls short of, or overruns the length of the south boundary of the township by more than three chains (due allowance being made for convergency), said random, and, if necessary, all the exterior boundaries of the township, will be retraced and remeasured to discover and correct the error.

When running random lines from east to west, temporary corners will be set at intervals of 40.00 chains, and proper permanent corners will be established upon the true line, corrected back in accordance with these instructions, thereby throwing the excess or deficiency against the west boundary of the township, as required by law.

133. Whenever practicable, the exterior boundaries of townships belonging to the west range, in a tract or block 24 miles square, will

first be surveyed in succession, through the range, from south to north; and in a similar manner, the other three ranges will be surveyed in regular sequence.

134. In cases where impassable obstacles occur and the foregoing rules can not be complied with, township corners will be established as follows:

In extending the south or north boundaries of a township to the west, where the southwest or northwest corners can not be established in the regular way by running a north and south line, such boundaries will be run west on a true line, allowing for convergency on the west half mile; and from the township corner established at the end of such boundary, the west boundary will be run north or south, as the case may be. In extending south or north boundaries of a township to the east, where the southeast or northeast corner can not be established in the regular way, the same rule will be observed, except that such boundaries will be run east on a true line, and the east boundary run north or south, as the case may be. Allowance for the convergency of meridians will be made whenever necessary.

METHOD OF SUBDIVIDING.

135. The exterior boundaries of a full township having been properly established so far as possible, the subdivision thereof will be made as follows:

At or near the southeast corner of the township, a true meridian will be determined by Polaris or solar observations, and the deputy's instrument will be tested thereon; then from said corner the first mile of the east and south boundaries will be retraced, if subdivisions and survey of the exteriors have been provided for in separate contracts; but, if the survey of the exterior and subdivisional lines are included in the same contract, the retracements from disagreement of bearings or measurements will be carefully stated in the field notes.

136. The meridional sectional lines will be made parallel to the range line or east boundary of the township, by applying to the bearing of the latter a small correction, dependent on the latitude, taken from the following table, which gives, to the nearest whole minute, the convergency of two meridians 6 miles long and from 1 to 5 miles apart; and supplies directly the deviation of meridional section lines west of north, when the range line is a true meridian. Add the correction to the bearing of the range line, if the same is west of north, but subtract when it bears east of north.

TABLE II.—*Corrections for Convergency within a Township.*

Latitude.	Correction to be applied to bearing of range lines at a distance of—				
	1 mile.	2 miles.	3 miles.	4 miles.	5 miles.
° °	′	′	′	′	′
30 to 35	1	1	2	2	3
35 to 40	1	1	2	3	3
40 to 45	1	2	2	3	4
45 to 50	1	2	3	4	5
50 to 55	1	2	3	5	6
55 to 60	1	3	4	5	7
60 to 65	2	3	5	7	8
65 to 70	2	4	6	8	10

Example.—Latitude, 47°. Range line bears N. 0° 2′ E.; then parallel meridional section lines will be run as follows:

From the corner for sections—
35 and 36, N. 0° 1′ E.
34 and 35, north.
33 and 34, N. 0° 1′ W.
32 and 33, N. 0° 2′ W.
31 and 32, N. 0° 3′ W.

137. After testing his instrument on the true meridian thus determined, the deputy will commence at the corner to sections 35 and 36, on the south boundary, and run a line parallel to the range line, establishing at 40.00 chains, the quarter-section corner between sections 35 and 36, and at 80.00 chains the corner for sections 25, 26, 35, and 36.

138. From the last-named corner, a random line will be run eastward, with out blazing, parallel to the south boundary of section 36, to its intersection with the east boundary of the township, placing at 40.00 chains from the point of beginning, a post for temporary quarter-section corner. If the random line intersects said township boundary exactly at the corner for sections 25 and 36, it will be blazed back and established as the true line, the permanent quarter-section corner being established thereon, midway between the initial and terminal section corners.

139. When the objective corner is in sight from the starting corner, or the deputy has evidence of its location to prove that a different random course would fall closer to the corner, he may use such changed course for his random. A line may be run as a "random for distance only," when the course is certain.

140. If the random intersects said township boundary to the north or south of said corner, the falling (see "Limits," page 66) will be carefully measured, and from the data thus obtained, the true return course will be calculated, and the true line blazed and established and the position of the quarter-section corner determined, as directed above.

The details of the entire operation will be recorded in the field notes.

141. Having thus established the line between sections 25 and 36, from the corner from sections 25, 26, 35, and 36, the west and north boundaries of sections 25, 24, 13, and 12, will be established as directed for those of section 36; with the exception that the random lines of said north boundaries will be run parallel to the established south boundaries of the sections to which they belong, instead of the south boundary of section 36; e. g., the random line between sections 24 and 25 will be run parallel to the estalished south boundary of section 25, etc.

142. Then, from the last established section corner, i. e., the corner of sections 1, 2, 11, and 12, the line between sections 1 and 2 will be projected northward, on a random line, parallel to the east boundary of the township, setting a post for temporary quarter-section corner at 40.00 chains, to its intersection with the north boundary of the township. If the random intersects said north boundary exactly at corner for sections 1 and 2, it will be blazed back and established as the true line, the temporary quarter-section corner being established permanently in its original position, and the fractional measurement thrown into that portion of the line between said corner and the north boundary of the township.

If however, said random intersects the north boundary of the town-

ship, to the east or west of the corner for sections 1 and 2, the consequent falling will be carefully measured, and from the data thus obained the true return course will be calculated[10] and the true line established, the permanent quarter-section corner being placed upon the same at 40.00 chains from the initial corner of the random line, thereby throwing the fractional measurement in that portion lying between the quarter-section corner and the north boundary of the township.

143. When the north boundary of a township is a base line or standard parallel, the line between sections 1 and 2 will be run parallel to the range line as a true line, the quarter-section corner will be placed at 40.00 chains, and a closing corner will be established at the point of intersection with such base or standard line; and in such case, the distance from said closing corner, to the nearest standard corner on such base or standard line, will be carefully measured and noted as a connection line.

144. Each successive range of sections progressing to the west, until the fifth range is attained, will be surveyed in a similar manner; then, from the section corners established on the west boundary of said range of sections, random lines will be projected to their intersection with the west boundary of the township, and the true return lines established as prescribed for the survey of the first or most eastern range of sections, with the exception that on the true lines thus established the quarter-section corners will be established at 40.00 chains from the initial corners of randoms, the fractional measurements being thereby thrown into those portions of the lines situated between said quarter-section corners and the west boundary of the township.

145. The following general requirements are reiterated for emphasis:

The random of a latitudinal section line will always be run parallel to the south boundary of the section to which it belongs, and with the true bearing of said boundary; and when a section has no linear south boundary, the random will be run parallel to the south boundary of the range of sections in which it is situtated, and fractional true lines will be run in a similar manner.[11]

146. The deputy is not required to complete the survey of the first range of sections from south to north before commencing the survey of the second or any subsequent range of sections, but the corner on which any random line closes shall have been previously established by running the line which determines its position, except as follows: Where it is impracticable to establish such section corner in the regular manner, it will be established by running the latitudinal section line as a true line, with a true bearing, determined as above directed for random lines, setting the quarter section corner at 40.00 chains and the section corner at 80.00 chains.[12]

10. See Table XI and rules, pages 118 and 119.

11. See Plate III, between sections 7 and 18, 17 and 20.

12. See Plate III, between sections 8 and 17.

147. Quarter-section corners, both upon meridional and latitudinal section lines, will be established at points equidistant from the corresponding section corners, except upon the lines closing on the north and west boundaries of the township, and in those situations the quarter-section corners will always be established at precisely forty chains to the north or west (as the case may be) of the respective section corners from which those lines respectively start, by which procedure the excess or deficiency in the measurements will be thrown, according

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to law, on the extreme tier or range of quarter sections, as the case may be.

148. Where by reason of impassable objects only a portion of the south boundary of a township can be established, an auxiliary base line (or lines, as the case may require) will be run through the portion which has no linear south boundary, first random, then corrected, connecting properly-established corresponding section corners (either interior or exterior) and as far south as possible; and from such line or lines, the section lines will be extended northwardly in the usual manner, and any fraction south of said line will be surveyed in the opposite direction from the section corners on the auxiliary base thus established. (See Plate II, figs. 3, 4, and 5.)

149. Where by reason of impassable objects or other reasons no part of the south boundary of a township can be regularly established, the subdivision thereof will proceed from north to south and from east to west, thereby throwing all fractional measurements and areas against the west boundary, and the meanderable stream or other boundary limiting the township on the south.

If the east boundary is without regular section corners and the north boundary has been run eastwardly as a true line, with section corners at regular intervals of 80.00 chains, the subdivision of the township will be made from west to east, and fractional measurements and areas will be thrown against the irregular east boundary.

150. When the proper point for the establishment of a township or section corner is inaccessible, and a witness corner can be erected upon each of the two lines which approach the same, at distances not exceeding twenty chains therefrom, said witness corners will be properly established, and the half miles upon which they stand will be recognized as surveyed lines.

The witness corner will be marked as conspicuously as a section corner, and bearing trees will be used wherever possible.

The deputy will be required to furnish good evidence that the section corner is actually inaccessible.

151. Where impassable precipices, deep canyons, or lands otherwise quite unsurveyable, prevent the extension of regular lines, deputies are not authorized to set meander corners, nor to meander the line separating lands that can be traversed from those that can not. In place of meandering, they are to set witness corners on line, near the intersection of section lines with the brink or foot of the impassable cliffs, or at the margin of the impracticable marsh, to represent an inaccessible regular section or quarter-section corner if within twenty chains. Such quarter sections thus marked may be platted as surveyed.

152. Where a large or desirable tract is found to have its accessible section lines too short to justify the erection of such witness corners, and to render it regularly surveyed, offset lines may be run on lines of legal subdivision, far enough to show, by necessary witness corners, the 40-acre tracts that would otherwise have been excluded from survey.

The topographic sketches of mesas and impassable canyon regions, returned by deputies, will show as nearly as practicable the location of these features and their margins; and where possible the corners on opposite sides of a canyon should be connected by triangulation at least once in each township.

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MEANDERING.

153. The running of meander lines has always been authorized in the survey of public lands fronting on large streams and other bodies of water, but does not appear to have been proper in other cases. The mere fact that an irregular or sinuous line must be run, as in case of a reservation boundary, does not entitle it to be called a meander line except where it closely follows a stream or lake shore. The legal riparian rights connected with meandered lines do not apply in case of other irregular lines, as the latter are strict boundaries.

154. Lands bounded by waters are to be meandered at mean high-water mark. This term has been defined in a State decision (47 Iowa, 370) in substance as follows: High water mark in the Mississippi River is to be determined from the river bed; and that only is river bed which the river occupies long enough to wrest it from vegetation.

In another case (14 Penn. St. 59) a bank is defined as the continuous margin where vegetation ceases, and the shore is the sandy space between it and low-water mark.

Numerous decisions in State and U. S. Supreme Courts, assert the principle that meander lines are not boundaries defining the area of ownership of tracts adjacent to waters. The general rule is well set forth (10 Iowa, 549) by saying that in a navigable stream, as the Des Moines River in Iowa, high-water mark is the boundary line. When by action of the water the river bed changes, high-watermark changes and ownership of adjoining land changes with it. The location of meander lines does not affect the question.

155. Inasmuch as it is not practicable in public-land surveys to meander in such a way as to follow and reproduce all the minute windings of the high-water line, the U. S. Supreme Court has given the principles governing the use and purpose of meandering shores, in its decision in a noted case (R. R. Co. *v.* Schurmeier, 7 Wallace, 286-7) as follows:

> Meander lines are run in surveying fractional portions of the public lands bordering on navigable rivers, not as boundaries of the tract, but for the purpose of defining the sinuosities of the banks of the stream, and as the means of ascertaining the quantity of land in the fraction subject to sale, which is to be paid for by the purchaser. In preparing the official plat from the field notes, the meander line is represented as the border line of the stream, and shows to a demonstration that the water-course, and not the meander line as actually run on the land, is the boundary.

In cases where the deputy finds it impossible to carry his meander line along mean high-water mark, his notes should state the distance therefrom, and the obstacles which justify the deviation.

156. Proceeding down stream, the bank on the left hand is termed the left bank and that on the right hand the right bank. These terms will be universally used to distinguish the two banks of a river or stream.

157. Navigable rivers, as well as all rivers not embraced in the class denominated "navigable," the right-angle width of which is three chains and upwards, will be meandered on both banks, at the ordinary mean high-water mark, by taking the general courses and distances of their sinuosities, and the same will be entered in the field book. Rivers not classed as navigable will not be meandered above the point where the average right-angle width is less than three chains, except that streams which are less than three chains wide and which are so deep,

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swift and dangerous as to be impassable through the agricultural season, may be meandered, where good agricultural lands along the shores require their separation into fractional lots for the benefit of settlers. But such meander surveys shall be subject to rejection if proved unnecessary by field inspection.

158. Shallow streams, without any well-defined channel or permanent banks, will not be meandered; except tide-water streams, whether more or less than three chains wide, which should be meandered at ordinary high-water mark, as far as tide-water extends.

At every point where either standard, township, or section lines intersect the bank of a navigable stream, or any meanderable shore, corners will be established at the time of running these lines. Such corners are called meander corners, and the deputy will commence at one of these corners, follow the bank or boundary line, and take the bearing and measure the length of each course, from the beginning corner to the next meander corner.

159. All courses reported are to be compass courses, taken or counted from the meridian, and not from a latitudinal line; and "transit angles" showing only the amount of deviation from the preceding course, are not allowed in field notes of meanders.

160. For convenience of testing by traverse, the courses of meander lines should be given by the nearest quarter degree. As meandered lines are not strict boundaries, this method will give results with approximate accuracy for good closings within the limits of a section. Meander lines will be examined in the field as well as rectangular lines, before acceptance.

161. All meanders should be traversed before leaving the vicinity, and if misclosure is found, indicating error in measurement or in reading courses, the lines must be remeandered.

162. The crossing distance between meander corners on same line, and the true bearing and distance between corresponding meander corners, will be ascertained by triangulation or direct measurement, in order that both shores may be protracted. The particulars will be given in the field notes.

163. For convenience of platting and computation, the deputy is required to use in meanders distances having whole chains, or multiples of ten links, with odd links only in closing distances.

164. The meanders of all lakes, navigable bayous, and deep ponds of the area of twenty-five acres and upwards, will be commenced at a meander corner and continued, as above directed for navigable steams; from said corner, the courses and distances of the entire margin of the same, and the intersections with all meander corners established thereon, will be noted.

165. All streams falling into the river, lake, or bayou will be noted, and the width at their mouths stated; also, the position, size, and depth of springs, whether the water be pure or mineral; also, the heads and mouths of all bayous; all islands, rapids, and bars will be noted, with intersections to their upper and lower ends, to establish their exact situation. The elevation of the banks of lakes, bayous, and streams, the height of falls and cascades, and the length and fall of rapids will be recorded in the field notes.

166. To meander a lake or deep pond lying entirely within the boundaries of a section, two line will be run from the two nearest corners on different sides of such lake or pond, the courses and lengths

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of which will be recorded, and if coincident with unsurveyed lines of legal subdivisions, that fact will also be stated in the field notes, and at each of the points where said lines intersect the margin of the pond or lake, a special meander corner will be established as above directed.

A special meander corner is one established on a line of legal subdivision, not a standard, township, or section line.

167. The relative position of these points being thus definitely fixed in the section, the meandering will commence at one of them and be continued to the other, noting the intersection, and thence to the beginning. The proceedings are to be fully entered in the field notes.

168. Meander lines will not be established at the segregation line between dry and swamp or overflowed land, but at the ordinary high-water mark of the actual margin of the rivers or lakes on which such swamp or overflowed lands border.

169. The precise relative position of an island, in a township made fractional by a river or lake in which the island is situated, will be determined by triangulation from a special and carefully measured base line, initiated upon the surveyed lines, on or near the lake or river bank on the mainland, so as to connect by course and distance on a direct line, the meander corner on the mainland with the corresponding point on the island, where the proper meander corner will be established.

170. In making the connection of an island lying entirely within a section, with the mainland, a special base will be measured from the most convenient meander corner, and from such base, the location of an auxiliary meander corner (that is, one not on a line belonging to the system of rectangular surveying; see page 48) will be determined by triangulation, at which the meanders of the island will be initiated.

171. In the survey of lands bordering on tide waters, meander corners may be temporarily set at the intersection

of the surveyed lines with the line of mean high tide, but no monument should be placed in a position exposed to the beating of waves and the action of ice in severe weather. In all such cases, the rule given in section 90 must be observed, by establishing a witness corner on line at a secure point near the true point for the meander corner.

172. The field notes of meanders will show the dates on which the work was performed, as illustrated in the specimen notes, page 186. The field notes of meanders will state and describe the corner from which the meanders commenced, and upon which they closed, and will exhibit the meanders of each fractional section separately; following, and composing a part of such notes, will be given a description of the land, timber, depth of inundation to which the bottom is subject, and the banks, current, and bottom of the stream or body of water meandered. The utmost care will be taken to pass no object of topography, or change therein, without giving a particular description thereof in its proper place in the notes of the meanders.

SUMMARY OF OBJECTS AND DATA INTERSECTED BY THE LINE OR IN ITS VICINITY, TO BE NOTED.

173. 1. The precise course and length of every line run, noting all necessary offsets therefrom, with the reason for making them, and method employed.

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2. The kind and diameter of all bearing trees, with the course and distance of the same from their respective corners; and the precise relative position of witness corners to the true corners.

3. The kind of materials of which corners are constructed.

4. Trees on line. The name, diameter, and distance on line to all trees which it intersects.

5. Intersections by line of land objects. The distance at which the line intersects the boundary lines of every reservation, town site, donation claim, Indian allotment, settler's claim, improvement, or rancho; prairie, bottom lands, swamp, marsh, grove, and windfall, with the course of the same at all points of intersection; also, the distances at which the line begins to ascend, arrives at the top, begins to descend, and reaches the foot of all remarkable hills and ridges, with their courses, and estimated height in feet, above the level land of the surrounding country, or above the bottom lands, ravines, or waters near which they are situated. Also, distance to and across large ravines, their depth and course.

6. Intersections by line of water objects. All rivers, creeks, and smaller streams of water which the line crosses; the distances measured on the true line to the bank first arrived at, the course down stream at points of intersection, and their widths on line. In cases of navigable streams, their width will be ascertained between the meander corners, as set forth under the proper head.

7. The land's surface—whether level, rolling, broken, hilly, or mountainous.

8. The soil—whether rocky, stony, sandy, clay, etc., and also whether first, second, third, or fourth rate.

9. Timber—the several kinds of timber and undergrowth, in the order in which they predominate.

10. Bottom lands—to be described as wet or dry, and if subject in inundation, state to what depth.

11. Springs of water—whether fresh, saline, or mineral, with the course of the streams flowing from then.

12. Lakes and ponds—describing their banks and giving their height, and whether it be pure and stagnant, deep or shallow.

13. Improvements. Towns and villages; houses or cabins, fields, or other improvements with owners' names; mill sites, forges, and factories, U. S. mineral monuments, and all corners not belonging to the system of rectangular surveying; will be located by bearing and distance, or by intersecting bearings from given points.

14. Coal banks or beds; peat or turf grounds; minerals and ores; with particular description of the same as to quality and extent, and all diggings therefor; also salt springs and licks. All reliable information that can be obtained respecting these objects, whether they be on the line or not, will appear in the general description.

15. Roads and trails, with their directions, whence and whither.

16. Rapids, cataracts, cascades, or falls of water, with the estimated height of their fall in feet.

17. Precipices, caves, sink holes, ravines, remarkable crags, stone quarries, ledges of rocks, with the kind of stone they afford.

18. Natural curiosities, interesting fossils, petrifactions, organic remains, etc.; also all ancient works of art, such as mounds, fortifications, embankments, ditches, or objects of like nature.

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19. The magnetic declination will be incidentally noted at all points of the lines being surveyed, where any material change in the same indicates the probable presence of iron ores; and the position of such points will be perfectly identified in the field notes.

PRESCRIBED LIMITS FOR CLOSINGS AND LENGTHS OF LINES.

174. If in running a random township exterior, such random exceeds or falls short of its propr length by more than three chains, allowing for convergency, or falls more than three chains to the right or left of the objective point (or shows a proportionate error for lines of greater or less length than six miles), it will be re-run, and if found correctly run, so much of the remaining boundaries of the township will be retraced, or resurveyed, as may be found necessary to locate cause of misclosure.

175. Every meridional section line, except those which terminate upon a fractional side of a township, will be 80 chains in length, without allowance of 50 links per mile for difference or measure, or any other allowance beyond a small reasonable discrepancy according to the nature of the surface, to be determined after examination.

176. The random meridional or latitudinal lines through a tier or range of fractional sections shall fall within 50 links of

the objective corners, and a greater falling will indicate negligence or error.

177. The actual lengths of meridional section lines through a fractional north or south tier of sections shall be within 150 links of their theoretical length. The latter will be determined from the given lengths of meridional boundaries on the east and the west range lines.

178. Each latitudinal section line, except in a fractional east or west range of sections, shall be within 50 links of the actual distance established on the governing north or south boundary of the township for the width of the same range of sections.

179. The north boundary and the south boundary of any section, except in a fractional range, shall be within 50 links of equal length.

180. The meanders within each fractional section or between any two successive meander corners, or of an island or lake in the interior of a section, should close by traverse within a limit to be determined by allowing five-eighths of a link for each chain of such meander line. This rule does not apply to irregular boundaries of reservations or private claims, except as far as the same are natural water boundaries. The total misclosure of meanders will not be permitted to exceed 150 links, except in large private land claims, which are governed by a different rule and limit. (See section 153.)

181. In closing upon accepted surveys, when irregularities beyond the allowable limits are developed, either in the length or direction of the closing lines, closing corners will be set, with quarter-section corners at 40 chains from the last interior section corner;

182. And, in general, when conditions are met which result in a random line being defective, either in length or direction, such procedure will be adopted as will secure the greatest number of new rectangular legal subdivisions, without disturbing the condition of accepted surveys.

FIELD NOTES.

183. The proper blank books for original field notes will be furnished by the surveyor general, and in such books the deputy surveyor

will make a faithful, distinct, and minute record of everything done and observed by himself and his assistants, pursuant to instructions, in relation to running, measuring, and marking lines, establishing corners, etc., and present, as far as possible, full and complete topographical sketches of all standard and exterior lines, drawn to the usual scale for township exteriors. These "original field notes" are not necessarily the entries made in the field, in the deputy's pocket note books called tablets; but they are to be fully and correctly written out in ink, from such tablets, for the permanent record of the work. Tablets should be so fully written as to verify the original field notes whenever the surveyor general requires them for inspection.

184. A full description of all corners belonging to old surveys, from which the lines of new surveys start, or upon which they close, will in all cases be furnished the deputy from the surveyor general's office, when authority is given for commencing work; then, if the old corners are found to agree with said descriptions, the deputy will describe any one of them in this form, "which is a _____ firmly set, marked and witnessed as described by the surveyor general;" but, should a corner not answer the description supplied, the deputy will give a full description of such corner and its accessories, following the proper approved form given in these instructions.

185. A full description of each corner established under any one contract will be given once only; subsequent reference to such corner will be made in the form, "heretofore described," or "the corner of sections 2, 3, 10, and 11," as the case may require.

In all cases where a corner is reestablished, the field notes will describe fully the manner in which it is done.

186. The field notes of the survey of base, standard, and meridian lines will describe all corners established thereon, how established, the crossings of streams, ravines, hills, and mountains; character of soil, timber, minerals, etc.; and after the description of each township corner established in running such lines, the deputy will note particularly in the "general description" the character of townships on each side of the lines run.

187. The field notes of the survey of exterior boundaries of townships will describe the corners and topography, as above required, and the "general description" at the end of such notes will describe the townships as fully as possible, and also state whether or not they should be subdivided.

188. The field notes of the subdivisional survey of townships will describe the corners and topography as above required, and the "general description" at the end of such notes will state minutely the character of the land, soil, timber, etc., found in such townships.

The topography will be given on the true line in all cases, and will be taken correctly, not estimated or approximated.

189. With the field notes of the survey of base lines and standard parallels, and principal and guide meridians forming a tract 24 miles square (see page 20 and Plate II), including those of the township exteriors therein, the deputy will submit a diagram of the lines surveyed, drawn to a scale of half an inch to one mile, upon which will be written the true bearings and lengths of all surveyed lines, except the lengths of those which are actually 40.00 or 80.00 chains. These diagrams will exhibit all water courses, with the direction of each

indicated by an arrow head pointing down stream; also, the intersection of the lines with all prairies, marshes, swamps, ravines, lakes, ponds, mountains, hills, and all other natural or artificial topographical features mentioned in the field notes, to the fullest extent possible.

190. With the special instructions for making subdivisional surveys of townships into sections, the deputy will be furnished by the surveyor general with blank township diagrams drawn to a scale of one inch to forty chains, upon which the true bearings and lengths of the township and section lines, from which the surveys are to be projected, or upon which they are to close, will be carefully marked; and on such

diagrams the deputy who subdivides will make appropriate sketches of the various objects of topography as they occur on his lines, so as to exhibit not only the points of intersection therewith, but also the directions and relative positions of such objects between the lines, or within each section, as far as practicable, so that every topographical feature may be properly completed and connected in the showing.

191. Triangulations, offsets, or traverses, made to determine distances that can not be directly measured, such as those over deep streams, lakes, impassable swamps, canons, etc., will be made on the random lines (see pages 24 and 121), when random lines are run. All particulars will be fully stated in the field notes.

192. The exhibition of every mile of surveying, whether on standard, township, or subdivision lines, and the meanders in each section, will be complete in itself, and will be separated from other records by a black line drawn across that part of the page containing the body of notes. The description of the surface, soil, minerals, timber, undergrowth, etc., on each mile of line will follow the notes of survey of such line, and not be mingled with them.

Particular care will be taken to record at the end of each mile the number of chains of mountainous land, heavily timbered land, or land covered with dense undergrowth. (See section 395.)

The date of each day's work will immediately follow the notes thereof.

193. Near the end of the field notes of exteriors and immediately before the "general description," the deputy surveyor will add, in the form shown in specimen field notes (page 155), a tabular statement of the latitude and departure of all boundary lines of the township, derived from a traverse table, and will give the totals, and the errors in latitude and departure; said errors shall in no case exceed three chains, the prescribed limit for the falling of the random north boundary of a township. If a part or the whole of one or more boundaries is made up of meander lines, the northings, southings, eastings, and westings of the full section lines, nearest said meanders, will replace the missing N., S., E., or W. township lines, as the case may require, thereby presenting the errors of said boundaries of a closed survey.

194. If all the exterior lines have been surveyed by the deputy, the bearings and distances of the table will be taken from his own notes. In a case where some of the boundaries have been surveyed under another contract, the deputy will use the bearings and distances supplied by the surveyor general, in connection with those of his own lines; and, if errors exceed the allowance of three chains, specified in paragraph 1 of the "Prescribed Limits", the deputy will determine by retracement where the error occurs, correct the same before he leaves the field, and place the table in his original field notes.

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195. Besides the ordinary notes taken on line (and which will always be written down on the spot, leaving nothing to be supplied by memory), the deputy will subjoin, at the conclusion of his book, such further description of information touching any matter or thing connected with the township (or other) survey which he may be able to afford, and may deem useful or necessary to be known—with a general description of the township in the aggregate, as respects the face of the country, its soil and geological features, timber, minerals, waters, settlements, etc.

196. Following the general description of the township will be placed "A list of the names of the individuals employed to assist in running, measuring, and marking the lines and corners described in the foregoing field notes of township No. _____ of the base line of range No. _____ of the _____ meridian, showing the respective capacities in which they acted."

AFFIDAVITS TO FIELD NOTES.

197. The forms of official oaths required to be taken by deputy surveyors and assistants, and attached to their field notes, are exemplified in the specimen field notes, pages 144 and 145.

There may be several books of one class of lines covered by one set of oaths, which must distinctly specify the work they are intended to cover. When the contract comprises several books of returns, they, as well as transcripts of the same, are to be lettered in proper sequence, A, B, etc., on the title pages. Any book not containing the affidavits must show by a final note where to find the oaths covering that portion of the contract, as "Final affidavits in book D."

198. When the work of two deputies is recorded in the returns under one contract, each book must show clearly what lines were surveyed by each deputy. Wherever one deputy's work ceases and another begins in the same book, the name of the former must be inserted at the end of his part of the notes.

199. The final oath of the deputy surveyor will be taken before the U. S. survey or general for the State or Territory in which the survey is executed, or before any other officer authorized by the laws of the United States or by the municipal authorities, to administer land oaths, except notaries public.

It is preferable that both preliminary and final oaths of assistants should be taken before some officer duly authorized to administer oaths other than the deputy surveyor. In cases, however, where great delay, expense, or inconvenience would result from a strict compliance with this rule, the deputy surveyor is authorized to admininster the necessary oaths to his assistants, but in each case where this is done, he will submit to the property surveyor general, a full written report of the circumstances which required his stated action.

200. The deputy will transmit the field notes duly attested and the required sketches to the surveyor general at the earliest practicable date after completion of his work in the field. Said original field notes will be filed in the office of the surveyor general as a part of its permanent records, subject only to the direction of the Commissioner of the General Land Office; and no changes whatever will be made in said original field notes, after they have been filed in the surveyor general's office, without permission of the Commissioner.

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The delivery of the field notes and sketches to the surveyor general's office for examination, constitutes the filing of the

deputy's returns, which must at that time include his final oath. The surveyor general will record the date of such filing. (See page 15.)

201. The field notes, each book bearing the written approval of the surveyor general, will be substantially bound in volumes of suitable size and retained in the surveyor general's office. Certified transcripts of said field notes will be prepared at the earliest practicable date, as follows:

202. The field notes of the survey of base lines and standard parallels, of principal and guide meridians, of township exteriors, and of subdivision and meander lines, will be written in separate books. A complete set of preliminary and final oaths will be attached to the field notes of each class of lines. (See page 55.) No adhesive material of any kind will be used to fasten leaves or covers. Cut or mutiliated leaves, or slips, will not be inserted.

203. The field notes of subdivisions will be written in a separate book for each township; the preliminary oaths of the assistants employed in making said subdivisions will be prefixed to the first book, and their final oaths will be attached to the last book of the series, arranged in the order of dates.

204. The first or title page of each book of field notes will describe the subject matter of the same, the locus of the survey, by whom surveyed, number and date of contract, and the dates of commencement and completion of the work.

205. The second page of each book of field notes will contain the names and duties of the assistants employed on the surveys recorded therein; the index will be placed on the same or following page.

206. Whenever a new assistant is employed, or the duties of any one of them changed, such fact will be stated in an appropriate entry immediately preceding the notes taken under such changed arrangements.

207. No abbreviations or contractions of words are allowable, except as enumerated on page 26 or as shown in the specimen field notes.

208. All transcripts of field notes, made out as herein directed, will be written on official field-note paper, foolscap size (pages 13½ X 8½ inches), in a bold, legible hand, or type-written, preserving the marginal spaces intact for binding, and as nearly as possible without erasures or interlineations; such transcripts of any series of surveys, included in one account forwarded to the General Land Office, will be securely put up for mailing, at the office of the surveyor general, prior to transmission.

SPECIAL INSTRUCTIONS TO DEPUTY SURVEYORS.

209. One of the most important duties to be performed by the surveyor general is to provide the deputy surveyor with Special Instructions, in connection with the contract, prepared in accordance with law, which instructions will not consist of directing attention to certain paragraphs in this Manual, reiteration of its requirements, and printed directions of a general nature; but they will in all cases be specific in character, with all necessary detailed statements setting forth what the deputy is to do and how the work is to be performed. Before making out special instructions, the surveyor general will cause a thorough examination to be made of the field notes and plats of older surveys of standard and township lines upon which the deputy is to base his work, and give him full information—both written and graphic—of the exact condition of adjoining surveys, with all irregularities that may be found, carefully and clearly noted; with all necessary instructions for his guidance if he finds everything as it should be, and, in addition, full advice as far as practicable what to do in case the surveys on the ground are not as represented in the old notes.

210. If the contract includes exterior lines, the surveyor general will specify in detail where the deputy is to commence, in what order and in what direction he is to run the lines, and provide for his use one or more diagrams, drawn to a scale of one inch or one-half inch to one mile, giving full and accurate information in regard to lengths and bearings of all lines of old surveys, from which he is to work, or upon which he is to close. The diagrams will be made in triplicate, one copy for the General Land Office, one for the deputy, and one to be retained; they may be either original drawings, or blue prints or tracings therefrom. In no case must the deputy be sent into the field without full and accurate information in regard to all irregularities on the records which will affect the extent or accuracy of his survey.

SPECIMEN FIELD NOTES.

[See Plates II and III.]

211. Specimen field notes Nos. 1, 2, 3, 4, and 5, illustrate, respectively, the method and order to be followed in the survey of standard parallels, guide meridians, and township exteriors; resurvey of township exteriors; and the subdivision of a township into sections and quarter sections.

The attention of every deputy surveyor is particularly directed to these specimens, as indicating not only the method by which his work will be conducted, but also the form, order, language, etc., in which his field notes will be prepared for the office of the surveyor general, and such specimens will be deemed a part of these instructions; and any departure from their details, in cases where the circumstances are analogous in practice, will be regarded as a violation of his contract and oath.

DIAGRAM OF TOWNSHIP EXTERIORS.

212. The title, certificate, and remarks on Plate II, with the specimen field notes Nos. 1, 2, and 3, will fully explain the drawing designated "Township Exteriors."

In all cases the course and length of each township boundary will be clearly stated on the diagram of exteriors; and when any township boundary entered on the diagram, surveyed under the current contract or a prior one, departs from the true meridian or proper latitude curve, or falls short or exceeds its proper length, by an amount in excess of the prescribed limits of 21′ of arc and three chains to six miles, the actual position and extent of such township boundary will be graphically exhibited on the diagram, as well as by bearing and length recorded in the field notes. Where exteriors

are surveyed or resurveyed in connection with subdivision work, a separate diagram of such exteriors is required.

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SPECIMAN TOWNSHIP PLAT.

213. Plate III illustrates the subdivision of a township into sections and quarter sections; the record of said subdivision being given in detail in specimen field notes No. 5.

214. Each township plat will be prepared in triplicate. One plat, considered the original, will be retained as the record in the office of the surveyor general; the duplicate will be transmitted to the General Land Office; and the triplicate, after acceptance and permission given by the Commissioner, will be filed in the United States land office of the proper district. These plats will not be altered or added to, and any changes (beyond correction of clerical errors) authorized by the Commissioner, will be shown upon a supplemental plat or diagram, prepared in triplicate.

215. The plats will be prepared as nearly as possible in accordance with the specimen plat designated, "Plate III." The use of all fluids, except a preparation of India ink of good quality, will be avoided by the draughtsman in dilineations relating to the public surveys. All lines, figures, etc., will be sharply defined. All lettering on the plats will be clear and sharp in outline and design, and *black*; ornamentation of any kind is prohibited. These requirements are necessary in order that everything shown upon original plats may be fairly reproduced in making photolithographic copies of the same.

Surveyors general will require that the specimen plat shall be closely followed, in order that uniformity of appearance and expression of drawing representing the public land surveys may be attained.

All township plats are to be drawn to a uniform scale of 1 inch to 40 chains, United States standard, and diagrams of exteriors to a scale of 1 inch to 160 chains. Size of sheet to be 19 x 24 inches.

216. Plats will not be trimmed. A margin of three inches for binding will be preserved on the left-hand side of each plat. Each plat will be certified by the surveyor general, with table annexed, according to the form on Plate III, and will exhibit the area of public land, water surface, townsite, private land claims, and mineral claims, with the total area of the township.

All towns, settlements, permanent buildings, private claims, reservations, water courses, ditches, lakes, islands, mountains, buttes, cañons, roads, railroads, telegraph lines, canals, etc., will be shown upon the plats and designated by proper names where such are known.

The names of natural features will be correctly give according to accepted usage. Surveyors are not authorized to report names of their own selection, but will give those in use, or leave the lake, stream, or peak unnamed. The "U. S. Geographic Board" is the authority upon these matters.

217. Topography, such as ridges, valleys, streams, dry runs, acequias, trails, plateaus, marshes, etc., will if possible be connected across sections. All water ditches or acequias will be shown and designated as such, without reference to ownership. Timbered areas, large or small, will not be left blank like open country.

218. Dry runs will be shown by broken or dotted lines, and actual water courses by continuous lines. Where it is difficult for the deputy to decide whether to consider it a water course or not, the words "dry run," "water in holes," or other explanation may be inserted, as the location of water in a dry country is an important feature. The former

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practice of representing dry swales by full black lines like those for running streams will not be continued.

219. Where heavy topographical details are to be drawn, first insert the figures and letters, and avoid obscuring them by subsequent marks.

Draftsmen should not lose sight of the fact that their work is to be reproduced at this office in the form of photolithographic copies for all future applicants; and that imperfect characters, weak lines, and diluted india ink are not compatible with good copying by that process. Use dense black ink in all instances, and avoid brush shading.

220. Where a surveyed line between sections is broken into two or more portions by intervening corners, the fractional distances will be fully given. Leave no such distance to be computed by the reader. This need not, however, apply where a connection distance in shown at a closing corner on township line.

221. The table at bottom of plat will be filled out, so as to show how and when each exterior line was surveyed, as well as the subdivisions, thus: "S. Boundary," "W. Boundary," and "N. and E. Boundary," may fill three lines describing work under three separate contracts.

The number of the contract will always be conspicuously shown on the plat, and on the title page of transcripts. Its frequent omission is a source of annoyance. See table in Plate III.

Lines not actually run, but extended by offsetting around impassable obstacles, are to be dotted or broken lines, as shown on sections 16, 21, and 22, in the specimen plat.

222. Township plats will show the complete condition of all their exteriors, including all closing and standard corners, connecting distances, offsets, and topography. A line common to two townships will be drawn with equal completeness for both, as far as approved surveys permit.

A township rendered fractional by an adjacent reservation or private land grant, will have the intervening boundary properly lettered, and the mile posts and connecting distances shown. The blank area will show its proper designation.

223. Where a fractional portion of a township is newly surveyed, the condition of adjacent areas will be clearly shown by words lettered thereon, such as these: "Unsurveyed," "U. S. National Forest," "Rancho San Luis," "Surveyed by James Jones, 1877," "Lava Bed," or other explanation.

On such supplementary plats, areas previously surveyed will have the sections and lots drawn in blank, to show the contact of old and new work.

224. The line of demarcation, between areas previously counted in total acreage surveyed and the new surveys, will

be distinctly shown. A light diagonal shading with black ink is recommended, to distinguish such a line.

225. Meanders will not be left without any index whatever in field notes and transcripts. They should be traced on the index diagram, and properly marked with page numbers. See note on page 160.

226. The use of small circles on plats, at any of the angles of sureyed lines, has been prohibited, and will not be permitted. Although distinctive marks of that sort are shown on some of the explanatory diagrams of this Manual, yet they are not desired in any kind of plats for official record, under the general rule forbidding useless ornamentation.

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227. The meander corners within any township were formerly all numbered consecutively on the plat. The lists of meanders, formerly placed in the margin, made such numbering useful for convenient reference. These lists not being now used, the consecutive numbers are no longer required.

228. As a general rule, a quarter section is returned as surveyed land when three of its regular corners have been legally established. The following exceptions are made to this rule:

When no authority had been given for the subdivision of that township or part of township, as in the case of the extreme quarter sections at the corners.

Where there is no corner opposite one of the three corners to which the protracting line can be connected.

229. When the land forms part of a fractional section where areas can not be accurately computed without the survey of other boundaries of the section, as in section 2 when it has its north and east but not its west line established.

When undetermined corners of the sections are in mountainous regions pronounced unsurveyable in the returns, or where witness corners have been substituted for true corners of the tract, at a distance greater than 10 chains.

FRACTIONAL LOTS.

230. The subdivision of fractional sections into lots is performed in the drafting division of the several offices, and not by the surveyor. Skill and judgment are required, to produce these lots in the most convenient and equitable form for both the purchaser and the Government. In addition to former rules, the following are now given:

231. Avoid needlessly small subdivisions.

Avoid giving to lots a long shore line with small width. Therefore apportion the privileges of water front among as many lots as regular division lines will permit, and let the longer direction extend back from the shore rather than along the water.

232. Instead of making as many full forty-acre tracts as possible, leaving small fractions of a few acres along the shore or other boundary, attach such marginal strips to the forties, making tracts of 45, 50, or 55 acres. But when the area of a fractional lot would equal or exceed 60 acres, it should be divided. No lot should lie partly in two sections.

233. The subdivision of fractional sections into regular lots (as near as may be) will be so laid down on the official township plat in broken black lines as to admit of giving to each a specific designation by word description, if possible, according to its relative position in the fractional section, as per examples on Plate III; or by a number, in all cases where the lot can not properly be designated as a quarter quarter. Those fractional lots which are not susceptible of being described according to relative local position will be numbered in a regular series; those bordering on the closing boundaries of a township to be numbered progressively from east to west or from north to south, in each regular section. As section 6 borders on both the north and west boundaries of the township, the fractional lots in the same will be numbered as follows: commencing with No. 1 in the northeast, thence progressively west to No. 4 in the northwest, and south to No. 7 in the southwest corner of the section.

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234. To secure a uniform system for numbering lots of fractional sections, including those above specified, imagine the section divided by three equidistant parallel latitudinal lines into four strips or tiers, numbered from north to south; then, beginning with the eastern lot of the north tier, call it No. 1, and continue the numbering west through the tier, then east in the second, west in the third, and east in the fourth tier. A lot extending north and south through two, or part of two tiers, will be numbered in the tier containing its greater area. In case any tier is without numbered lots, the numbering will be continued in the next tier to the south. (Plate III, section 18.)

This method of numbering will apply to any part of a section, regardless of the relative situation of a part or parts surveyed and lotted under a prior contract; in this case the lot numbers will be a continuation of the series already initiated.

A section that has been partly surveyed at different times should have no duplication of lot numbers.

235. When, by reason of irregular surveys or from other causes, the length of a township from south to north exceeds the lawful length of 480.00 chains, or the width from east to west exceeds 480.00 chains minus the proper convergency, to such extent as to require two or more tiers of lots along the north boundary, or two or more ranges of lots along the west boundary, as the case may be, the entire north or west portions of said sections beyond the quarter corner will be properly lotted, and to each lot will be assigned its proper number; and in such cases the area of each lot will be stated on the plat.

In case the length or width of the township falls so far short of legal dimensions as to eliminate the north or west half of any section situated as above specified, that part of the section remaining will be treated in a similar manner.

236. In a regular township (Plate III) the southeast quarter of the northwest quarter of section 6 will have its proper area in acres (40) inserted in all cases. The half quarter sections in north tier and west range of sections will exhibit their proper areas in acres (80); while the areas of quarter sections will be omitted, except as follows:

237. When two lines of legal subdivision of either 160, 80, or 40 acre tracts intersect each other on or so near a meander or boundary line that the ordinary inaccuracies of drawing would leave the areas of said tracts in doubt, the plats will, for

the sake of clearness and a full showing of the facts, exhibit the proper areas of such quarter, half-quarter, and quarter-quarter sections. See examples, Plate III, in sections 13, 17, 25, and 35.

TRANSCRIPTS.

238. Transcripts of field notes should have a proper heading on each page. Instead of the perplexing title, "Exterior Boundaries of T. 12 N., R. 4 W.," specify on each page thus: "West Boundary," or "N. Bdy. of T. 12 N., R. 4 W."

239. The index diagram of exteriors will show lines drawn in their true directions, as on page 152; thus, range lines will not be shown horizontally.

240. Where corrections in the field have been permitted, care will be exercised that field notes thereof be added to former field notes with proper dates, explanations, and additional oaths.

241. The sheets of each book are to be firmly bound together. But eyelets or clasps which prevent separating sheets without injury, are not to be used in documents or official correspondence.

A series of books under one contract should be lettered on the title page, A, B, etc., in their proper and consecutive order of dates; and in subsequent correspondence it will be convenient to refer to each book by its letter.

242. With the copy of each township plat furnished to a district land office, the surveyor general is requirecd by law to furnish descriptive notes of the character and quality of the soil and timber found on and in the vicinity of each surveyed line, and to give a description of each corner.

Printed blank forms of such notes are furnished by the General Land Office. The forms provide eighteen spaces for meander corners, which, in most cases, will be sufficient; but when the number shall exceed eighteen, the residue will have to be inserted on the supplemental blank form.

COMPUTATION OF THE AREAS OF LOTS ADJOINING THE BOUNDARIES OF TOWNSHIPS.

243. In regular townships, the tracts of land in each section adjoining the north and west boundaries of such townships, in excess of the regularly subdivided 480 acres (exceptin section 6), will, in general, be in the form of trapezoids, 80.00 chains in length by about 20 chains in width.

On the plats of such townships, each of said tracts will be divided into four lots, by drawing broken lines at intervals of 20.00 chains, parallel to the ends of the tracts, which will be regarded as parallel to each other.

With the exception of section 6, the south boundaries of sections of the north tier, when within prescribed limits, will be called 80.00 chains.

When the above-named conditions obtain, the areas of the lots in any one tract (except in section 6) may be determined, as follows:

Divide the difference between the widths of the ends of the tract by 4; if 3 remains, increase the hundredth figure of the quotient by a unit; in all other cases disregard the fraction; call the quotient thus obtained, "d"; then, taking the end widths of the tract in chains and decimals of a chain, the areas of the lots, in acres, will be:

Of the smallest lot: twice the width of the lesser end, plus "d";

Of the largest lot: twice the width of the greater end, minus "d";

Of the smaller middle lot: sum of the widths of the ends, minus "d";

Of the larger middle lot: sum of the widths of the ends, plus "d".

A check on the computation may be had by multiplying the sum of the widths of the ends of the tract by 4; the product should agree exactly with the total area of the four lots.

The proper application of the above rules will always give areas correct to the nearest hundredth of an acre; and, as the use of fractions is entirely avoided, the method is recommended for its simplicity and accuracy.

Example 1. (See Plate III, section 31.)

The ¼ difference of latitudinal boundaries is 0.03¾ chains; consequently, "d" is .04 chains; then,

18.35 × 2	+ .04 =	36.74	acres,	the area of lot 1;
18.50 × 2	− .04 =	36.96	acres,	the area of lot 4;
18.50 + 18.35	− .04 =	36.81	acres,	the area of lot 2;
18.50 + 18.35	+ .04 =	36.89	acres,	the area of lot 3;
Check: [18.35 + 18.50] × 4 =		147.40	acres,	the area of the four lots.

The arithmetical operations are here written in detail, for the purpose of illustration; but the practical computer will perform all the work mentally.

244. Section 6. (See Plate II, figs. 6 and 7; and Plate III.) The areas of lots 5, 6, and 7 may be obtained by the foregoing rules in all cases, except when the township closes on a base line or standard parallel; also, the area of lot 4, provided both meridional boundaries are 80.00 chains in length; when the last condition obtains, the areas of lots 1, 2, and 3 will be equal, and each will contain 40.00 acres.

In any case where the west boundary of sec. 6, is 80.00 chains, and the east boundary either greater or less than 80.00 chains, the areas of lots 1, 2, 3, and 4 will be computed as follows:

Refer to figures 6 and 7 and determine the difference, "q", between the east boundaries of lots 1 and 4 by the following proportion:

N. bdy. sec. 6.: diff. of meridional bdrs. sec. 6.::60 chs.: q; then will E. bdy. lot 4 = E. bdy. lot 1 ± q; in which, "q" will be added when the east boundary of sec. 6 is less than 80.00 chains (fig. 7.); but subtracted when said east boundary is greater than 80.00 chains (fig. 6).

Now take one third of "q," and add it to the shorter east boundary of lots 1 or 4, as conditions may require, and thereby determine the length of one of the meridional boundaries of lot 2; to which, again add "one third of q," and thus obtain the length of the opposite side of lot 2. The areas of lots 1, 2, and 3, in acres, will be found by taking the sum of their respective meridional boundaries, expressed in chains and decimals of a chain.

The area of lot 4 may be had by multiplying its mean width by its mean length.

Finally, to test the entire work, multiply the sum of the latitudinal boundaries by 4, and to the product add the area of the small triangle C A B, if the east boundary is greater than 80.00 chains (fig. 6); but subtract the area of said small triangle if the east boundary is less than 80.00 chains (fig. 7). These operations, correctly performed, will give the true area of the section, which should agree exactly with the total area of its legal subdivisions, obtained as directed in the preceding paragraphs.

Example 2. (See Plate II, figs. 6 and 7, and Plate III.)

Compute areas of lots 5, 6, and 7 of sec. 6, as directed in paragraph 1, and illustrated by the example; then write:

chs.		chs.		chs.		chs.		chs.
77.75	:	0.05	: :	60.00	:	0.0386	= q; ⅓ q =	0.0129

chs.		chs.		chs.	
20.0500	−	0.0386	=	20.01,	the E. bdy. of lot 4;
20.0114	+	0.0129	=	20.02,	the E. bdy. of lot 3;
20.0243	+	0.0129	=	20.04,	the E. bdy. of lot 2;

Then, for the areas of lots 1, 2, 3, and 4, we have:

chs.	chs.		acres.	
20.05 +	20.04	=	40.09,	the area of lot 1;
20.04 +	20.02	=	40.06,	the area of lot 2;
20.02 +	20.01	=	40.03,	the area of lot 3;
$\frac{20.00+20.01}{2}$ ×	$\frac{17.75+17.78}{2}$	=	35.54,	the area of lot 4.
Also [17.78 + 17.87] × 3		=	106.95,	the area of lots 5, 6, and 7.
Area of regular subdivisions		=	360.00	
Total		=	622.67,	the area of sec. 6.

	chs.	chs.			
Check:	[77.87	+ 77.75] × 4	=	622.48	
	77.75	× 0.025	=	0.19,	the area of triangle C A B (fig 6).
Total			=	622.67,	which agrees with the area of section 6, before determined.

245. The area in acres of a tract 40.00 chains long, adjoining north or west township boundaries (except in NW. ¼ sec. 6), is equal to the sum of its parallel boundaries (expressed in chains and decimals thereof) multiplied by 2; e. g., the area of lots 6 and 7 (Plate II, fig. 6), is [17.87 + 17.81] × 2 = 71.36 acres.

The area in acres of a tract 60.00 chains long, situated as above described (excluding lot 4, of sec. 6), may be found by multiplying the sum of its parallel boundaries (expressed in chains and decimals of a chain) by 3; e. g., fig. 6; south boundary lot 4 = 17.78 chs.; area of lots 5, 6, 7 is [17.78 + 17.87] × 3 = 106.95 acres. (See example 2.)

The area in acres of quarter sections adjoining north and west township boundaries (excluding NW. ¼ sec. 6), may be obtained by multiplying the sum of their parallel boundaries (taken in chains and decimals of a chain), by 2; e. g., the area of SW. ¼ sec. 6 (fig. 6), is [37.87 + 37.81] × 2 = 151.36 acres.

The area in acres of any section along the north and west boundaries of regular townships (except sec. 6) may be had by multiplying the sum of its parallel boundaries (expressed in chains and decimals of a chain) by 4; e. g., the area of sec. 1 (Plate III) is [80.00 + 79.77] × 4 = 639.08 acres.

Subdivisions closing irregularly to the south or east exterior boundary are to be computed by similar methods.

EXPLANATIONS OF ARTICLES ON PAGES 80 to 86, WITH GENERAL DEFINITIONS OF A "RETRACEMENT" AND A "RESURVEY."

246. When new surveys are to be initiated or closed upon the lines of old surveys, which although reported to have been executed correctly, are found to be actually defective in alinement, measurement, or position, it is manifest that the employment of the regular methods prescribed for surveying normal township exteriors and subdivisions would result in extending the imperfections of the old surveys into the new, thereby producing irregular townships bounded by exterior lines not in conformity with true meridians or parallels of latitude, and containing trapezium-shaped sections which may or may not contain 640 acres each, as required by law.

247. Therefore, in order to extend such new surveys without incorporating therein the defects of prior erroneous work, special methods, in harmony as far as practicable with the following requirements, should be employed, viz:

The establishment of township boundaries conformable to true meridian and latitude lines.

The establishment of section boundaries by running two sets of parallel lines governed respectively by true meridians and parallels of latitude, and intersecting each other approximately at right angles at such intervals as to produce tracts of square form containing 640 acres each.

The reduction to a minimum of the number of fractional sections in a township, and consequently of the amount of field and office work.

248. Such special methods are based upon certain limits of allowable error in the alinement, measurement, and position of old township boundaries, as prescribed in the following article entitled "Definitions of Defective Township Boundaries," which will be carefully determined and rectifications made, if necessary, under the provisions of the article entitled "Retracement or Resurvey of Township Lines and Linear Boundaries not Established in Conformity with the Rectangular System of Surveying," page 80, prior to the execution of new surveys under the methods prescribed by the article entitled "Methods of Executing New Surveys, when Initiated or closed upon Defective old Surveys," page 82, and illustrated on Plate VI, by figures 1 to 15; on Plate VII, figures 1 to 7, and on Plate VIII.

249. In order to prevent any misunderstanding relative to the modus operandi indicated by the terms "retracement" and "resurvey," the following definitions of the same are here presented:

The retracement of a township boundary, or other line of survey, consists in the determination of the true bearings and distances between the successive corners along the entire length of such a line; and the data thus obtained will be

embodied in the field notes together with detailed particulars of the methods employed.

The resurvey of a township boundary or other line of survey consists of a retracement of such a line accompanied by the reconstruction of defective original corners and the establishment thereon of all the necessary new corners; and the detailed particulars of the entire operations will be embodied in the field notes.

DEFINITIONS OF DEFECTIVE TOWNSHIP BOUNDARIES.

250. Upon retracement thereof, an old township boundary may be found to be defective in one or all of three qualifications, viz: alinement, measurement, and position, as follows:

In alinement: when any portion thereof deviates more than twenty-one minutes of arc from a true meridian or latitude line.

251. In measurement: when the length of the whole boundary or some portion thereof, between two successive corners, is proved to be greater or less than the distance certified in the preceding survey, at a rate exceeding 25 links to the half mile.

252. In position: when the corners originally established on such a boundary can not be connected with the corners on the opposite regu-

larly established boundary, by lines which do not deviate more than twenty-one minutes of arc from true meridian or latitude lines.

253. The limits prescribed in the foregoing paragraph are to be considered only in determining the necessity of resurveying old township boundaries when new surveys are to be initiated or closed upon the same, and will not be construed in any way as establishing limits of allowable error in the execution of new surveys.

RETRACEMENT OR RESURVEY OF TOWNSHIP LINES AND LINEAR BOUNDARIES NOT ESTABLISHED IN CONFORMITY WITH THE RECTANGULAR SYSTEM OF SURVEYING.

254. If in subdividing a township, it is found that any boundary thereof is defective in excess of the limits of allowable error prescribed in the article entitled "Definitions of Defective Township Boundaries," above, or that the corners originally established thereon had been incorrectly marked, or have been obliterated, the deputy surveyor will resurvey so much of said boundaries as may be necessary.

255. Such necessity is often doubtful until proved by retracement. In connecting new surveys with accepted lines, when misclosure appears, the presumption is in favor of accepted work instead of new lines. A deputy must first examine and remeasure his own lines for possible error; and if he finds them accurate, and is willing to confide the result to a strict inspection thereof, he is to retrace the older work to find the cause of the misclosure. Such retracements and resurveys receive special attention in the inspection; and if their necessity and accuracy are corroborated by the examiner, and approved by the Commissioner, the deputy will be allowed compensation. (See 27 L. D. 79.)

256. When subdivisional lines have not been closed upon either side of, or mineral claims tied to, a township boundary, it will be corrected (if necessary), in point of alinement, as well as measurement, by establishing regular new corners at lawful distances (minus the northing or plus the southing of the south boundary; or minus the westing or plus the easting of the east boundary), from said boundaries respectively (as the case may be), upon a right line connecting the proper township corners, provided said line does not deviate more than twenty-one minutes of arc from a true meridian or latitude line (as the case may be). (See Plate VI, figs. 1, 2, 3.)

But, if the bearing of said line exceeds the limit prescribed above, the new corners will be placed on a line run due north or west, from the southeast corner of the township, to intersection with the township or range line (as the case may be), where a closing corner will be established, and the old township corner properly changed to a corner common to two townships.

The old corners on all township boundaries rectified under the provisions of this paragraph will be destroyed. (See Plate VI, figs. 4 and 5.)

257. Where subdivisional lines have been closed upon one side of, or mineral claims tied to, a township boundary prior to the subdivision of the township on the other side, its alinement will not be changed; all obliterated old corners will be reestablished in their original places; new regular corners common to two townships, sections, or quarter sec-

tions, will be established upon it at lawful distances (minus the northing or plus the southing of the south boundary; or minus the westing or plus the easting of the east boundary), from said boundaries respectively (as the case may be), marked with reference to the township being subdivided, and the marks on the old corners upon such boundary which refer to the new work will be effaced.

Marks on bearing trees will be corrected (if necessary) to indicate the township, range, and section in which they stand, but the mounds will remain as originally established. (See Plate VI, figs 6 and 7.)

258. Where subdivisional lines have been closed upon one side of, or mineral claims tied to, the northern portion of a range line prior to the subdivision of the township on the other side (see section 257), while upon the southern portion of the same such attachments have not been made on either side (see section 256), said southern portion will be resurveyed and proper new corners established thereon, at lawful distances from the south boundary, as follows:

If the bearing of said southern portion does not deviate more than twenty-one minutes of arc from a true meridian line, it will be rectified under the provisions of the first clause of section 256, and the rectifications will be continued on the northern portion under the provisions of section 257. (See Plate VI, fig. 8.)

If, however, said bearing exceeds the specified limit, from the northern terminal corner of said southern portion, the range line will be extended due south on a random to its intersection with the south boundary, where a corner com-

mon to two townships will be established, all the necessary changes made in the markings on the original corner common to four townships situated in its immediate vicinity, and regular new corners placed upon the respective portions of the entire range line as specified in the foregoing clause. (See Plate VI, fig. 9.)

259. Similar cases involving the rectification of the northern portion of a range line when the southern portion of the same can not be rectified in bearing, will be treated in conformity with the rules prescribed in the foregoing clauses, with the exception, that where such northern portion deviates more than twenty-one minutes of arc from a true meridian line, its alinement will be rectified by extending the same from its southern terminal corner, due north on a true line to its intersection with the north boundary, where a proper closing corner will be established and the necessary corrections applied to the old corner common to four townships in its immediate vicinity, so as to change it to a corner common to two townships. (See Plate VI, figs. 10, 11, and 12.)

In the treatment of latitudinal township lines the rule prescribed in the foregoing clauses will be applied, observing, however, that the stated designations north or south will correspond in such cases to west or east, respectively.

260. When subdivisional lines have been closed upon one or both sides of, or mineral claims tied to, the northern and southern portions of a range line, while the middle portion thereof is free from such attachments, said portion will be resurveyed and new regular corners will be established thereon at intervals of forty chains from its southern terminal corner, upon a right line connecting the original terminal corners thereof, the fractional measurement being thrown against the northern terminal corner. (See Plate VI, figs. 13, 14, and 15.)

In such cases all the original corners, excepting the terminal corners, of the portion of the lines thus resurveyed, will be destroyed.

The rectification of the middle portions of latitudinal township lines, on which the conditions specified above obtain, will be executed in a similar manner, observing, however, that the designations north or south in the foregoing clauses will in such cases correspond to west or east, respectively.

261. Under the foregoing paragraphs, the fact that mineral claims have been tied to a defective township boundary as therein specified, will act as a bar to the rectification of such a boundary in alinement, only when the number of claims involved is great; while in cases where a few such claims have been connected with a few of the corners on such a boundary, said boundary will be rectified in alinement and new corners placed thereon, care being taken, however, to perpetuate in a proper manner such old corners as are found to be connected with the claims; and the methods employed to accomplish the same, together with the bearings and distances of such old corner from the new, will be briefly recorded in the field notes.

262. New corners on defective township boundaries must be established by an actual survey of such lines, and in no case will such corners be established from data acquired in running lines closing upon the same.

263. In the retracement or resurvey of base lines, standard parallels, principal meridians and guide meridians, two sets of chainmen will be employed, while for similar work on township lines, not of the character specified above, only one set of chainmen is required, and in cases where conditions such as specified in section 257 obtain, the bearings and distances between successive old corners and the connections of all new corners with the nearest old corners, will be carefully determined and recorded in the field notes.

Regarding restoration of lost corners, by private and county surveyors, see page 191.

264. When township or subdivisional lines intersect the boundaries of confirmed private land claims, or any other linear boundaries established at variance with the rectangular system of surveying, as much of said boundaries will be retraced as may be necessary, temporary stakes being set at intervals of ten chains thereon, and also at each angle formed by a change in the direction of the same.

All obliterated boundary corners will be reestablished in their original places, and the regular surveys will be closed upon the retraced line as prescribed for "closings" in page 60.

METHODS OF EXECUTING NEW SURVEYS, WHEN INITIATED OR CLOSED UPON OLD SURVEYS, AND EXPLANATION OF FIGURES ON PLATE VI.

265. Such methods are illustrated by the several figures on Plate VI, the rectification of the lines of old surveys, and the establishment of new township exterior and subdivisional lines connected with such old lines, being based upon the rules prescribed in the article entitled "Retracement or Resurvey of Township Lines," etc., page 80.

In considering the several cases, the probable obtaining conditions relative to a range line have been adopted in order to reduce the number of figures on said plate, and, to curtail also as much as practi-

cable, the amount of reiterative verbal explanation; it being definitely understood, however, that whatever conditions may obtain relative to a latitudinal line similar to those illustrated and explained in extenso in the cases relative to the range line, the necessary rectifications will be made by the application of similar methods, subject, however, to the proper modifications due to the difference in the direction of the respective lines.

The character of such modifications, when not obvious, are expressed in detail under the various clauses of the several paragraphs of the article on retracements referred to above.

It will also be clearly understood that, in order to avoid unnecessary structural complications, the figures on Plate VI exhibit only the positions of township and section corners after rectification, while in actual practice the quarter section corners will also be properly affected.

266. Fig. 1. The east boundary is assumed as irregular in bearing and defective in measurement; the township corners on the same, however, being susceptible of connection by a

line not deviating more than twenty-one minutes of arc from a true meridian line.

It will be rectified under the rules prescribed by clause 1, section 256, while from the proper corners the west and north boundaries will be established in the regular manner, as well as the subdivisions within the exteriors thus rectified and established.

267. Fig. 2. The east boundary defective in measurement. It will be rectified under clause 1, section 256, while the west and north boundaries will be established, and the subdivisions executed in the regular manner.

268. Fig. 3. The east boundary defective in position. Since the south boundary deviates from a true east and west line by more than twenty-one minutes of arc, said east boundary will be rectified under clause 1, section 256; the west and north boundaries will be established in the regular manner; and the subdivisions will be executed from north to south, and from east to west, commencing at the corner of sections 1, 2, 35, and 36, and closing the fractional measurements on the south and west boundaries, as such closings are made in regular subdivisions on the north and west boundaries.

269. Fig. 4. The east boundary defective in alinement. It will be rectified under clause 2, section 256; while the west and north boundaries will be established, and the subdivisions executed, in the regular manner.

270. Fig. 5. The east boundary defective in alinement and measurement. It will be rectified under clause 2, section 256; the west boundary will be established in the regular manner, while from the corner common to two townships on the rectified east boundary, the north boundary will be run west on random and east on true line, permanent corners common to sections and quarter sections of the township to be subdivided being established on the same.

The subdivisions will be executed in the regular manner.

271. Fig. 6. The south and east boundaries being defective in alinement, measurement, and position, will be rectified under clause 1, section 257; the west boundary will be established in the regular manner, and the north boundary by east on random, and west on true line, throwing the fractional measurement against the old east boundary;

due west on a true line to its intersection with the west boundary of the township, where a closing corner will be established. A line thus run is termed a

SECTIONAL CORRECTION LINES;

and when such an auxiliary line, thus projected, intersects its objective limiting line in such proximity to its objective corner that the accessories of the two corners would interfere, that portion of the auxiliary line situated between the last-established section corner and the limiting line will be changed in alinement to close upon the corner found, thus avoiding placing two corners in close proximity.

274. From the initial point of the sectional correction line, which, in this case, is the corner of sections 25, 26, 35, and 36, the line between sections 25 and 26, 23 and 24, 13 and 14, 11 and 12, and 1 and 2, will be projected north on a true line to its intersection with the north boundary, where a closing corner will be established. A line thus established is termed a

SECTIONAL GUIDE MERIDIAN.

South of the sectional correction line, and east of the sectional guide meridian, the subdivisions will be closed upon the south and east boundaries by random and true lines, throwing the fractional measurements against the same, as such closings are made in regular surveys on the north and west boundaries; while that portion of the township situated to the north and west respectively, of said auxiliary lines, will be subdivided in the regular manner, the parallelism of the latitudinal section lines being referred to the sectional correction line, and that of the meridional section lines to the sectional guide meridian.

Closings on the west and north boundaries will be made by random and true lines, when the fallings are less than 50 links per mile, and by true lines run to closing corners when the fallings exceed said limit.

275. Fig. 8. The east boundary defective in measurement, the northern portion of the same being unchangeable, while the southern portion admits of rectification.

while the subdivisions will be executed from north to south, and from west to east, commencing at the corner of sections 5, 6, 31, and 32, and closing the fractional measurements on the old south and east boundaries, as such closings are made in regular subdivisions on the north and west boundaries.

272. Fig. 7. The north, south, east, and west boundaries being defective in alinement, measurement, and position. The south and east boundaries will be rectified under clause 1, section 257; while the west and north boundaries will be retraced for length and bearing, any obliterated old corners being reestablished in their original places.

273. The subdivisions will be executed as follows:

From the corners of sections 35 and 36, and 25 and 36, the lines between said sections will be extended due north and west, respectively, to their mutual intersection, where the corner of sections 25, 26, 35 and 36, will be established.

From said corner, the line between sections 26 and 35, 27 and 34, 28 and 33, 29 and 32, and 30 and 31 will be projected

The east boundary will be rectified under clause 2, section 257, the west and north boundaries will be established, and the subdivisions executed, in the regular manner.

276. Fig. 9. The east boundary defective in alinement and measurement, the northern portion thereof being unchangeable, while the southern portion of the same admits of rectification.

The east boundary will be rectified under clause 3, section 258, the south boundary, under clause 1, section 257; the west boundary will be established in the regular manner; while the north boundary will be run east on random, and west on true line, throwing the fractional measurement against the east boundary.

The subdivisions will be executed from south to north, and from west to east, closing the fractional measurements on the north and east boundaries, as such closings are made in regular surveys, on the north and west boundaries.

277. Fig. 10. The east boundary defective in measure-

ment, the southern portion thereof being unchangeable, while the northern portion admits of rectification.

The east boundary will be rectified under clause 4, section 258; while the west and north boundaries will be established, and the subdivisions executed in the regular manner.

278. Fig. 11. The east boundary defective in alinement and measurement, the southern portion thereof being unchangeable, while the northern portion admits of rectification.

The east boundary will be rectified under clause 1, section 259; the west boundary will be established in the regular manner; the north boundary by east on true line to closing corner, the fractional measurement being thrown against the old east boundary; while the subdivisions will be executed from south to north, and from west to east, the fractional measurements being thrown against the old north and east boundaries, as such closings are made in regular surveys against the north and west boundaries.

279. Fig. 12. The east boundary defective in measurement; the northern and southern portions thereof being unchangeable, while the middle portion admits of rectification.

The east boundary will be rectified under clause 1, section 260, the west and north boundaries will be established, and the subdivisions executed in the regular manner.

280. Fig. 13. The east boundary defective in alinement and measurement; the northern and southern portions thereof being unchangeable; while the middle portion admits of rectification.

The east boundary will be rectified under clause 1, section 260; the west boundary will be established in the regular manner; the north boundary by west on random and east on true line, the fractional measurement being thrown against the old east boundary; while the subdivisions will be executed from south to north and from east to west, closing the fractional measurements against the east, north and west boundaries.

281. Fig. 14. The east boundary defective in alinement and measurement; the northern and southern portions thereof not admitting of rectification in any way, since subdivisional surveys have been closed upon both sides of the same; while the middle portion admits of rectification in measurement.

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The east boundary will be rectified under clause 1, section 260; the west boundary will be established in the regular manner, the township corner at the end of six miles thereon being temporarily established.

From said temporary corner, the fractional north boundary will be run east on random to the nearest old established corner on the same, at which point if the falling of the random is within 50 links per mile, said boundary will be corrected westward on true line, setting corners common to the sections and quarter sections on the north, at regular intervals from the initial point of the true line, and throwing the consequent fractional measurement in its normal place against the new west boundary, while the temporary township corner previously established thereon will be made permanent.

If, however, the falling defined above exceeds the stated limit from the last established corner of the old surveys, the fractional north boundary will be projected due west to its intersection with the west boundary, at which point the proper township corner will be permanently established, and the temporary corner destroyed.

In establishing the corners on said north boundary under the latter procedure, the requirements prescribed in the former relative to the allowance for fractional measurement will be strictly observed.

In subdividing, the methods prescribed under Fig. 6 will be applied as far as practicable. The details of the case under consideration are clearly exhibited by fig. 14.

282. Fig. 15. All of the boundaries are assumed to be defective in alinement, measurement, and position; also portions of each as being closed upon by subdivisional surveys and consequently unchangeable relative to the old surveys, while other portions of the same being free from such attachments, admit of rectification.

This figure is constructed on a larger scale than those explained in the preceding paragraphs, in order to illustrate in detail the modus operandi to be pursued in rectification, under the rules of the article on retracements applicable to each of the obtaining conditions, and also in subdividing within the rectified exteriors.

HIATUSES AND OVERLAPS.

283. The several figures on Plate VII illustrate in detail the methods to be employed in connecting the unsurveyed portions of two or more township boundaries, when four of such fractional lines, upon being projected toward each other in the direction of the cardinal points by lines not deviating more than 21 minutes of arc from true meridian or latitudinal lines, do not form a common intersection.

Said methods, in addition to the reasons embodied in the article entitled "Explanations of Articles," etc., page 78, are based upon the following desiderata, viz:

1. The adjustment of such township boundaries so as to maintain section 36 in a condition theoretically and practically perfect, according to the requirements of the rectangular system of surveying.

2. That in accomplishing the above, the resultant fractional excess or deficiency (which for brevity of explanation is termed "the rectangular fraction") will be thrown into, or taken out of section 6, whenever practicable.

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3. That all incidental fractional measurements developed in the establishment of township boundaries or subdivisional lines by such methods shall be thrown against the old surveys whenever practicable.

284. In considering said methods it will be observed that the conditions to be dealt with are either hiatuses or overlaps, the former possessing three characteristic features, which are named as follows:

Simple hatus. See figures 1 and 2, Plate VII.

Meridional hiatus. See figure 3.

Latitudinal hiatus. See figure 4; while overlaps are shown by figure 5.

As the application of said methods, when the conditions exhibited obtain, gives similar results with but few excep-

tions, which will be specifically detailed hereafter, the condition represented by A, figure 3, will be considered and the method of connection described as an example, upon the following assumptions, viz:

That, of the boundaries of townships 1 and 2 north, ranges 3 and 4 west, those portions indicated by broken lines are unsurveyed;

That it is required to connect said portions in order to complete the subdivisions in one or more of the townships.

Beginning at the established terminal corners on the south and east boundaries of T. 2 N., R. 4 W., blank lines will be projected due east and due south, respectively, with temporary stakes at intervals of ten chains, to an intersection, which point will be marked by a temporary stake;

Then, from the established terminal corners on the west and north boundaries of T. 1 N., R. 3 W., true lines will be projected due north and due west, respectively, with regular corners for two sections and quarter sections, to an intersetion, which point will be marked by a temporary stake;

Then, by proper measurements, the character of the resulting condition will be determined, and by comparison with diagrams A, of the figures on Plate VII, the particular method of connection will be obtained and applied.

285. Said condition in the case under consideration, it will be observed, is a meridional hiatus; therefore, from the temporary stake marking the intersection of the extended south and east boundaries of T. 2 N., R. 4 W., which will be replaced by a permanent corner (common to two townships) for T. 1 N., R. 3 W., and T. 2 N., R. 4 W., the south boundary of the latter will be extended due east to its intersection with the west boundary of the former, where a corner for (one township only) T. 1 N., R. 4 W., will be permanently established;

Then, from the corner for T. 1 N., R. 3 W., and T. 2 N., R. 4 W., the south and east boundaries of the latter will be corrected back west and north, respectively, on true lines, establishing regular corners common to two quarter sections and sections of said township, to the initial points of the blank lines, against which the resulting fractional measurements will be thrown, while the stakes temporarily established on the blank lines at intervals of ten chains will be destroyed;

Then, from the stake temporarily marking the intersection of the north and west boundaries of T. 1 N., R. 3 W., which will be destroyed, the former boundary will be extended due west to its intersection with the east boundary of T. 2 N., R. 4 W., where a proper closing corner

will be established, the resulting fractional measurement thrown against the same, and the distance to the nearest corner on said boundary carefully determined and recorded in the field notes.

Thus section 36 is made full, serving as a perfect base on which to initiate the subdivisional work in T. 2 N., R. 4 W.; the rectangular fraction, which in this case indirectly represents an excess, is incorporated in section 6, which being lotted on two sides in its normal condition, absorbs the excess without deranging materially those portions of the same usually defined as regular subdivisions; while the unsurveyed portions of the entire group of townships are arranged in such a manner as to admit of completing the subdivisional work therein on the approved rectangular basis.

Relative to incorporating an excess in, or supplying a deficiency from, section 6, simple hiatuses are noted as exceptions to the general rule; therefore, when such hiatuses are square, or longer meridionally (see 1, diagrams A, fig. 1), the rectangular fraction will be taken out of section 31, and incorporated in section 1; but if the length thereof (see 1, diag. A, fig. 2) lie in a latitudinal direction, said rectangular fraction will be taken out of section 1 and incorporated in section 31.

286. If the surveys contemplated, within a group of four townships, consist of the completion of the southeast unsurveyed portion of the northwest township only, the method detailed in the foregoing paragraphs will be employed in all particulars, with the exception that the extension of the north and west boundaries of the southeast township will be omitted; but the completion of the unsurveyed portions of any of the other three demands of the deputy surveyor the performance of the whole operation, and the complete connection of all the boundaries.

When, of four township boundaries whose directions tend to an approximate common point, two of the same have been carried to a mutual intersection, and are closed upon by subdivisional and other lines (see section 257), the unsurveyed portion of the remaining boundaries will be connected with them by the application of these methods, sufficiently modified to preserve intact the prior subdivisional surveys.

FRAGMENTARY SUBDIVISION.

287. Plate VIII illustrates the general methods to be employed in the execution of fragmentary subdivisions within townships, portions of which have been subdivided from fractional township boundaries extended from various directions and not connected with each other.

These conditions obtain to a large extent in mountainous regions, where in accordance with the existing provisions, relative to the survey of agricultural lands, in the acts of Congress making appropriations for public-land surveys, such surveys are extended along the valley and bottom lands, leaving the mountainous areas unsurveyed at the time of the execution of the original work; but which, at a later date, in view of other considerations are placed under contract for survey.

288. It is obvious that the number and character of such cases would be too great and varied to be considered in detail; therefore, when the deputy surveyor meets with a case which is not covered exactly by these instructions, or the special instructions from the surveyor general, his thorough understanding of the preceding articles on this subject, and of the conditions illustrated on Plates V and VII, it is expected will point out to him the proper method to be employed.

It is possible, however, that cases may arise so complex in their character as to produce a feeling of doubt relative to the proper solution of the problem; in which case he will at once communicate with this office through the surveyor general, submitting information, by letter and diagrams, of the exact

condition as found by him, and the necessary instructions will be forwarded as soon as practicable.

GEOGRAPHICAL POSITIONS OF BASE LINES AND PRINCIPAL MERIDIANS GOVERNING THE PUBLIC SURVEYS.

289. The system of rectangular surveying, authorized by law May 20, 1785, was first employed in the survey of United States public lands in the State of Ohio.

The boundary line between the States of Pennsylvania and Ohio, known as "Ellicott's line," in longitude 80° 32′ 20″ west from Greenwich, is the meridian to which the first surveys are referred. The townships east of the Scioto River, in the State of Ohio, are numbered from south to north, commencing with No. 1 on the Ohio River, while the ranges are numbered from east to west, beginning with No. 1 on the east boundary of the State, except in the tract designated "U. S. military land," in which the townships and ranges are numbered, respectively, from the south and east boundaries of said tract.

290. During the period of one hundred and seventeen years since the organization of the system of rectangular surveying, numbered and locally-named principal meridians and base lines have been established, as shown by the following tabular exhibit. These bases and meridians may all be found by examining the large wall map of the United States, published by the General Land Office. They are also severally shown upon the various of ficial State maps.

(Table III, page 90, deleted. The table contains a list of the Principal Meridians of the contiguous 48 States.)

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DISUSE OF MAGNETIC NEEDLE SURVEYS.

291. The strict requirement that all lines of public surveys must be run by courses derived from the true local meridian, independently of the magnetic needle, and subject to close tests by field inspection, renders the data and discussion of magnetic declinations no longer necessary in the Manual. The scientific information heretofore published had apparent value to surveyors required to restore ancient lines; but even in such work there is often wide opportunity for error, from lack of full understanding of the former customs.

292. While some of the early surveyors were exact and faithful men, competent to observe Polaris with the plain compass and note the correct local variation, others probably obtained the figures for declination by hearsay and from distant places; hence implicit reliance can not be placed on calculations based on the presumed change of variation.

An additional reason for considering these matters of magnetic declination less important in old surveys, is that the rules for restoring lost lines and corners place chief importance upon the finding and identification of material evidence in the field, with less regard to theoretical courses.

METHODS OF OBTAINING A TRUE MERIDIAN.

293. The work of every deputy surveyor or examiner depends for its correctness upon his using a correct meridian, which can be obtained only by careful observance of the following instructions. They include astronomical tables, adapted from data heretofore supplied by the Coast and Geodetic Survey, and brought down to dates in the twentieth century.

The accuracy with which the meridian may be determined depends chiefly upon the instruments at command and upon the ability and care of the observer in using them. It rests with him to select the proper instrument, the proper method and time for observing. The instruments ordinarily in the hands of the surveyor are sufficiently described in books on surveying or in catalogues of instrument makers. The method to be followed will depend greatly upon circumstances. Thus the sun or the pole star may be observed for azimuth; local time may be had by the method of equal altitudes of the sun, for which the latitude of the place need only to be known roughly. Observations of the pole star for the true azimuth are generally preferred, since no great precision in the local time is required. Tables and explanatory remarks have been inserted to facilitate the use of this method, and will serve for the period 1901 to 1910.

294. The table given in the Manual of 1894 for times of elongation and culmination at 24 dates of the year 1893, with a system of corrections for other years and dates, is now omitted. All the necessary data therein given can now be obtained from the upper culmination table on page 101 in the form already familiar but revised and extended for the present decade.

295. For correct and rapid use of these tables, it is indispensable that the surveyor have clear comprehension of the outlines of the astronomical facts involved, and the term used in dealing with them, such as the following:

The earth's annual motion around the sun.

Its diurnal motion upon its axis.

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The apparent opposite motion of Polaris and other circumpolar stars about the north-polar point in the heavens. (See figure 1 on page 97.)

Mean solar time, derived from successive apparent passages of the sun across the local meridian, and averaged or equalized for the year to remove irregularities caused by the earth's varying distances from the sun, often shown in almanacs under the head, "sun fast" or "sun slow."

Equation of time, as tabulated in the ephemeris.

Sidereal time, measured by the astronomical day of 23 hrs. 56.1 min., the interval between two successive passages of a fixed star across the local meridian.

The civil day, beginning at midnight, and its relation to the astronomical day which begins at noon. The former counts twelve hours twice over, the latter numbers the hours up to 24, and lasts twelve hours after the civil day of the same date is ended.

The culminations of Polaris.

The elongations of Polaris.

The azimuth of Polaris or its apparent distance east or west from the polar point, measured by a horizontal angle at the place of observation.

The hour-angle azimuth of Polaris, at those times when it is neither at elongation nor culmination.

The meridian of any locality. Since any line not coinciding with the true meridian is not a meridian, the use of the word true is superfluous, and generally avoided.

Reduction of standard time to local mean time by difference of longitude.

296. These essentials are presumed to have been acquired in preparatory studies; therefore it is the purpose of the Manual to simplify the work, omit all technicalities requiring a full knowledge of astronomy, and present the method, with two new and compact tables adapted to common clock time, with such plain directions for use that any person of ordinary intelligence can understand and apply them.

297. As the surveyor should have a perfectly clear idea of what is meant by Astronomical Time (used to simplify computations), and the Hour Angle of Polaris, these terms will now be explained.

298. The Civil Day, according to the customs of society, commences at midnight and comprises twenty-four hours from one midnight to the next following. The hours are counted from 12 to 12 from midnight to noon, after which they are again reckoned from 12 to 12 from noon to midnight. Thus the day is divided into two periods of 12 hours each; the first of which is marked a. m., the last p. m.

299. The Astronomical Day commences at noon on the civil day of the same date. It also comprises twenty-four hours; but they are reckoned from 0 to 24, and from the noon of one day to that of the next following.

The civil day begins twelve hours before the astronomical day; therefore the first period of the civil day answers to the last part of the preceding astronomical day, and the last part of the civil day corresponds to the first part of the astronomical day. Thus, January 9, 2 o'clock p. m., civil time, is also January 9, 2^h, astronomical time; and January 9, 2 o'clock a. m., civil time, is January 8, 14^h, astronomical time.

300. The rule then for the transformation of civil time into astronomical time is this: *If the civil time is marked p. m., take away the*

designation p. m., and the astronomical time is had without further change; if the civil time is marked a. m., take one from the day and add twelve to the hours, remove the initials a. m., and the result is the astronomical time wanted.

The substance of the above rule may be otherwise stated, as follows: when the surveyor takes an observation during p. m. hours, civil time, he can say; the astronomical time is the hours and minutes passed since the noon of this day; and when observing in the a. m. hours he can say the astronomical time is the hours and minutes elapsed since the noon of yesterday, in either case omitting the designation a. m. or p. m., and writing for the day of the month, that civil date on which the noon falls, from which the time is reckoned. Finally, *the astronomical time may be called the hours and minutes elapsed since the noon last past, the astronomical date being that of the civil day to which the noon belongs.* Thus, April 23, 4.15 p. m., civil time, is April 23, 4^h 15^m, astronomical time, and April 23, 4.15 a. m., civil time, is April 22, 16^h 15^m, astronomical time.

The surveyor should thoroughly master this transformation of the civil time into astronomical time, as it will be the first duty he will have to perform after observing Polaris out of the meridian.

The change can be made mentally, no written work being required. Table V might be easily altered to give the times by the civil count marked a. m. and p. m., but such an arrangement would greatly extend and complicate the rules and examples, and correspondingly increase the chances for error.

301. The general use of telescopic instruments makes it far easier to determine a meridian, than formerly when the open-sight compass was almost the only obtainable instrument. In those days it was required that the deputy ascertain for himself by observation what was the true north line, and then observe and record the "variation" of his needle from the north. Instructions for the process have been an important part of the early manuals, and surveyors of integrity faithfully observed them. Similar directions are here given.

TO DETERMINE A MERIDIAN WITHOUT A TELESCOPE.

302. Attach a plumb line to a support situated as far above the ground as practicable, such as the limb of a tree, a piece of board nailed or otherwise fastened to a telegraph pole, a house, barn, or other building, affording a clear view north and south.

The plumb bob may consist of some weighty material, such as a brick, a piece of iron or stone, weighing four to five pounds, which will hold the plumb line vertical, fully as well as one of finished metal.

Strongly illuminate the plumb line just below its support by a lamp or candle, care being taken to obscure the source of light from the view of the observer by a screen.

For a peep sight, cut a slot about one-sixteenth of an inch wide in a thin piece of board, or nail two strips of tin, with straight edges, to a square block of wood, so arranged that they will stand vertical when the block is placed flat on its base upon a smooth horizontal rest, which will be placed at a convenient height south of the plumb line and firmly secured in an east and west direction, in such a position that, when viewed through the peep sight, Polaris will appear about a foot below the support of the plumb line.

The position may be practically determined by trial, the night preceding that set for the observation.

About thirty minutes before the time of elongation, as obtained from the table, bring the peep sight into the same line of sight with the plumb line and Polaris.

To reach elongation, the star will move off the plumb line to the east for eastern elongation, or to the west for western elongation, therefore by moving the peep sight in the proper direction, east or west, as the case may be, keep the star on the plumb line until it appears to remain stationary, thus indicating that it has reached its point of elongation.

The peep sight will now be secured in place by a clamp or weight, with its exact position marked on the rest, and all further operations will be deferred until the next morning.

By daylight, place a slender rod at a distance of two or three hundred feet from the peep sight, and exactly in range with it and the plumb line; carefully measure this distance.

Take from the table on page 95 the azimuth of Polaris corresponding to the latitude of the station and year of observation; find the natural tangent of said azimuth and multiply it by the distance from the peep sight to the rod; the product will express the distance to be laid off from the rod exactly at right angles to the direction already determined (to the west for eastern elongation or to the east for western elongation), to a point, which with the peep sight, will define the direction of the meridian with sufficient accuracy for the needs of local surveyors.

TO ESTABLISH A MERIDIAN AT ELONGATION BY TELESCOPIC INSTRUMENT.

303. Set a stone, or drive a wooden peg, firmly in the ground, and upon the top thereof make a small distinct mark.

About thirty minutes before the time of the eastern or western elongation of Polaris, obtained from the table, set up the transit firmly, with its vertical axis exactly over the mark, and carefully level the instrument.

Illuminate the cross wires by the light from a suitable lantern, the rays being directed into the object end of the telescope by an assistant; while great care will be taken, by perfect leveling, to insure that the line of collimation describe a truly vertical plane.

Place the vertical wire upon the star, which, if it has not reached its elongation, will move to the right for eastern, or to the left for western elongation.

While the star moves toward its point of elongation, by means of the tangent screw of the vernier plate it will be repeatedly covered by the vertical wire, until a point is reached where it will appear to remain on the wire for some time, then leave it in a direction contrary to its former motion; thus indicating the time of elongation.

Then while the star appears to thread the vertical wire, depress the telescope to a horizontal position; five chains north of the place of observation, set a stone or drive a firm peg, upon which by a strongly illuminated pencil or other slender object, exactly coincident with the vertical wire, mark a point and drive a tack in the line of sight thus determined; then, to eliminate possible errors of collimation or imperfect verticality of the motion of the telescope, quickly revolve the vernier plate 180°, direct the glass at Polaris and repeat the observation; if it gives a different result, find and mark the middle point between the two results. This middle point, with the point marked

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by the plumb bob of the transit, will define on the ground the trace of the vertical plane through Polaris at its eastern or western elongation, as the case may be.

By daylight, lay off to te east or west, as the case may require, the proper azimuth taken from the following table; the instrument will then define the meridian, which may be permanently marked for future reference.

The magnetic declination may be obtained from a true meridian, as follows: Take the magnetic bearing of the true meridian; then the angle expressed by said magnetic bearing will be the observed magnetic declination, named like the departure if the bearing is taken from the south needle-point, but the reverse if from the north.

(The remainder of page 95 and pages 96 through 128 are deleted. They contain instructions and tables for Polaris observations, offsets from the secant and tangent to the parallel, etc. All are technical in character.)

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FIELD EXAMINATION OF SURVEYS.

368. To insure the faithful and accurate execution of surveys of Government lands, the Department has found it necessary to adopt a uniform rule requiring all work to be inspected in the field, before its acceptance will be considered. The details of this process are governed by instructions issued by the General Land Office to those serving as examiners of surveys. The rules are subject to such modifications as the good of the service may demand.

369. For several years past, it has been required that 10 per cent of all lines run by a deputy in each township, must be carefully retraced. A full report of all courses, distances, topography, and descriptions of corner monuments and accessories, upon lines examined, must be returned under oath to the Commissioner, for comparison with the returns of the deputy. The examiner's returns must show all distances across lands that are mountainous, heavily timbered, or covered with dense undergrowth.

370. If the examiner finds erroneous or negligent work which in his opinion deserves correction or rejection, he has been instructed to continue his work by extending the retracement to 20 or 30 per cent of the lines, in order to make his evidence conclusive.

371. Examiners are required to observe the rules of the Manual in the technical and professional details, to use instruments of the best construction and adaptation, and to exercise special care that their courses and measurements are precise and free from all error, that no injustice may be done to a deputy. In case a serious error is found, they may repeat the chaining or observation, to guard against possible mistake on their part. They are required, whenever practicable, to make a closed survey around one or several sections, which should close by traverse within limits; also to extend the examination into remote and difficult parts, as well as those easily accessible. Whatever future regulations may be adopted will seek the same purpose of preventing error, negligence or fraud.

[The remainder of this Manual, pages 131 through 203 are deleted. They contain Speciman Field Notes and Index, identical in vein and content to the Manual of 1894.]

Fig.1.

SECANT METH

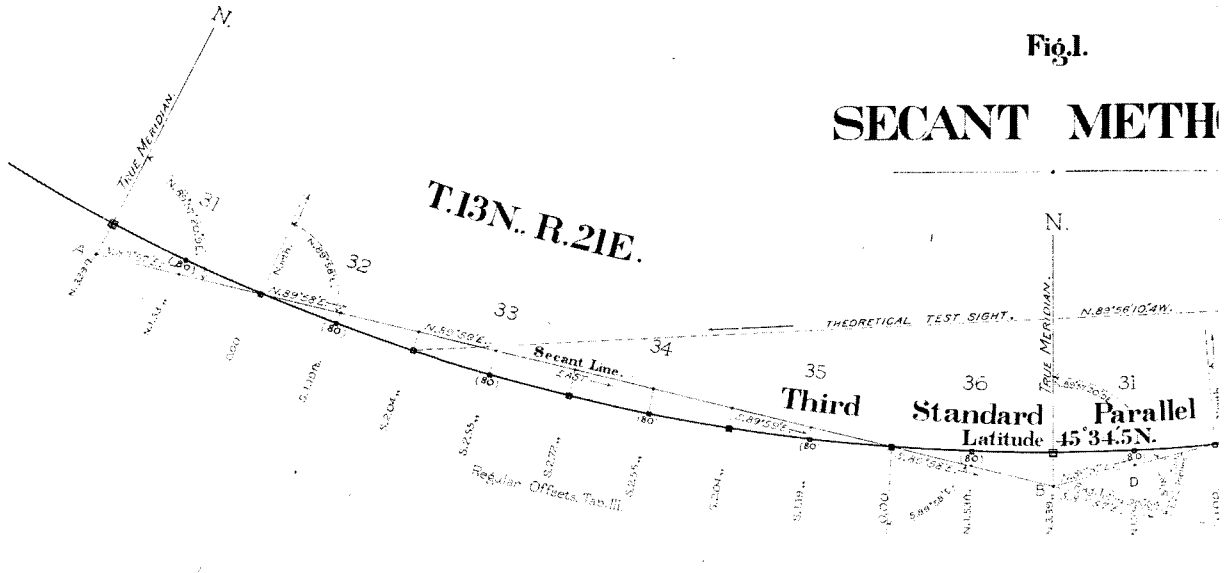
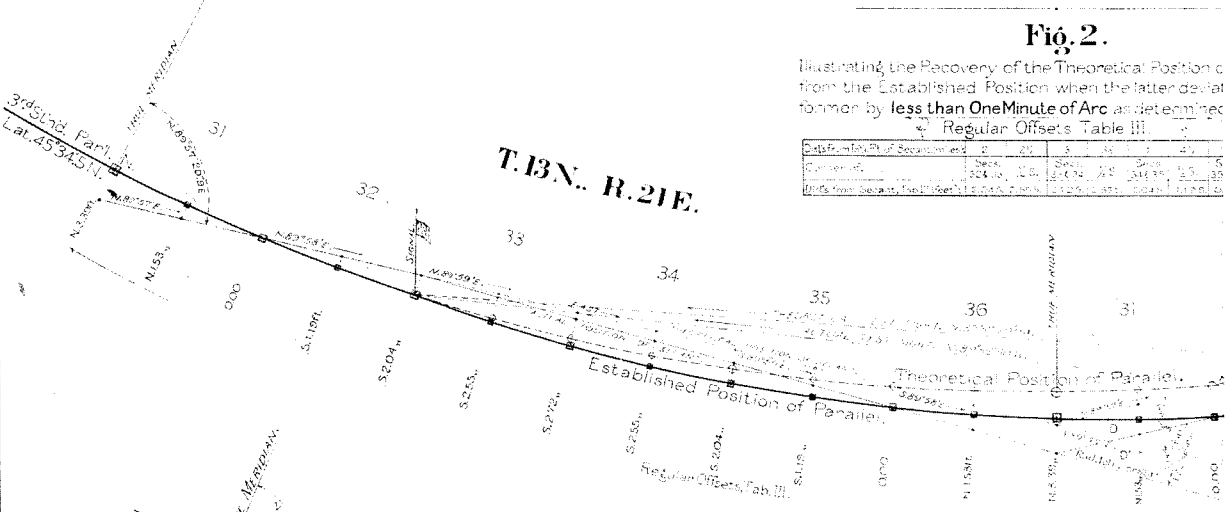


Fig. 2.

Illustrating the Recovery of the Theoretical Position o
from the Established Position when the latter deviat
former by less than One Minute of Arc as determined
Regular Offsets Table III.

Dist. from Int. Pt. of Secant Line	2	2½	3	3½	4	4½
Corner of	Secs. 32 & 33	Secs. 32 & 33	Secs. 32 & 33	Secs. 32 & 33	Secs. 32 & 33	Secs. 32 & 33
Dist. from Secant, Tab. III (feet)	0.00	0.00	0.00	0.00	0.00	0.00



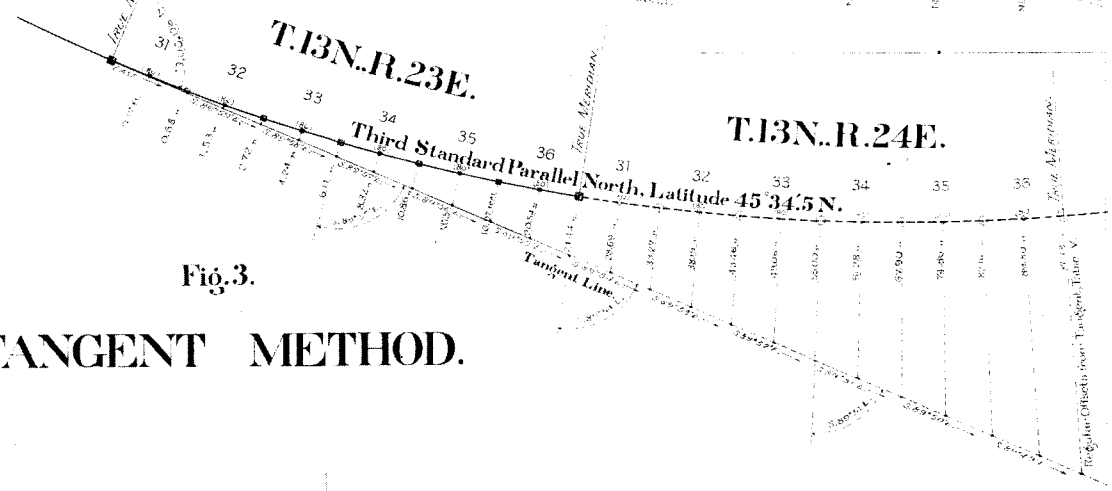


Fig.3.

TANGENT METHOD.

Fig. 1.

ECANT METHOD.

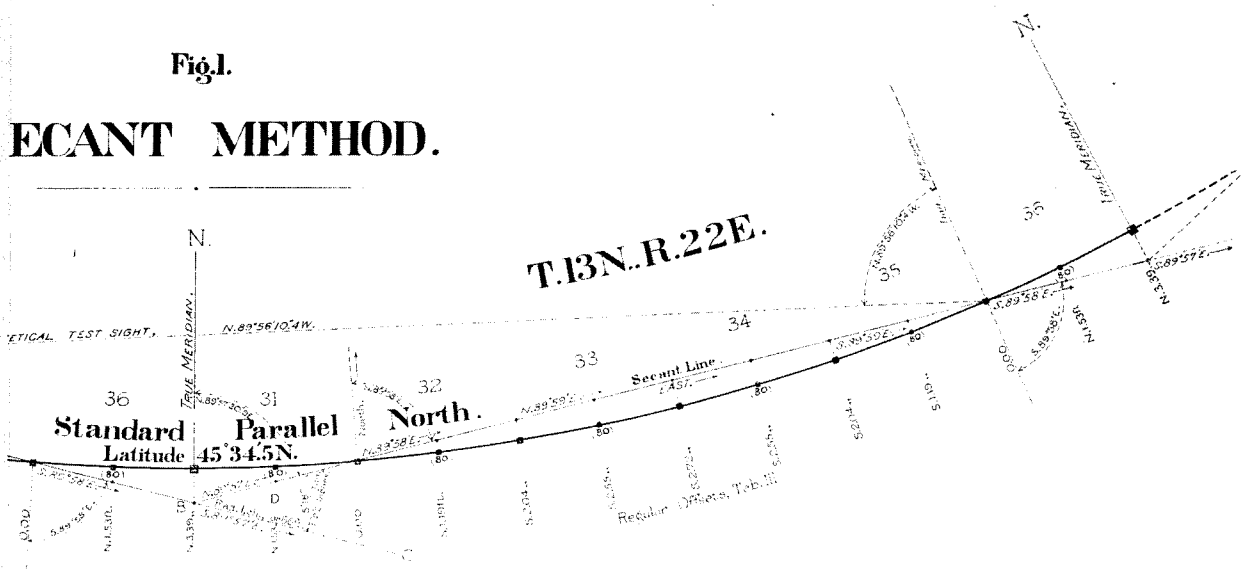


Fig. 2.

g the Recovery of the Theoretical Position of the Parallel
Established Position when the latter deviates from the
by less than One Minute of Arc as determined by Polaris Obs.

← Regular Offsets Table III. →

Pt. of Secant	B	2½	5	3½	1	4½	8	11½	4
	Sec. 33	22	Sec. 34	7.5	Sec. 34	4.5	Sec. 35	4½	Sec. 35
Chain, Tab. III feet	1.0	5.0	1.0	4.0	1.0	1.0	0.00	1.0	1.0

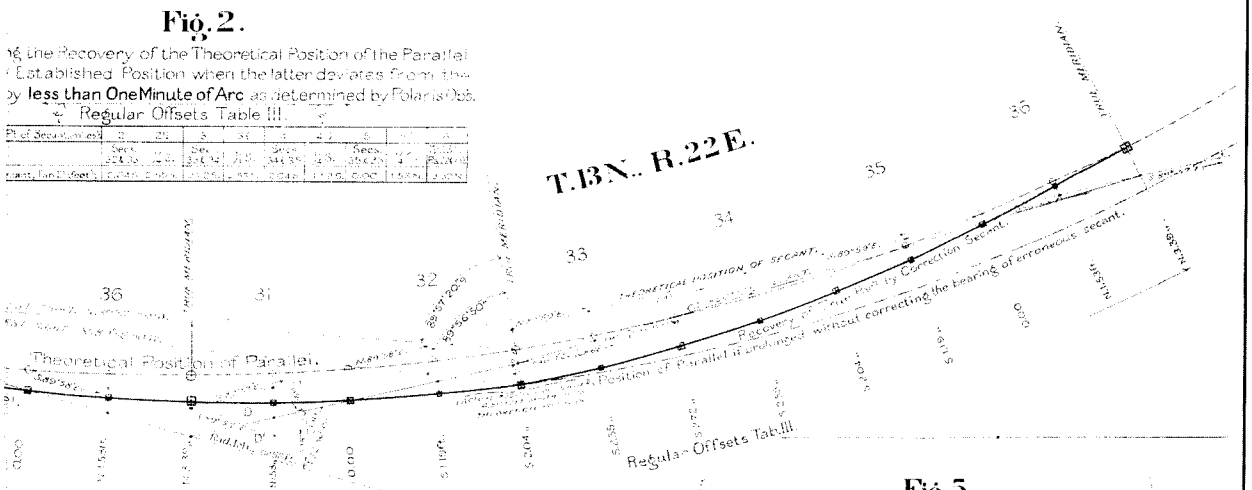
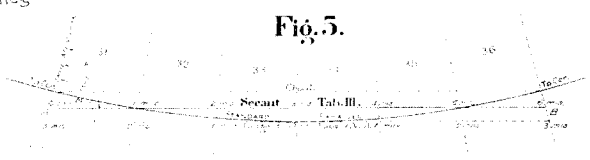
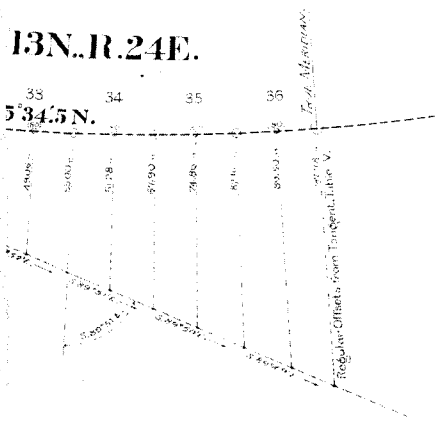


Fig. 5.





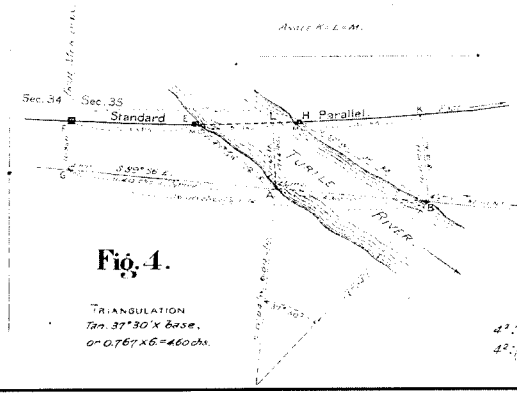


Fig. 4.

TRIANGULATION
Tan. 37°30' × Base,
0.767 × 6 = 460 chs.

AL = diff. lat. of course AE;
EL = departure of AE;
practically, AG = FL;
then, EF = AG − EL;

HK = departure of BH;
and, FH = GB − HK.

FOR THE DISTANCES AL AND BK.
$4^2 : (4\frac{1}{2})^2 :: 10.86 : 11.65$ Ft. = 17.64 lks. = AL.
$4^2 : (4\frac{1}{2})^2 :: 10.86 : 11.97$ Ft. = 18.13 lks. = BK.

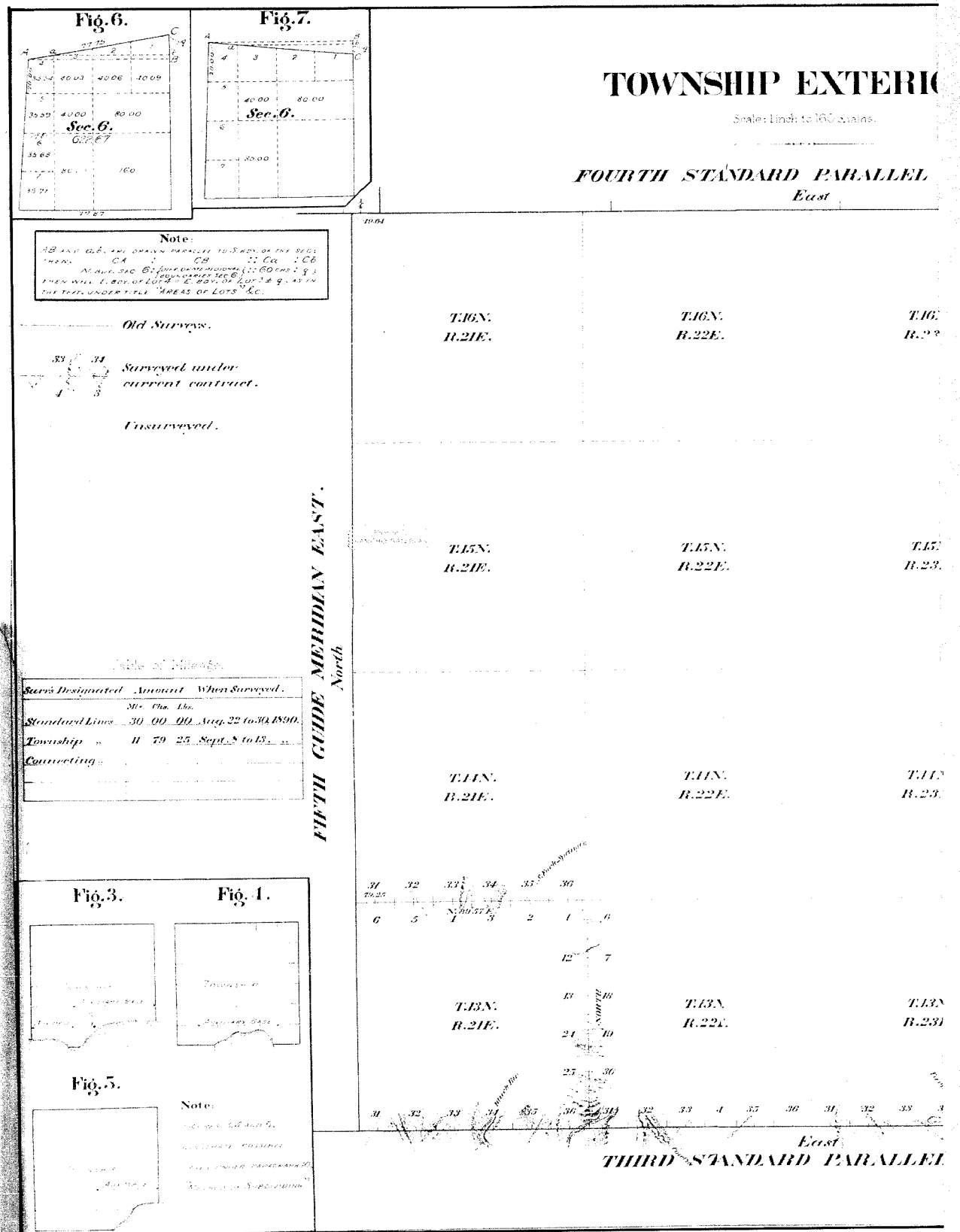
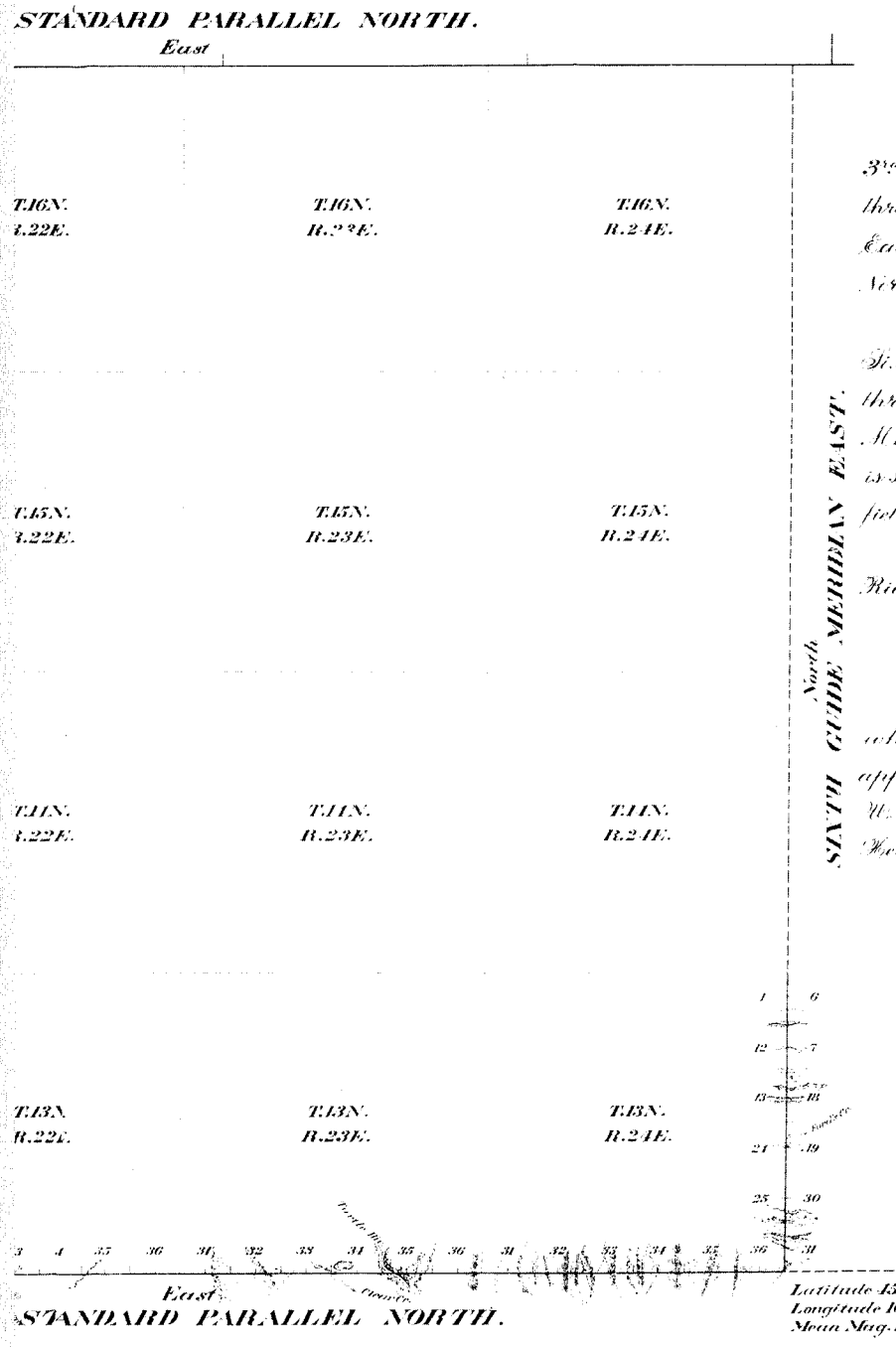


Fig. 6.
Sec. 6.
Fig. 7.
Sec. 6.
TOWNSHIP EXTERI
Scale: 1 inch to 160 chains.
FOURTH STANDARD PARALLEL
East
Note:
Old Surveys.
Surveyed under current contract.
Unsurveyed.
Table of Mileage.
Surv's Designated Amount When Surveyed.
Mls. Chs. Lks.
Standard Lines 30 00 00 Aug. 22 to 30, 1890.
Township " 11 79 25 Sept. 8 to 13. "
Connecting "
FIFTH GUIDE MERIDIAN EAST.
North
T.16N. R.21E.
T.16N. R.22E.
T.15N. R.21E.
T.15N. R.22E.
T.14N. R.21E.
T.14N. R.22E.
T.13N. R.21E.
T.13N. R.22E.
Fig. 3.
Fig. 4.
Fig. 5.
Note:
East
THIRD STANDARD PARALLEL

NSHIP EXTERIORS.

Scale: 1 inch to 160 chains.

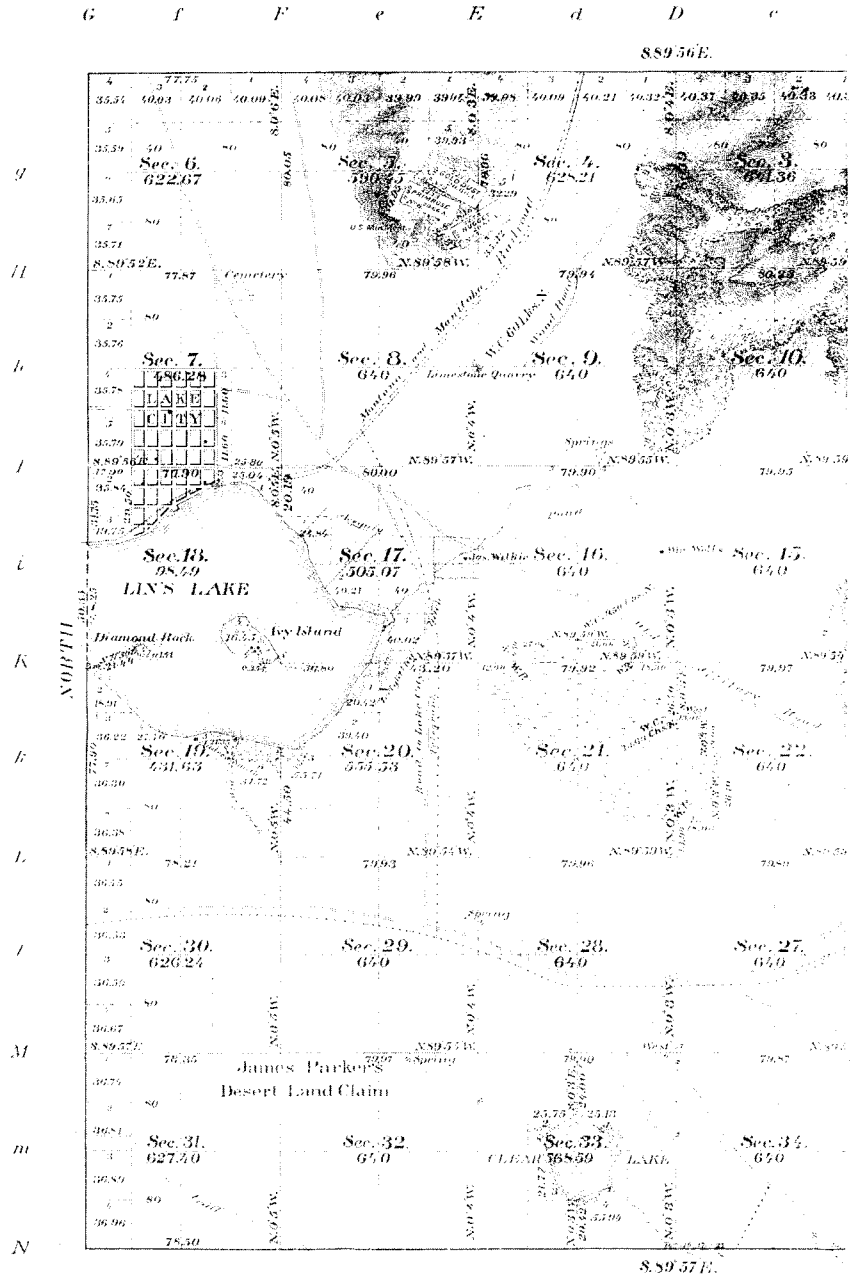


This Plat,
of the
3rd Standard Parallel North
through Ranges 21, 22, 23 & 24 E.;
East Boundary of T.13 N., R.21 E.;
North " " " "
and the
Sixth Guide Meridian East
through Township 13 North,
Montana Principal Meridian;
is strictly conformable to the
field notes of the survey thereof
by
Richard Roods, U.S. Dep. Surv.
under his
Contract No. 97,
dated July 10th 1890,
which have been examined,
approved and filed in this office
U.S. Surv. Gen'l's Office,
Helena, Montana.

U.S. Surv. Gen'l.

Latitude 45°31'.5 N.
Longitude 107°24' W. of Gr.
Mean Mag. Decl. 18°02' East.

Township No. 15 North, Range No. 20 East of the

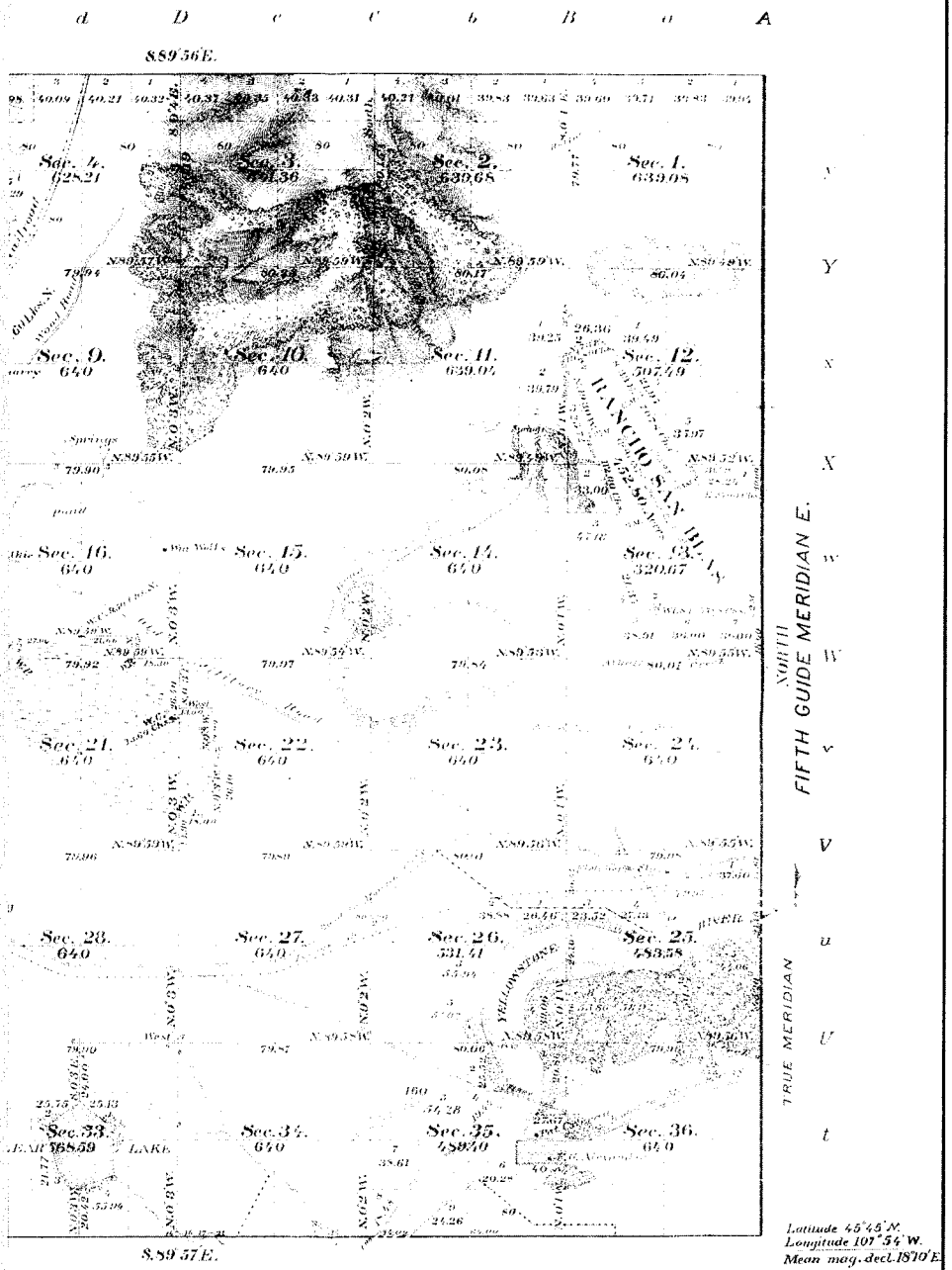


n O o P p Q q

Area in acres:	Public Land, 20872.27, Water surface, 1362.99.	Townsite, 199.01. Mineral Claims, 61.98.	Private Land Claim, 452.80. Total Area, 22949.05 Acres.				
Surveys Designated	By Whom Surveyed	Contract No.	Contract Date	Amount of Surveys Ms.	Chs.	Lks.	When Surveyed
Subdivisions	Robert Acres	207	March 22nd 1893	56	60	72	Aug. 4th to 19th 1893.
Connections	,,	,,	,,		73	60	,,
Meanders	,,	,,	,,	12	19	26	,,

PLATE III.

ge No 20 East of the Principal Meridian Montana.



Latitude 45°45'N.
Longitude 107°54'W.
Mean mag. decl. 18°10'E.

p Q q R r S s T

Private Land Claim, 472.80,
Total Area, 22949.05 Acres.

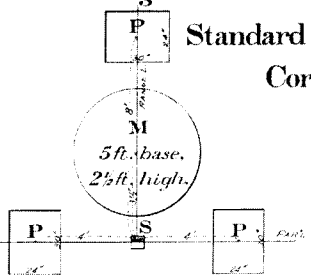
Amount of Surveys Chs.	Lks.	When Surveyed
60	72	Aug. 4th to 19th 1893.
73	60	"
19	26	"

Scale 40 Chains to an Inch.

The above Map of Township No. 15 North, of Range No. 20 East of the Principal Meridian, Montana, is strictly conform with to the field notes of the survey thereof on file in this Office, which have been examined and approved.
Surveyor General's Office.

Surv. Gen.

Fig. 1.



Standard Township Corners.

Fig. 2.

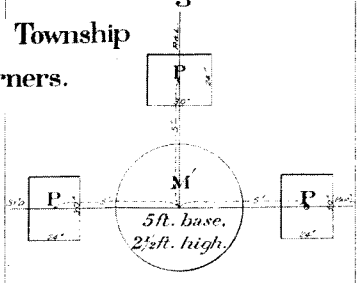
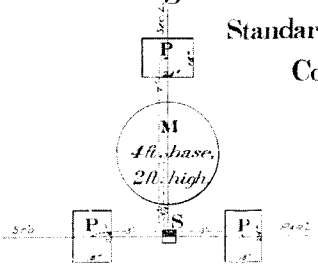


Fig. 3.



Standard Section Corners.

Fig.

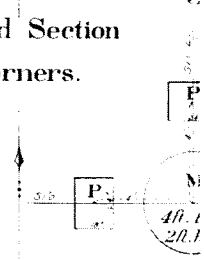


Fig. 7.

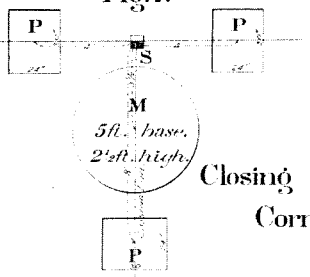
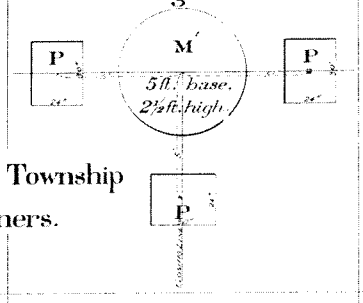
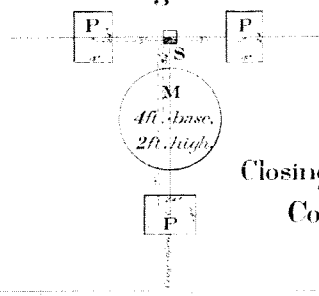


Fig. 8.



Closing Township Corners.

Fig. 10.



Closing Section Corners.

Fig.

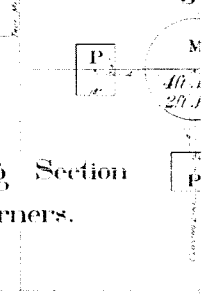


Fig. 14.

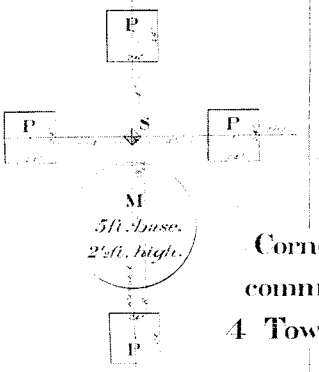
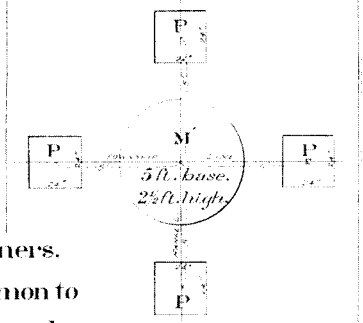


Fig. 15.



Corners. common to 4 Townships.

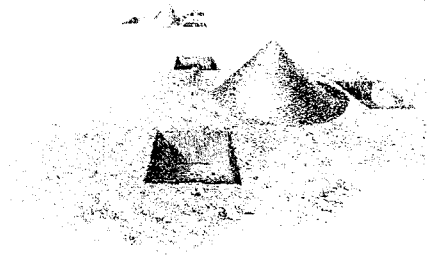
PLANS OF CORNE

EXPLANATIONS.

S. M. M′

W.

S.



E.

PERSPECTIVE.

of Standard Tp Cor. with Closing Tp Cor.

Fig. 16.

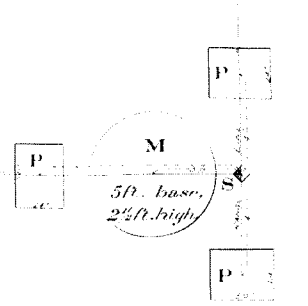
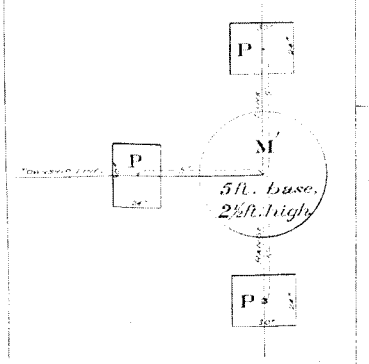


Fig. 17.



Corners. common to 2 Townships.

Fig. 22.

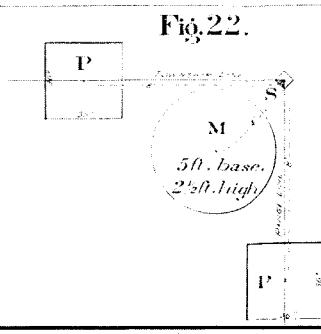
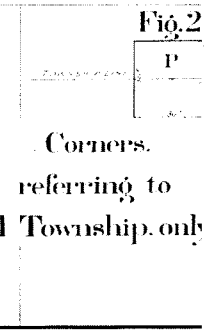


Fig. 2



Corners. referring to 1 Township. only

Fig. 3.

Fig. 4.

Standard Section Corners.

Fig. 5.

Standard Quarter Section Corners.

Fig. 6.

Fig. 10.

Fig. 11.

Closing Section Corners.

Fig. 12.

Fig. 13.

Corners common to 4 Sections.

Fig. 18.

Fig. 19.

Corners common to 2 Sections.

Fig. 20.

Fig. 21.

Corners referring to 1 Section only.

ANS OF CORNERS.

EXPLANATIONS.

PERSPECTIVE.

ndard Tp Cor., with Closing Tp Cor., in the distance.

Fig. 22.

Fig. 23.

Corners referring to 1 Township only.

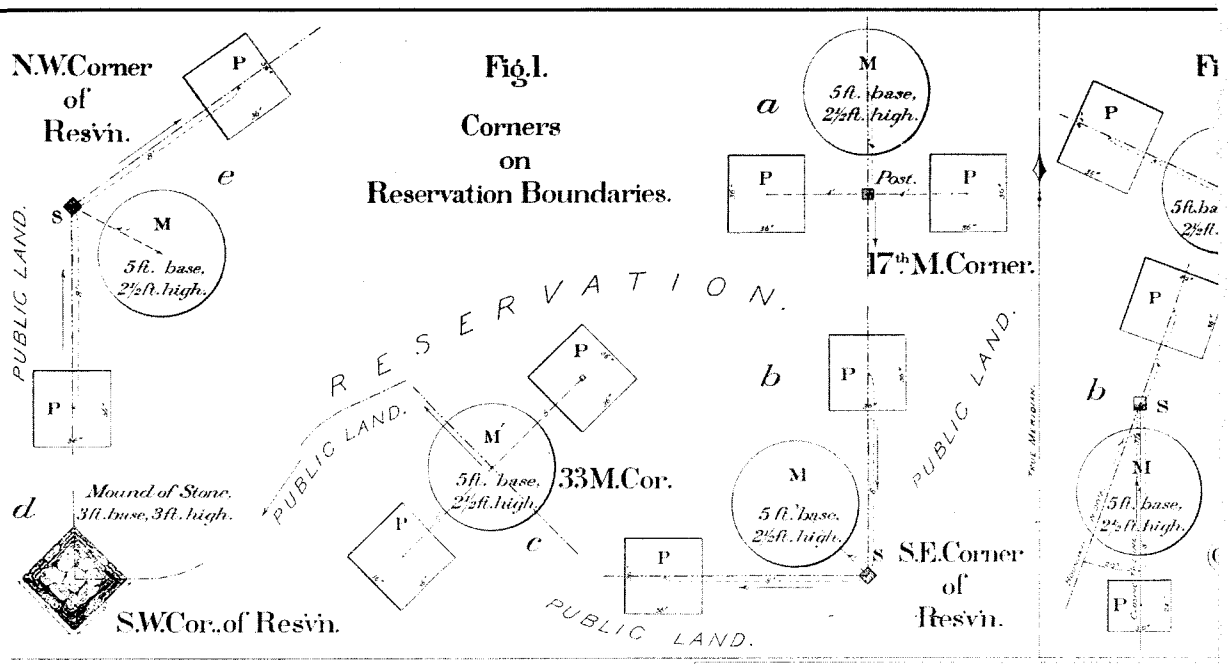
Fig. 24.

Quarter Sec. Cor. on a meridional line.

MEANDERABLE BODY OF WATER.

Fig. 25.

Meander Corners.



Convergency of Meridians.

Fig.5.

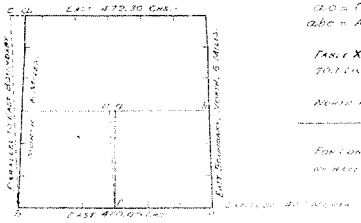


Fig.6.

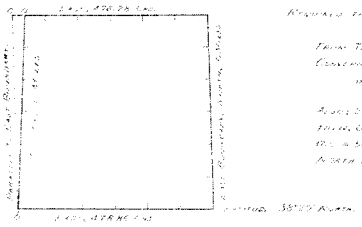
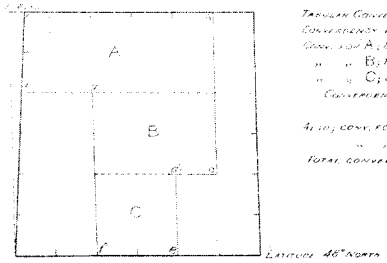


Fig.7.



PLANS OF CORNE

(Scale 1 inch = 1 foot.)

AND

Miscellaneous Diagrams.

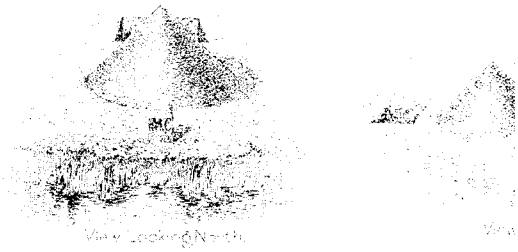
EXPLANATIONS.

S. Corner Stone. M. Mound. M. Mound with deposit of Coal.

Fig.8.

Meander Corner.

PERSPECTIVE.



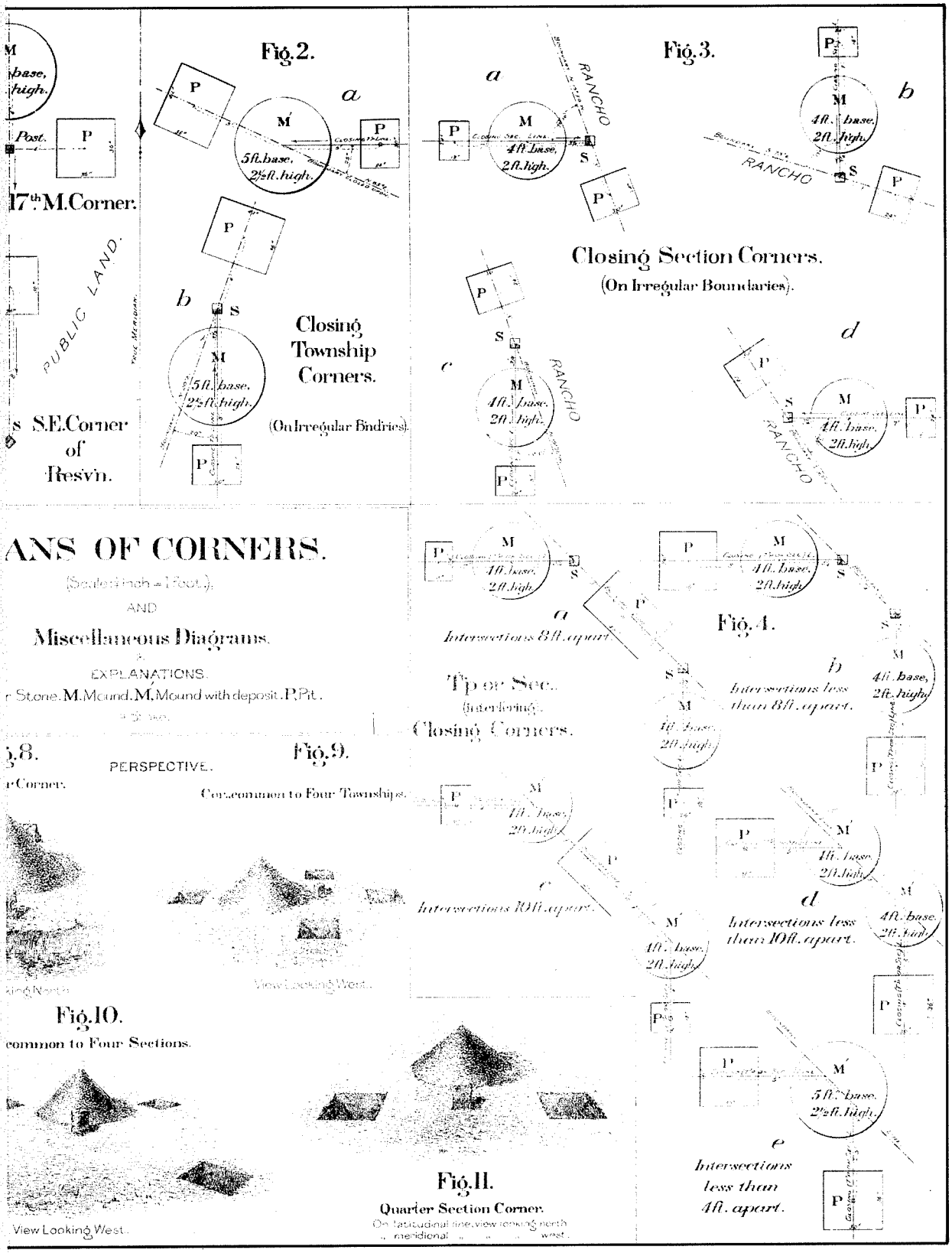
View Looking North.

Fig.10.

Cor. common to Four Sections.

View Looking West.

PLATE V.



17th M. Corner.
PUBLIC LAND.
S.E. Corner of Resvn.
Fig. 2.
Closing Township Corners.
(On Irregular Bndries).
Fig. 3.
Closing Section Corners.
(On Irregular Boundaries).
RANCHO
ANS OF CORNERS.
(Scale 1 inch = 1 foot.)
AND
Miscellaneous Diagrams.
EXPLANATIONS.
r Stone. M. Mound. M′. Mound with deposit. P. Pit.
PERSPECTIVE.
Fig. 9.
Cor. common to Four Townships.
View Looking West.
Fig. 10.
common to Four Sections.
View Looking West.
Fig. 11.
Quarter Section Corner.
On latitudinal line, view looking north
" meridional " " " west.
Fig. 4.
Tp or Sec.
(Interfering).
Closing Corners.
Intersections 8 ft. apart.
Intersections less than 8 ft. apart.
Intersections 10 ft. apart.
Intersections less than 10 ft. apart.
Intersections less than 4 ft. apart.

Fig. 1.

East Boundary defective in Alignment.

See Clause 1, Paragraph 1.

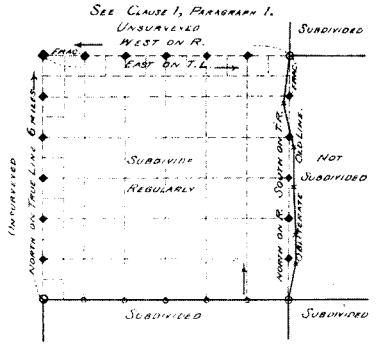


Fig. 2.

East Boundary defective in Measurement

See Clause 1, Paragraph 1.

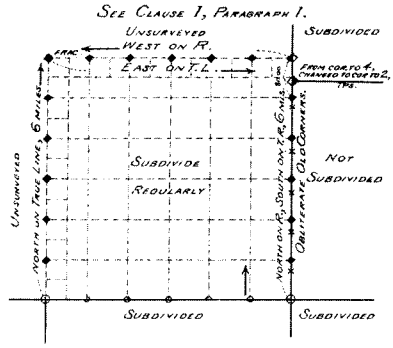


Fig. 3.

South Boundary defective in Alignment.

East " " " Position.

See Clause 1, Paragraph 1.

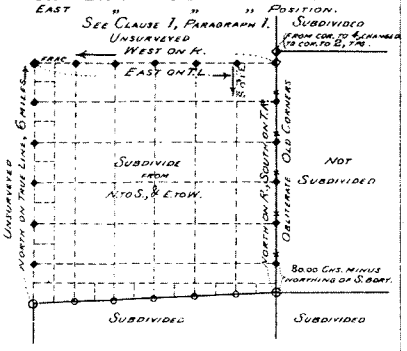


Fig. 6.

South and East Boundaries defective in Alignment, Measurement & Position.

See Clause 1, Paragraph 2.

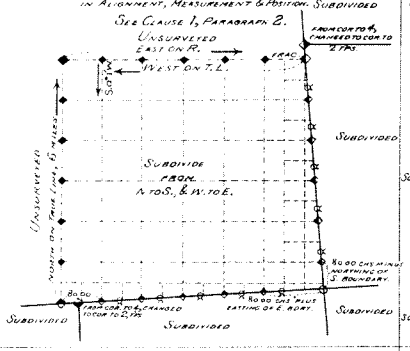


Fig. 7.

North Boundary
South " "
East " "
West " "
defective in Alignment, Measurement & Position.

See Clause 1, Paragraph 2.

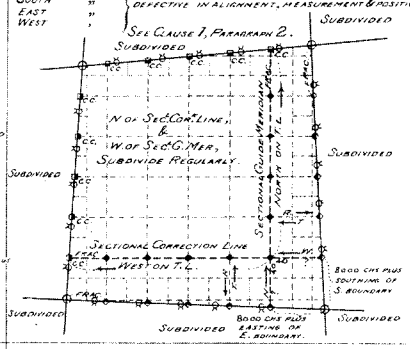


Fig. 8.

East Boundary defective in Measurement & Position.

See Clause 2, Paragraph 3.

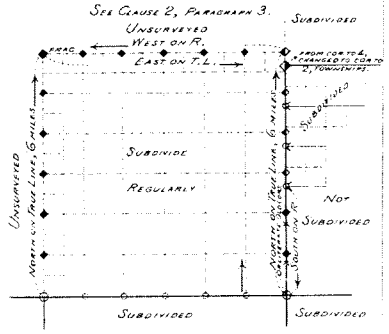


Fig. 9.

East Boundary defective in Alignment, Measurement and Position.

See Clause 3, Paragraph 3.

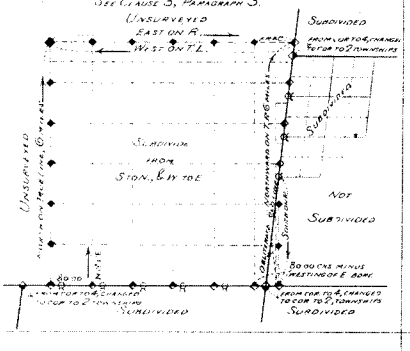


Fig. 10.

East Boundary defective in Measurement & Position

See Clause 4, Paragraph 3.

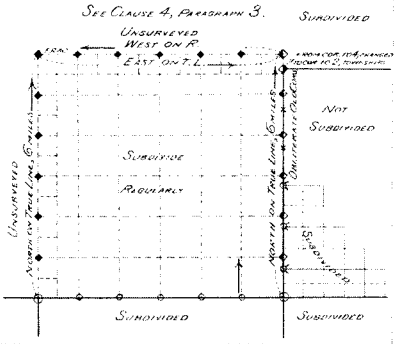


Fig. 11.

East Boundary defective in Alignment, Measurement & Position

See Clause 4, Paragraph 3.

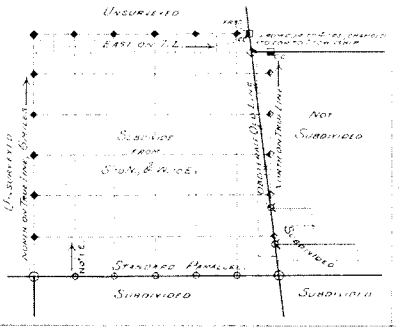


Fig. 12.

East Boundary defective in Measurement & Position.

See Clause 1, Paragraph 4.

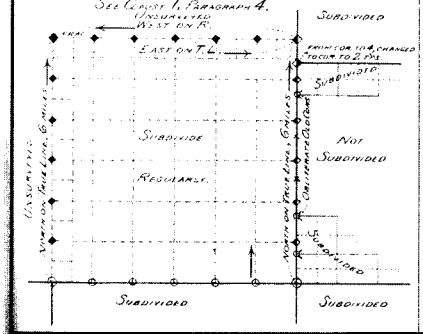


Fig. 13.

East Boundary defective in Alignment, Measurement & Position

See Clause 1, Paragraph 4.

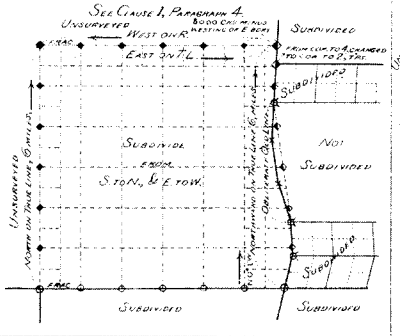


Fig. 14.

East Boundary defective in Alignment, Measurement & Position.

See Clause 1, Paragraph 4.

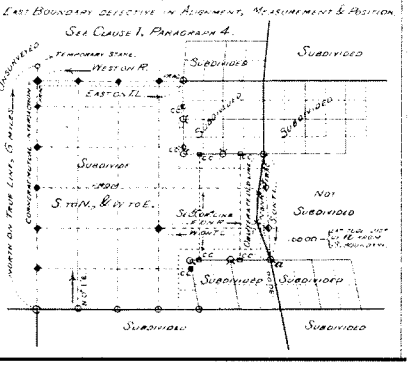


Fig. 3.

ITH BOUNDARY DEFECTIVE IN ALIGNMENT.
" " " POSITION.
SEE CLAUSE 1, PARAGRAPH 1.

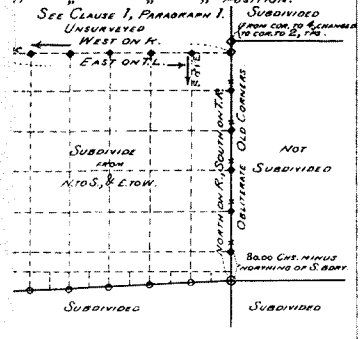


Fig. 4.

EAST BOUNDARY DEFECTIVE IN ALIGNMENT.
SEE CLAUSE 2. PARAGRAPH 1.

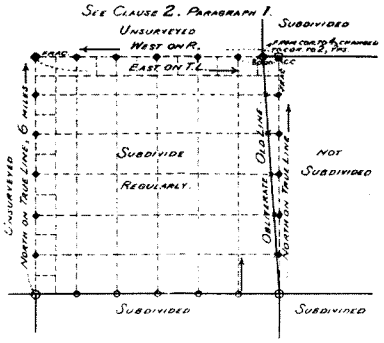


Fig. 5.

EAST BOUNDARY DEFECTIVE IN ALIGNMENT.
SEE CLAUSE 2, PARAGRAPH 1.

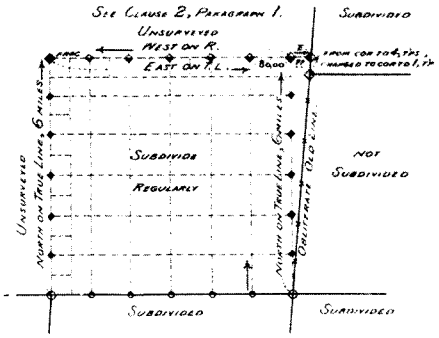


Fig. 8.

ST BOUNDARY DEFECTIVE IN MEASUREMENT & POSITION.
SEE CLAUSE 2, PARAGRAPH 3.

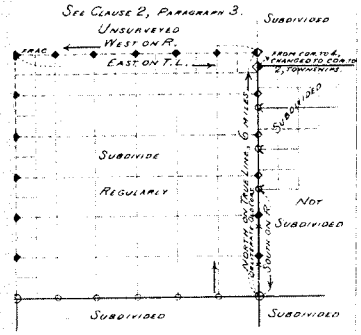


Fig. 11.

DARY DEFECTIVE IN ALIGNMENT, MEASUREMENT & POSITION
SEE CLAUSE 4, PARAGRAPH 3.

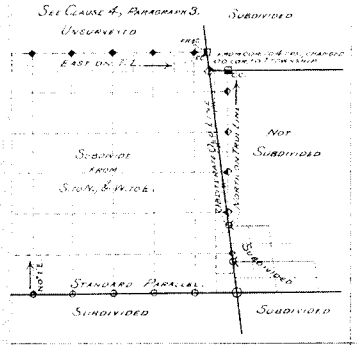


Fig. 14.

DARY DEFECTIVE IN ALIGNMENT, MEASUREMENT & POSITION
SEE CLAUSE 1, PARAGRAPH 4.

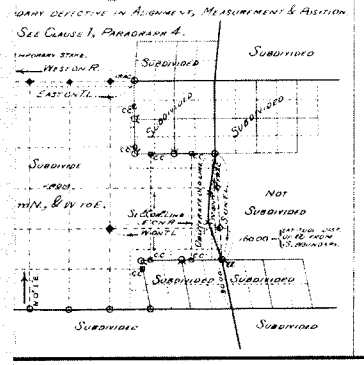
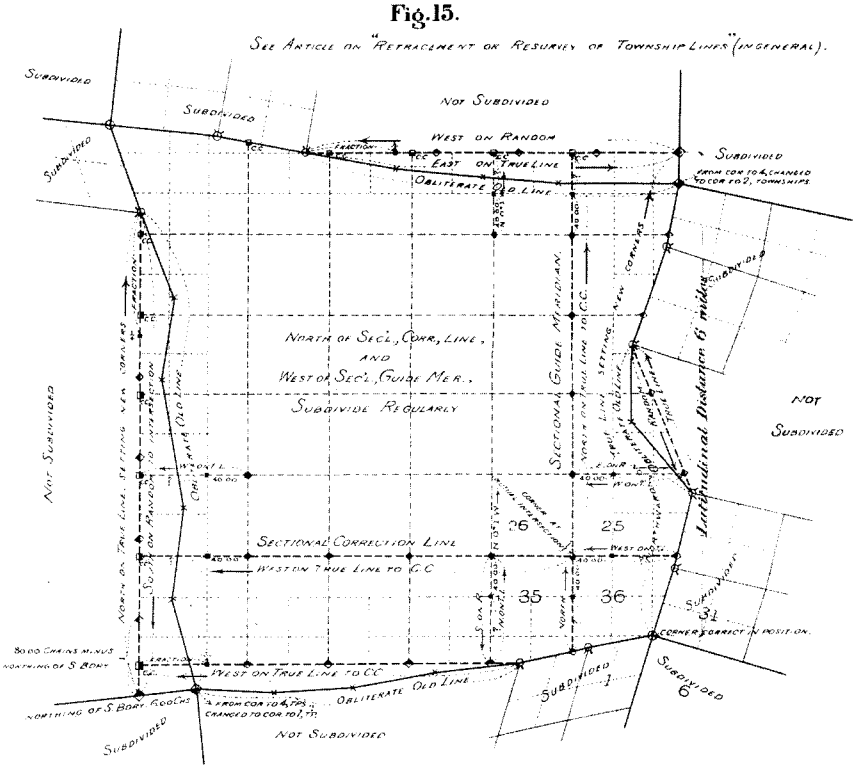


Fig. 15.

SEE ARTICLE ON "RETRACEMENT OR RESURVEY OF TOWNSHIP LINES" (IN GENERAL).



EXPLANATIONS.

Note.
The clauses and paragraphs referred to under the several figures are those of the Article on "Retracements and Resurveys" &c.

When not otherwise specified, distances between corners are assumed to be 40.00 or 80.00 chains, as the case may be.

When not otherwise specified, an old surveyed line is assumed to be correct in all particulars.

Detailed descriptions of the several figures are given in the Article on "Methods of Executing New Surveys" &c.

- Old Surveyed Lines.
- New Lines, to be surveyed.
- ○ Old corners, to remain unchanged in all particulars.
- ○ " to be changed from corners common to 4 Tps. or Secs., to corners to 1 Tp. or Sec. only, in original positions.
- ○ " " " " " " " " " " " " " " " Com'n to 2 Tps. or Secs. " " "
- × " " " completely obliterated
- New corners referring to 1 township or section only.
- " common to 2 townships or sections
- " " " 4 " " "
- " " " 2 quarters of one section, or 4 quarters of two sections
- New closing corners
- ◇ Temporary stakes, to be removed when permanent corners are established.

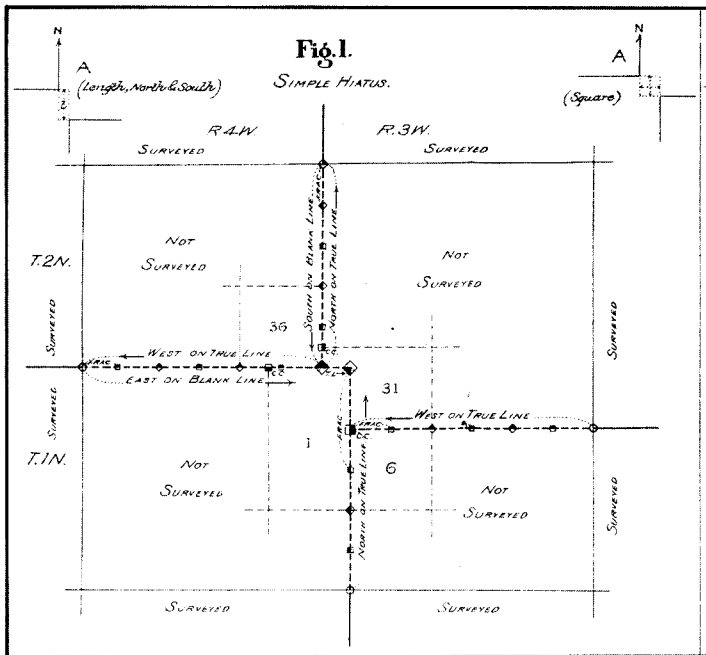


Fig. 1.
Simple Hiatus.
A (Length, North & South)
A (Square)
R.4W.
R.3W.
Surveyed
Not Surveyed
T.2N.
T.1N.
36
31
1
6
West on True Line
East on Blank Line
South on Blank Line
North on True Line

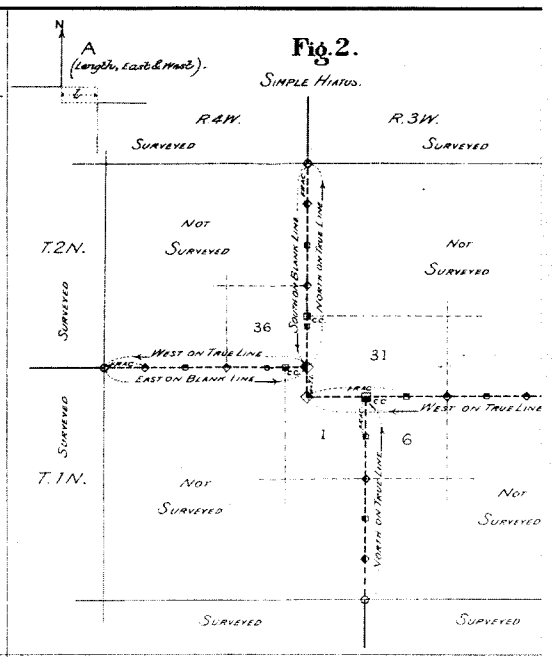


Fig. 2.
Simple Hiatus.
A (Length, East & West)
R.4W.
R.3W.
Surveyed
Not Surveyed
T.2N.
T.1N.
36
31
1
6
West on True Line
East on Blank Line
South on Blank Line
North on True Line

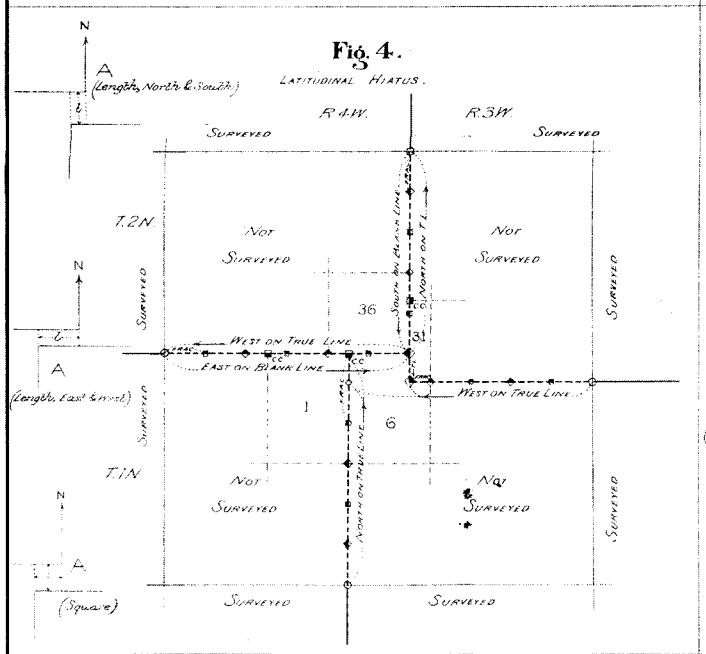


Fig. 4.
Latitudinal Hiatus.
A (Length, North & South)
A (Length, East & West)
A (Square)
R.4W.
R.3W.
Surveyed
Not Surveyed
T.2N.
T.1N.
36
31
1
6
West on True Line
East on Blank Line
South on Blank Line
North on True Line

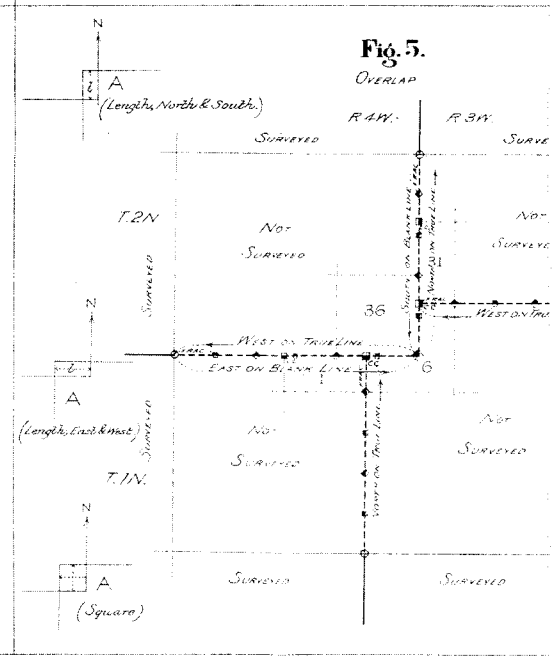


Fig. 5.
Overlap
A (Length, North & South)
A (Length, East & West)
A (Square)
R.4W.
R.3W.
Surveyed
Not Surveyed
T.2N.
T.1N.
36
6
West on True Line
East on Blank Line

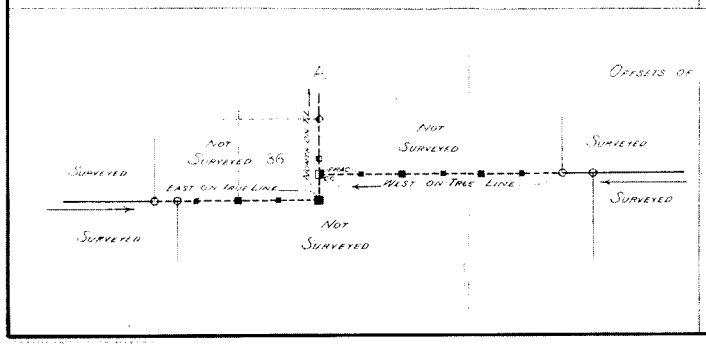


Fig. 7.
Offsets of Standard Parallels.
A
Surveyed
Not Surveyed
36
East on True Line
West on True Line
North on True Line

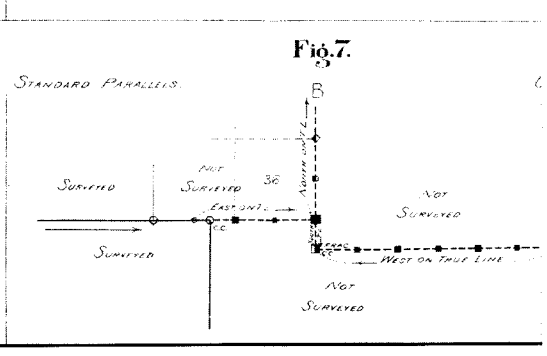

B
Surveyed
Not Surveyed
36
East on True Line
West on True Line
North on True Line

PLATE VII.

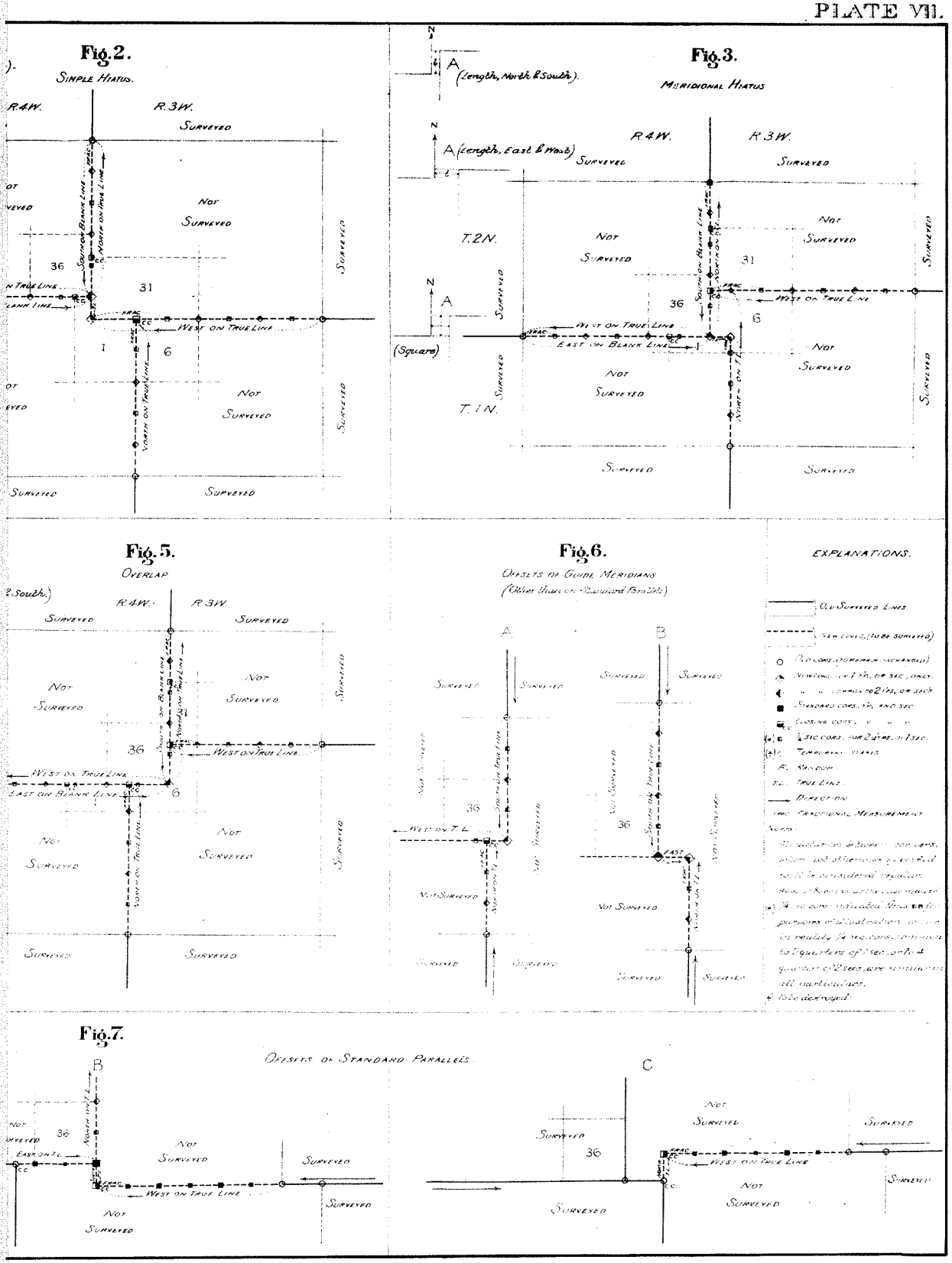
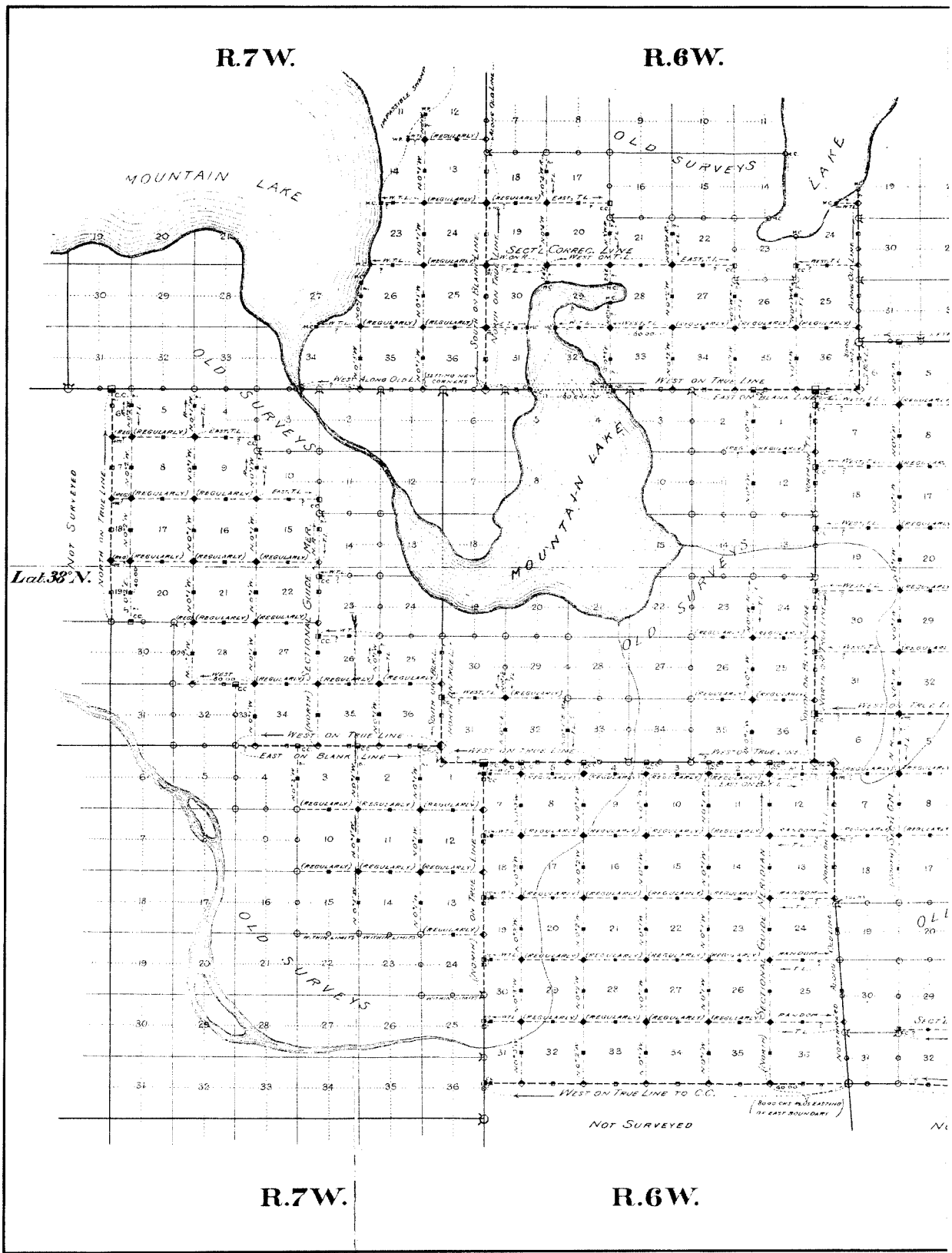
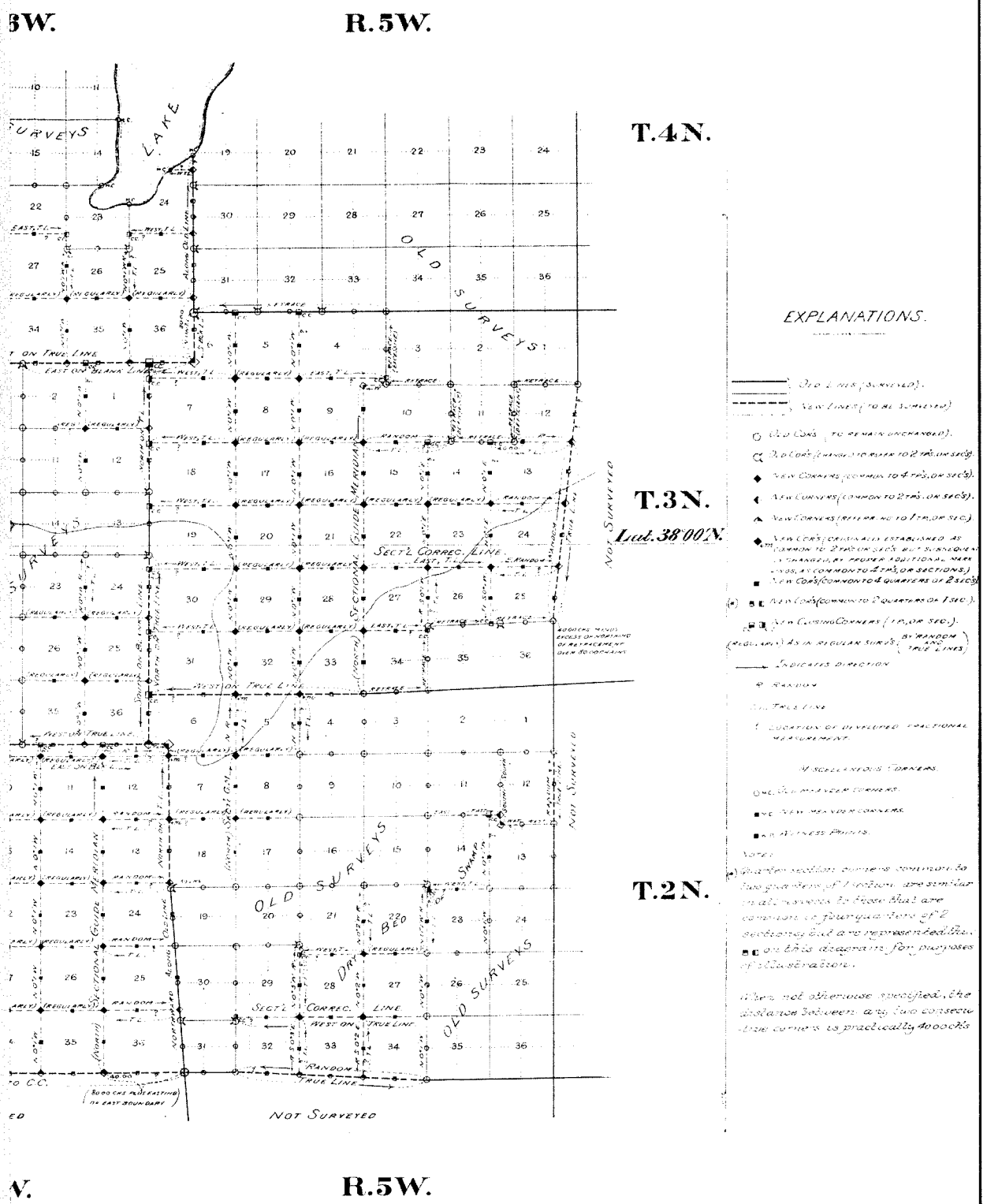


Fig. 2.
Simple Hiatus.
R.4W.
R.3W.
Surveyed
Not Surveyed
36
31
1
6
West on True Line
North on True Line
South on Blank Line
Fig. 3.
Meridional Hiatus
A (Length, North & South).
A (Length, East & West)
T.2N.
T.1N.
(Square)
West on True Line
East on Blank Line
Fig. 5.
Overlap
Fig. 6.
Offsets of Guide Meridians
(Other than on Standard Parallels)
Fig. 7.
Offsets of Standard Parallels
Explanations.
Old Surveyed Lines.
New Lines (to be surveyed)
Old cors. (to remain unchanged)
Newtons, for 1 ft. or sec. only.
Standard cors. 1/4 and sec.
Closing cors.
1/4 sec. cors. for 2 qrs. of 1 sec.
Temporary stakes
R. Random.
T.L. True Line.
Direction
Fractional Measurement
Notes:
(*) 1/4 sec. cors. indicated thus for purposes of illustration, in reality 1/4 sec. cors. common to 3 quarters of 1 sec. or to 4 quarters of 2 secs. are similar in all particulars.
(+) To be destroyed.


R.7W.
R.6W.
MOUNTAIN LAKE
OLD SURVEYS
LAKE
SECT'L CORREC. LINE
WEST ON TRUE LINE
EAST ON BLANK LINE
NOT SURVEYED
NORTH ON TRUE LINE
SECTIONAL GUIDE MER.
Lat. 38° N.
WEST ON TRUE LINE TO C.C.
NOT SURVEYED
R.7W.
R.6W.


R.5W.
T.4N.
T.3N.
Lat. 38°00'N.
T.2N.
R.5W.
LAKE
OLD SURVEYS
SECT'L CORREC. LINE
NOT SURVEYED
EXPLANATIONS.

(This copy of the Circular Pamphlet, issued in 1909, is taken from an original now in the possession of the BLM, Oregon State Office, Portland.)

GENERAL LAND OFFICE RESTORATION OF LOST OR OBLITERATED CORNERS AND SUBDIVISION OF SECTIONS

Revision of June 1, 1909
[Reprinted July 1, 1916]

DEPARTMENT OF THE INTERIOR
WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

[Page 2]

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PENALTIES FOR DESTROYING CORNER MONUMENTS.

To aid in the protection of all evidences of public-land surveys, a clause was enacted in chapter 398, 29 United States Statutes, page 343, prohibiting the destruction or removal of monuments of any United States survey, and fixing penalties for violation.

This clause was amended by section 57 of the act approved March 4, 1909, revising and amending the penal laws of the United States, to read as follows:

SEC. 57. Whoever shall willfully destroy, deface, change, or remove to another place any section corner, quarter-section corner, or meander post, on any Government line of survey, or shall willfully deface, change, or remove any monument or bench mark of any government survey, shall be fined not more than two hundred and fifty dollars, or imprisoned not more than six months, or both.

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[Page 5]

RESTORATION OF LOST AND OBLITERATED CORNERS.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., June 1, 1909.

1. The increasing number of letters from county and local surveyors received at this office making inquiry as to the proper method of restoring to their original position lost or obliterated corners marking the survey of the public lands of the United States, or such as have been willfully or accidentally moved from their original position, have rendered the preparation of the following general rules necessary, particularly as in a very large number of cases the immediate facts necessary to a thorough and intelligent understanding are omitted. Moreover, surveys having been made under the authority of different acts of Congress, different results have been obtained, and no special law has been enacted by that authority covering and regulating the subject of the above-named inquiries. Hence, the general rule here given must be considered merely as an expression of the opinion of this office on the subject, based, however, upon the spirit of the several acts of Congress authorizing the surveys, as construed by this office, and by United States court decisions. When cases arise which are not covered by these rules, and the advice of this office is desired, the letter of inquiry should always contain a description of the particular corner, with reference to the township, range, and section of the public surveys, to enable this office to consult the record.

2. An obliterated corner is one where no visible evidence remains of the work of the original surveyor in establishing it. Its location may, however, have been preserved beyond all question by acts of landowners, and by the memory of those who knew and recollect the true situs of the original monument. In such cases it is not a lost corner.

A lost corner is one whose position can not be determined, beyond reasonable doubt, either from original marks or reliable external evidence.

Surveyors sometimes err in their decision whether a corner is to be treated as lost or only obliterated.

3. Surveyors who have been United States deputies should bear in mind that in their private capacity they must act under somewhat different rules of law from those governing original surveys, and should carefully distinguish between the provisions of the statute which guide a government deputy and those which apply to retracement of lines once surveyed. The failure to observe this distinction has been prolific of erroneous work and injustice to landowners.

4. To restore extinct boundaries of the public lands correctly, the surveyor must have some knowledge of the manner in which townships were subdivided by the several methods authorized by Congress. Without this knowledge he may be greatly embarrassed in

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the field, and is liable to make mistakes invalidating his work, and leading eventually to serious litigation.

5. Various regions of this country were surveyed under different sets of instructions issued at periods ranging from 1785 to the present time. The earliest rules were given to deputy surveyors in manuscript or in printed circulars, and no copies are available for distribution.

Regulations more in detail, improving the system for greater accuracy and permanency, were issued in book form, editions of 1855, 1871, 1890, 1894, and 1902. The supply of copies of these is exhausted, except the latest, which is now sold at cost to unofficial applicants by the Superintendent of Documents.

6. The chief acts of Congress authorizing and regulating public-land surveys are summarized below to enable anyone to consult the full record thereof for explanation of difficult questions regarding early surveys.

7. Compliance with the provisions of congressional legislation at different periods has resulted in two sets of corners being established on township lines at one time; at other times three sets of corners have been established on range lines; while the system now in operation makes but one set of corners on township boundaries, except on standard lines—i. e., base and correction lines, and in some exceptional cases.

The following brief explanation of the modes which have been practiced will be of service to all who may be called upon to restore obliterated boundaries of the public-land surveys:

Where two sets of corners were established on township boundaries, one set was planted at the time the exteriors were run, those on the north boundary belonging to the sections and quarter sections north of said line, and those on the west boundary belonging to the sections and quarter

sections west of that line. The other set of corners was established when the township was subdivided. This method, as stated, resulted in the establishment of two sets of corners on all four sides of the townships.

Where three sets of corners were established on the range lines, the subdivisional surveys were made in the above manner, except that the east and west section lines, instead of being closed upon the corners previously established on the east boundary of the township, were run due east from the last interior section corner, and new corners were erected at the points of intersection with the range line.

8. The method now in practice, where regular conditions are found, requires section lines to be initiated at the corners on the south boundary of the township, and to close on existing corners on the east, north, and west boundaries of the township, except that when the north boundary is a base line or standard parallel, new corners are set thereon, called closing corners. But in some cases, for special reasons, an opposite course of procedure has been followed, and subdivisional work has been begun on the north boundary and has been extended southward.

9. For the above reasons it is evident that a subsequent surveyor ought not to perform field work without knowing all the facts of the original survey, lest there be unsuspected duplication of official corners, leading him to use the wrong one in his survey. Upon township and range lines it is often necessary to procure copies of the plats of surveys on both sides, in order to become certain of the necessary

understanding of the case, as required in section 57 of this circular. A great many township plats fail to show the second set of corners, established in the survey of an adjoining township, subsequent to the plat of the former township.

10. In the more recent general instructions greater care has been exercised to secure rectangular subdivisions by fixing a strict limitation that no new township exteriors or section lines shall depart from a true meridian or east and west line more than twenty-one minutes of arc; and that where a random line is found liable to correction beyond this limit, a true line on a cardinal course must be run, setting a closing corner on the line to which it closes.

This produces, in new surveys closing to irregular old work, a great number of exteriors marked by a double set of corners. All retracing surveyors should proceed under these new conditions with full knowledge of the field notes and exceptional methods of subdivision.

SYNOPSIS OF ACTS OF CONGRESS.

11. The first enactment in regard to the surveying of the public lands was an ordinance passed by the Congress of the Confederation May 20, 1785, prescribing the mode for the survey of the "Western Territory," and which provided that said territory should be divided into "townships of six miles square, by lines running due north and south, and others crossing them at right angles" as near as might be.[1]

It further provided that the first line running north and south should begin on the Ohio River at a point due north from the western terminus of a line run as the south boundary of the State of Pennsylvania, and the first line running east and west should begin at the same point and extend through the whole territory. In these initial surveys only the exterior lines of the townships were surveyed, but the plats were marked by subdivisions into sections 1 mile square, numbered from 1 to 36, commencing with No. 1 in the southeast corner of the township, and running from south to north in each tier to No. 36 in the northwest corner of the township; mile corners were established on the township lines. The region embraced by the surveys under this law forms a part of the present State of Ohio, and is generally known as "the Seven Ranges."

12. The Federal Congress passed a law, approved May 18, 1796, in regard to surveying the public domain, which applied to "the territory northwest of the River Ohio, and above the mouth of the Kentucky River."[2]

Section 2 of said act provided for dividing such lands as had not been already surveyed or disposed of "by north and south lines run according to the true meridian, and by others crossing them at right angles, so as to form townships of six miles square," etc. It also provided that "one-half of said townships, taking them alternately, should be subdivided into sections containing, as nearly as may be, 640 acres each, by running through the same each way parallel lines at the end of every two miles; and by marking a corner on each of said lines at the end of every mile." The act also provided that "the sections shall be numbered, respectively, beginning with the

number one in the northeast section, and proceeding west and east alternately through the township, with progressive numbers till the thirty-sixth be completed." This method of numbering sections is still in use.

13. An act amendatory of the foregoing, approved May 10, 1800, required the "townships west of the Muskingum, which are directed to be sold in quarter townships, to be subdivided into half sections of 320 acres each, as nearly as may be, by running parallel lines through the same from east to west, and from south to north, at the distance of one mile from each other, and marking corners, at the distance of each half mile on the lines running from east to west, and at the distance of each mile on those running from south to north. And the interior lines of townships intersected by the Muskingum, and of all townships lying east of that river, which have not been heretofore actually subdivided into sections, shall also be run and marked * * *. And in all cases where the exterior lines of the townships thus to be subdivided into sections or half sections, shall exceed or shall not extend six miles, the excess or deficiency shall be specially noted, and added to or deducted from the western or northern ranges of sections or half sections in such townships, according as the error may be in running the lines from east to west or from south to north." Said act also provided that the northern and western tiers of sections should be sold as containing only the quantity ex-

1. Ordinance of the Congress of the Confederation of May 20, 1785. U. S. Land Laws, p. 349, edition 1828.

2. Act of May 18, 1796. U. S. Statutes at Large, vol. 1, p. 465. Section 2395, U. S. Revised Statutes.

pressed on the plats, and all others as containing the complete legal quantity.[3]

14. The act approved June 1, 1796, "regulating the grants of land appropriated for military services," etc., provided for dividing the "United States Military Tract," in the State of Ohio, into townships 5 miles square, each to be subdivided into quarter townships containing 4,000 acres.[4]

15. Section 6 of the act approved March 1, 1800, amendatory of the foregoing act, enacted that the Secretary of the Treasury was authorized to subdivide the quarter townships into lots of 100 acres, bounded as nearly as practicable by parallel lines 160 perches in length by 100 perches in width. These subdivisions into lots, however, were made upon the plats in the office of the Secretary of the Treasury, and the actual survey was only made at a subsequent time when a sufficient number of such lots had been located to warrant the survey. It thus happened, in some instances, that when the survey came to be made the plat and survey could not be made to agree, and that fractional lots on plats were entirely crowded out. A knowledge of this fact may explain some of the difficulties met with in the district thus subdivided.[5]

16. The act of greatest importance to the work of all retracing surveyors is the one approved February 11, 1805, which is still in force, as reenacted by revision in 1873. It directs the subdivision of public lands into quarter-sections, and sets forth three principles for ascertaining the boundaries and contents of tracts of public land, after survey, in substance as follows:[6]

17. (a) All corners marked in the surveys returned by the surveyor-general shall be established as the proper corners of the sections or quarter-sections which they were intended to designate, and corners

of half and quarter sections not marked shall be placed as nearly as possible "equidistant from those two corners which stand on the same line."

18. (b) "The boundary lines actually run and marked" (in the field) "shall be established as the proper boundary lines of the sections, or subdivisions, for which they were intended, and the length of such lines as returned by either of the surveyors aforesaid shall beheld and considered as the true length thereof. And the boundary lines which shall not have been actually run and marked as aforesaid shall be ascertained by running straight lines from the established corners to the opposite corresponding corners, but in those portions of the fractional townships where no such opposite or corresponding corners have been or can be fixed, the said boundary lines shall be ascertained by running from the established corners due north and south" (see secs. 67 and 79) "or east and west lines, as the case may be, to the water course, Indian boundary line, or other external boundary of such fractional township."

3. Act of May 10, 1800. U. S. Statutes at Large, vol. 2, p. 73. Section 2395, U. S. Revised Statutes.

4. Act of June 1, 1796. U. S. Statutes at Large, vol. 1, p. 490.

5. Act of March 1, 1800. U.S. Statutes at Large, vol. 2, p. 14.

6. Act of February 11, 1805. U.S. Statutes at Large, vol. 2, p. 313. Section 2396, U.S. Revised Statutes.

19. (c) "Each section, or subdivision of section, the contents whereof shall have been returned by the surveyor-general, shall be held and considered as containing the exact quantity expressed in such return; and the half-sections and quarter-sections, the contents whereof shall not have been thus returned, shall be held and considered as containing the one-half or the one-fourth part, respectively, of the returned contents of the section of which they may make part."

20. These three principles were clearly designed for the purpose of establishing beyond dispute all lines and monuments of accepted official surveys and of placing a statutory limitation against attempts to alter the same, or to set up complaints of deficiency of area as a basis for resurvey.

PENALTIES FOR REMOVAL OF MONUMENTS.

21. Several of the States have passed laws prescribing penalties for the destruction or removal of United States survey corners, and the act of Congress quoted on page 2 relates to such destruction or removal in all the States and Territories. Any person having knowledge of a violation of the law last mentioned may present legal evidence thereof to the United States attorney for the district in which the land lies, and request the prosecution of the offender. Should any such attorney improperly refuse to take action, the matter may be called to the attention of the Department of Justice, Washington, D. C.

22. The act of Congress approved April 24, 1820, provides for the sale of public lands in half-quarter sections, and requires that "in every case of the division of a quarter section the line for the division thereof shall run north and south," "and fractional sections, containing 160 acres and upwards, shall in like manner, as nearly as practicable, be subdivided into half quarter sections, under such rules and regulations as may be prescribed by the Secretary of the Treasury; but fractional sections containing less than 160 acres shall not be divided."[7]

23. The act of Congress approved May 24, 1824, provides "that whenever, in the opinion of the President of the United States, a departure from the ordinary mode of surveying land on any river, lake, bayou, or water course would promote the public interest, he may direct the surveyor-general in whose district such land is situated, and where the change is intended to be made, under such rules and regulations as the President may prescribe, to cause the lands thus situated to be surveyed in tracts of two acres in width, fronting on any river, bayou, lake, or water course, and running back the depth of forty acres."[8]

24. The act of Congress approved April 5, 1832, directed the subdivision of the public lands into quarter-quarter sections; that in every case of the division of a half-quarter section the dividing line should run east and west, and that fractional sections should be subdivided, under regulations prescribed by the Secretary of the Treasury. Under the latter

7. Act of April 24, 1820. U.S. Statutes at Large, vol. 3 p. 566. Section 2397, U.S. Revised Statutes.

8. Act of May 24, 1824. U.S. Statutes at Large, vol. 4, p. 34.

provision the Secretary directed that fractional sections containing less than 160 acres, or the residuary portion of a fractional section, after the subdivision into as many quarter-quarter sections as it is susceptible of, may be subdivided into lots, each containing the quantity of a quarter-quarter section as nearly as practicable, by so laying down the line of subdivision that they shall be 20 chains wide, which distances are to be marked on the plat of subdivisions, as are also the areas of the quarter quarters and residuary fractions.[9]

These two acts last mentioned provided that the corners and contents of half-quarter and quarter-quarter sections should be ascertained as nearly as possible in the manner and on the principles prescribed in the act of Congress approved February 11, 1805.

GENERAL RULES.

25. From the foregoing synopsis of congressional legislation it is evident—

First. That the boundaries of the public lands established and returned by the duly appointed government surveyors, when approved by the surveyors-general and accepted by the Government, are unchangeable.

Second. That the original township, section, and quarter-section corners established by the Government surveyors must stand as the true corners which they were intended to represent, whether the corners be in the place shown by the field-notes or not.

Third. That quarter-quarter corners not established by the government surveyors shall be placed on the straight lines joining the section and quarter-section corners and midway between them, except on the last half mile of section lines closing on the north and west boundaries of the township, or on other lines between fractional sections.

Fourth. That all subdivisional lines of a section running between corners established on the original survey of a township must be straight lines, running from the proper corner in one section line to its opposite corresponding corner in the opposite section line. (See secs. 75 to 82.)

Fifth. That in a fractional section where no opposite corresponding corner has been or can be established, any required subdivision line of

such section must be run from the proper original corner in the boundary line as nearly due east and west, or north and south, as the case may be, to the water course, Indian reservation, or other boundary of such section, as due parallelism to section lines will permit, under the modifying rule in sec. 79.

26. From the foregoing it will be plain that extinct corners of the government surveys must be restored to their original locations, whenever it is possible to do so; and hence resort should always be first had to the marks of the survey in the field. The locus of the missing corner should be first identified on the ground by the aid of the mound, pits, line trees, bearing trees, etc., described in the field notes of the original survey.

9. Act of April 5, 1832. U. S. Statutes at Large, vol. 4, p. 503. Section 2397, U. S. Revised Statutes.

27. The identification of mounds, pits, buried memorials, witness trees, or other permanent objects noted in the field notes of survey, affords the best means of relocating the missing corner in its original position. If this can not be done, clear and convincing testimony of citizens as to the place it originally occupied should be taken, if such can be obtained. In any event, whether the locus of the corner be fixed by the one means or the other, such locus should always be tested and confirmed by measurements to known corners. No definite rule can be laid down as to what shall be sufficient evidence in such cases, and much must be left to the skill, fidelity, and good judgment of the surveyor in the performance of his work.

28. Actions or decisions by county surveyors which may result in changes of boundaries of tracts of land and involve questions of ownership in connection therewith, are subject to review by the local courts in proceedings instituted in accordance with the local statutes governing such matters.

EXCEPTIONAL CASES.

29. When new measurements are made on a single line to determine the position thereon for a restored lost corner (for example, a quarter-section corner on line between two original section corners), or when new measurements are made between original corners on two lines for the purpose of fixing by their intersection the position of a restored missing corner (for example, a corner common to four sections or four townships), it will almost invariably happen that discrepancies will be developed between the new measurements and the original measurements in the field notes. When these differences occur the surveyor will in all cases establish the missing corner by proportionate measurements (see secs. 49, 83, 84, and 85) on lines conforming to the original field notes and by the method followed in the original survey. From this rule there can be no departure, since it is the basis upon which the whole operation depends for accuracy and truth.

30. In cases where the relocated corner can not be made to harmonize with the field notes in all directions, and unexplained discrepancy in the original survey is apparent, it sometimes becomes the task of the surveyor to place it according to the requirements of one line and against the calls of another line. For instance, if the line between sections 30 and 31, reported 78 chains long, would draw the missing corner on range line 1 chain eastward out of range with the other exterior corners, the presumption would be strong that the range line had been run straight and the length of the section line wrongly

reported, because experience shows that west random lines are regarded as less important than range lines and more liable to error.

31. Again, where a corner on a standard parallel has been obliterated, it is proper to assume that it was placed in line with other corners, and if an anomalous length of line reported between sections 3 and 4 would throw the closing corner into the northern township, a surveyor would properly assume that the older survey of the standard line is to control the length of the later and minor line. The mark or corners

found on such a line closing to a standard parallel fix its location, but its length should be limited by its actual intersection, at which point the lost closing may be placed.

32. The strict rule of the law that "all corners marked in the field shall be established as the corners which they were intended to designate," and the further rule that "the length of lines returned by the surveyors shall be held and considered as the true length thereof," are found in some cases to be impossible of fulfillment in all directions at once, and a surveyor is obliged to choose, in his own discretion, which of two or more lines must yield, in order to permit the rules to be applied at all.

33. In a case of an erroneous but existing closing corner, which was set some distance out of the true state boundary of Missouri and Kansas, it was held by this office that a surveyor subdividing the fractional section should preserve the boundary as a straight line, and should not regard said closing corner as the proper corner of the adjacent fractional lots. The said corner was considered as fixing the position of the line between two fractional sections, but that its length extended to a new corner to be set on the true boundary line. The surveyor should therefore preserve such an original corner as evidence of the line; but its erroneous position should not be allowed to cause a crook between mile corners of the original state boundary. It is only in cases where it is manifestly impossible to carry out the literal terms of the law that a surveyor can be justified in making such a decision.

34. The principle of the preponderance of one line over another of less importance has been recognized in the rule for restoring a section corner common to two townships, in former editions of this circular. The new corner should be placed on the township line; and measurements to check its position by distances to corners within the townships are useful to confirm it if found to agree well, but should not cause it to be placed off the line if found not to agree, if the general condition of the boundary supports the presumption that it was properly aligned.

MAGNETIC DECLINATION.

35. The subject of the "variation," formerly deemed most important in surveys, is mentioned here only to advise against its use as a basis for the location of any lost line, though it may be a temporary guide in a preliminary search for old evidences. Its importance is greatly overrated, from lack of knowledge of the actual practice of surveyors, in the days when both their instruments and their knowledge were more primitive.

36. The General Land Office prohibits its employees and contracting surveyors from depending to any extent on courses derived from the needle. It also declines to advise other surveyors what variation to use in their own regions, for evident reasons, as follows:

The amount of local magnetism can not truly be determined by any process of mere calculation.

The secular change of declination reported at some distant time and place is no safe guide to the fact at any other station or period.

The variation recorded in old work may have been quite incorrect, as large contracts were sometimes executed by assuming a variation, from hearsay or estimation, and without due verification.

The needle is not only subject to daily and yearly change, but is also liable to defects in the instrument, so that different compasses may run different courses.

37. Another serious cause of distrust is found in the authorized rules followed in early surveys, down to the year 1864, under which a vast amount of public land was surveyed with a record showing variations which were openly inconsistent, and which should here be explained.

Before 1864, in running random and true section lines, it was required to make the record of courses on the ancient plan shown by this example: East on a random line between sections 1 and 12. Variation 13° 15′ E. (falling perhaps 42 links north of objective corner). West on true line between sections 1 and 12. Variation 12° 57′ E., etc., thus representing the "corrected" course by a nominal change of variation; whereas, after the instructions of 1864, the record would truly show the change to have been, not in the variation, but in the course, thus: N. 89° 42′ W. on a true line, etc.

Therefore, in a large portion of the early records, the words "east" and "west" in such connection were only approximate, while by the present system the true course is intended.

38. Terrestrial magnetism, the cause of "variation," is a fluctuating quantity, subject to unexplained changes. But since all qualified surveyors and engineers of this day are competent to make the requisite astronomical observations to determine true courses, surveying by the needle is not recommended.

MARKS ON MONUMENTS OF SURVEY.

39. Inquiries are often made to learn the meaning of the marks on corner stones. It is not practicable here to give an abstract of all the markings used in full compliance with the manual; but the following notes will suffice to explain ordinary cases:

Notches made on the east and south angles of an interior section corner indicate how many miles it is from the east and south lines of a full township; and by using the plan of a township plat, the numbers of the sections about the given corner stone will be known. In fractional townships, marks show the sections the same as if the boundaries were complete.

40. Observe that there are cases of irregular subdivision, where the stone or post is a corner of two townships or two sections only; also that stones may have been sometimes overthrown or turned around to a new and improper position.

41. On township and range lines grooves cut in the stone or post on opposite sides show distances to exterior corners of the township. Thus, two grooves on the south and four on the north indicate a corner of sections 19, 24, 25, and 30.

42. "W C" upon a monument means a witness corner, placed not at the true corner point (which may be in water or otherwise impracticable), but established elsewhere on safe

ground at a distance and course shown by the official field notes and plats.

"M C" shows a meander corner, placed either on an exterior or section line at any certain distance from a section corner as shown by the plat.

43. "S C" denotes a standard corner—that is, a regular corner on a standard parallel—belonging to two sections on the north side, with a closing corner (marked C C) somewhere east or west of it, belonging to two sections on the south side of the parallel. The letters C C are also used in many other situations, where a regular line closed upon a boundary of a State, a reservation, or a private land claim.

44. Post corners and bearing trees (B T) have marks that are self-explanatory. Two chops or notches on the two opposite sides of a tree indicate that it stood upon the original line when surveyed. Such are called "line trees," and are thus distinguished from trees merely blazed near the line.

Full instructions as to the construction, marking, and differentiation of the 108 kinds of corner monuments are given in the Manual of Surveying Instructions. These should be consulted, in connection with a correct copy of the original field notes, in case of difficulty.

TO RESTORE LOST OR OBLITERATED CORNERS.

45. To restore corners on base lines and standard parallels.—Lost or obliterated standard corners will be restored to their original positions on a base line, standard parallel, or correction line, by proportionate measurements on the line, conforming as nearly as practicable to the original field notes and joining the nearest identified original standard corners on opposite sides of the missing corner or corners, as the case may be.

46. The term "standard corners" will be understood to designate standard township, section, quarter section, and meander corners; and, in addition, closing corners, in the following cases: Closing corners used in the original survey to determine the position of a standard parallel, or established during the survey of the same, will, with the standard corners, govern the alinement and measurements made to restore lost or obliterated standard corners; but no other closing corners will control in any manner the restoration of standard corners on a base line or standard parallel.

47. A lost or obliterated closing corner from which a standard parallel has been initiated or to which it has been directed will be reestablished in its original place by *proportionate measurement* from the corners used in the original survey to determine its position. Measurements from corners on the opposite side of the parallel will not control in any manner the relocation of said corner.

48. A missing closing corner originally established during the survey of a standard parallel as a corner from which to project surveys south will be restored to its original position by considering it a standard corner and treating it accordingly.

49. Therefore, paying attention to the preceding explanations, we have for the restoration of one or several corners on a standard parallel, and for general application to all other surveyed lines, the following proportion:

As the original field-note distance between the selected known corners is to the new measure of said distance so is the original field-note length of any part of the line to the required new measure thereof.

The sum of the computed lengths of the several parts of a line must be equal to the new measure of the whole distance.

50. As has been observed, existing original corners can not be disturbed; consequently discrepancies between the new and the original field-note measurements of the line joining the selected original corners will not in any manner affect measurements beyond said corners, but the differences will be distributed proportionately to the several intervals embraced in the line in question.

After having checked each new location by measurement to the nearest known corners, new corners will be established permanently and new bearings and measurements taken to prominent objects, which should be of as permanent a character as possible, and the same recorded for future reference.

51. Restoration of township corners common to four townships.—Two cases should be clearly recognized: First, where the position of the original township corner has been made to depend upon measurements on two lines at right angles to each other. Second, where the original corner has been located by measurements on one line only; for example, on a guide meridian.

52. For restoration of a township corner originally subject to the first condition: A line will first be run connecting the nearest identified original corners on the meridional township lines, north and south of the missing corner, and a temporary corner will be placed at the proper proportionate distance. This will determine the corner in a north and south direction only.

Next, the nearest original corners on the latitudinal township lines will be connected and a point thereon will be determined in a similar manner, independent of the temporary corner on the meridional line. Then through the first temporary corner run a line east (or west) and through the second temporary corner a line north (or south), as relative situations may suggest. The intersection of the two lines last run will define the position of the restored township corner, which may be permanently established.

53. The restoration of a lost or obliterated township corner established under the second condition, i. e., by measurements, on a single line, will be effected by proportionate measurements on said line, between the nearest identified original corners on opposite sides of the missing township corner, as before described.

54. Reestablishment of corners common to two townships.—The two nearest known corners on the township line, the same not being a base or a correction line, will be connected, as shown in sections 45 to 50, by a right line, and the missing corner established by proportionate distance as directed in that case; the location thus found will be checked upon by measurements to nearest known section or quarter-section corners north and south, or east and west, of the

township line as the case may be, to obtain approximate though probably not exact verification of original distances.

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55. Reestablishment of closing corners.—Measure from the quarter-section, section, or township corner east or west, as the case may be, to the next preceding or succeeding corner in the order of original establishment, and reestablish the missing closing corner by proportionate measurement. The line upon which the closing corner was originally established should always be remeasured, in order to check upon the correctness of the new location. (See secs. 29 to 34 and 64 to 66 for details.)

56. Reestablishment of interior section corners.—This class of corners should be reestablished in the same manner as corners common to four townships. In such cases, when a number of corners are missing on all sides of the one sought to be reestablished, the entire distance must, of course, be remeasured between the nearest existing recognized corners both north and south, and east and west, in accordance with the rule laid down, and the new corner reestablished by proportionate measurement. The mere measurement in any one of the required directions will not suffice, since the direction of the several section lines running northward through a township, or running east and west, are only in the most exceptional cases true prolongations of the alinement of the section lines initiated on the south boundary of the township; while the east and west lines running through the township, and theoretically supposed to be at right angles with the former, are seldom in that condition, and the alinements of the closing lines on the east and west boundaries of the township, in connection with the interior section lines, are even less often in accord. Moreover, the alinement of the section line itself from corner to corner, in point of fact, also very frequently diverges from a right line, although presumed to be such from the record contained in the field notes and so designated on the plats, and becomes either a broken or a curved line. This fact will be determined, in a timbered country, by the blazes which may be found upon trees on either side of the line, and although such blazed line will not strictly govern as to the absolute direction assumed by such line, it will assist very materially in determining its approximate direction, and should never be neglected in retracements for the reestablishment of lost corners of any description. Sight or line trees described in the field notes, together with the recorded distances to same, when fully identified, will, it has been held in one or more States, govern the line itself, even when not in a direct or straight line between established corners, which line is then necessarily a broken line by passing through said sight trees. Such trees, when in existence and properly identified beyond a question of doubt, will very materially assist in evidencing the correct relocation of a missing corner. It is greatly to be regretted that the earlier field notes of survey are so very meager in the notation of the topography found on the original line, which might in very many instances materially lessen a surveyor's labors in retracement of lines and reestablishment of the required missing corner. In the absence of such sight trees and other evidence regarding the line, as in an open country, or where such evidence has been destroyed by time, the elements, or the progress of improvement, the line connecting the known corners should be run straight from corner to corner.

57. Reestablishment of quarter-section corners on township boundaries.—Only one set of quarter-section corners are actually marked in the field on township lines, and they are established at the time when

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the township exteriors are run. When double section corners are found, the quarter-section corners are considered generally as standing midway between the corners of their respective sections, and when required to be established or reestablished, as the case may be, they should be generally so placed; but great care should be exercised not to mistake the corners belonging to one township for those of another. After determining the proper section corners marking the line upon which the missing quarter-section corner is to be reestablished and measuring said line, the missing quarter-section corner will be reestablished in accordance with the requirements of the original field notes of survey, by proportionate measurement between the section corners marking the line.

58. Where there are double sets of section corners on township and range lines and the quarter-section corners for sections south of the township or east of the range lines are required to be established in the field, the said quarter-section corners should be so placed as to suit the calculation of areas of the quarter sections adjoining the township boundaries as expressed upon the official township plat, adopting proportionate measurements when the present measurements of the north and west boundaries of the sections differ from the original measurement.

59. Reestablishment of quarter-section corners on closing section lines between fractional sections.—This class of corners must be reestablished proportionately, according to the original measurement of 40 chains from the last interior section corner. If the whole measurement does not agree with the original survey, the excess or deficiency must be divided proportionately between the two distances expressed in the field notes of original survey. The section corner started from and the corner closed upon should be connected by a right line, unless the retracement should develop the fact that the section line is either a broken or curved line, as is sometimes the case.

60. Reestablishment of interior quarter-section corners.—In some of the older surveys these corners are placed at variable distances, in which case the field notes of the original survey must be consulted, and the quarter-section corner reestablished at proportionate distances between the corresponding section corners, in accordance therewith. The later surveys being more uniform and in stricter accordance with law, the missing quarter-section corner must be reestablished equidistant between the section corners marking the line, according to the field notes of the original survey. The remarks made under section 56, in relation to section lines, apply with full force here also; the caution there given not to neglect sight trees is equally applicable, since the proper reestablishment of the quarter-section corner may in some instances very largely depend upon its observance, and avoid one of the many sources of litigation.

61. NOTE.—In some of the southern public-land States it was the custom in the early surveys to establish half-mile posts at a distance of 40 chains from the point from which the section line was initiated, at the same time inserting in the field notes at the midway point "¼ sec. cor." without indication in the field notes that any other corner than the half-mile corner was set. And it is presumed that the ¼ sec cor. was merely "called for" at that place. This practice has long been discontinued owing to the confusion thereby occasioned.

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These half-mile posts have no bearing upon the subdivision of the section except where they happen to occupy the midway point on true lines between section corners. In such cases, when a subdivision is required of a section surveyed on this plan, and no original quarter corners are found, the latter should be reestablished at a point on a true line midway between the original section corners.

62. Where double corners were originally established, one of which is standing, to reestablish the other.—It being remembered that the corners established when the exterior township lines were run, belong to the sections in the townships north and west of those lines, the surveyor must first determine beyond a doubt to which sections the existing corner belongs. This may be done by testing the courses and distances to witness trees or other objects noted in the original field notes of survey, and by remeasuring distances to known corners. Having determined to which township the existing corner belongs, the missing corner may be reestablished in line from the existing corner, at the distance stated in the field notes of the original survey, by proportionate measurement, and tested by retracement to the opposite corresponding corner of the section to which the missing section corner belongs. These double corners being generally not more than a few chains apart, the distance between them can be more accurately laid off, and it is considered preferable to first establish the missing corner as above, and check upon the corresponding interior corner as noted in section 54 above.

63. Where double corners were originally established, and both are missing, to reestablish the one established when the township line was run.—The surveyor will connect the nearest known corners on the township line by a right line, being careful to distinguish the section from the closing corners, and reestablish the missing corner at the point indicated by the field notes of the original survey by proportionate measurement. The corner thus restored will be common to two sections either north or west of the township boundary, and the section north or west, as the case may be, should be carefully retraced, thus checking upon the reestablished corner, and testing the accuracy of the result. It can not be too much impressed upon the surveyor that any measurements to objects on line noted in the original survey are means of determining and testing the correctness of the operation.

64. Where double corners were originally established, and both are missing, to reestablish the one established when the township was subdivided.—The corner to be reestablished being common to two sections south or east of the township line, the section line closing on the missing section corner should be first retraced to an intersection with the township line in the manner previously indicated, and a temporary corner established at the point of intersection. The township line will of course have been previously carefully retraced in accordance with the requirements of the original field notes of survey, and marked in such a manner as to be readily identified when reaching the same with the retraced section line. The location of the temporary corner planted at the point of intersection will then be carefully tested and verified by remeasurements to objects and known corners on the township line, as noted in the original field notes of survey, and the necessary corrections made in such relocation. Should unusual error be found in one of the tested lines, the principles in "Exceptional Cases," sections 29 to 34, must

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be considered. A permanent corner will then be erected at the corrected location on the township line, properly marked and witnessed, and recorded for future requirements.

65. Where triple corners were originally established on range lines, one or two of which have become obliterated, to reestablish either of them.—It will be borne in mind that only two corners were established as actual corners of sections, those established on the range line not corresponding with the subdivisional survey east or west of said range line. The surveyor will, therefore, first proceed to identify the existing corner or corners, as the case may be, and then reestablish the missing corner or corners in line north or south, according to the distances stated in the original field notes of survey in the manner indicated for the reestablishment of double corners, testing the accuracy of the result obtained, as hereinbefore directed in other cases. If, however, the distances between the triple corners are not stated in the original field notes of survey, as is frequently the case in the returns of older surveys, the range line should be first carefully retraced, and marked in a manner sufficiently clear to admit of easy identification upon reaching same during the subsequent proceedings. The section lines closing upon the missing corners must then be retraced in accordance with the original field notes of survey, in the manner previously indicated and directed, and the corners reestablished in the manner directed in the case of double corners. The surveyor can not be too careful, in the matter of retracement, in following closely all the recorded indications of the original line, and nothing, however slight, should be neglected to insure the correctness of the retracement of the original line; since there is no other check upon the accuracy of the reestablishment of the missing corners, unless the entire corresponding section lines are remeasured by proportional measurement and the result checked by a recalculation of the areas as originally returned, which, at best, is but a very poor check, because the areas expressed upon the margin of many plats of the older surveys are erroneously stated on the face of the plats, or have been carelessly calculated.

66. Where triple corners were originally established on range lines, all of which are missing, to reestablish same.—These corners should be reestablished in accordance with the foregoing directions, commencing with the corner originally established when the range line was run, establishing the same in accordance with previously given directions for restoring section and quarter-section corners; that is to say, by

remeasuring between the nearest known corners on said township line, and reestablishing the same by proportionate measurement. The two remaining will then be reestablished in conformity with the general rules for reestablishment of double corners.

67. Reestablishment of meander corners.—Before proceeding with the reestablishment of missing meander corners, the surveyor should have carefully rechained at least three of the section lines between known corners of the township within which the lost corner is to be relocated, in order to establish the proportionate measurement to be used. It is also necessary, in retracing such original lines, to ascertain the real course used by the first surveyor. For instance, where he reported meridional lines as running due north, if they are found to have an average course of N. 1° 20′ E., the latter course should be considered in restoring an extinct north line to a meander corner.

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68. These requirements of preliminary retracement of section lines must in no case be omitted; since it gives the only data upon which the fractional section line can be remeasured proportionately and probable course found, the corner marking the terminus, or the meander corner, being missing, which it is intended to reestablish. The missing meander corner will be reestablished on the section or township line retraced in it original location, by the proportionate measurement found by the preceding operations, from the nearest known corner on such township or section line, in accordance with the requirements of the original field notes of survey.

69. Meander corners hold the peculiar position of denoting a point on line between landowners, without usually being the legal terminus or corner of the lands owned. Leading judicial decisions have affirmed that meander lines are not strictly boundaries, and do not limit the ownership to the exact areas placed on the tracts, but that said title extends to the water which, by the plat, appears to bound the land.

As such water boundaries are, therefore, subject to change by the encroachment or recession of the stream or lake, the precise location of old meanders is seldom important, unless in States whose laws prescribe that dried lake beds are the property of the State.

70. Where the United States has disposed of the fractional lots adjacent to shores, it claims no marginal lands left by recession or found by reason of erroneous survey. The lines between landowners are therefore regarded as extended beyond the original meander line of the shore, but the preservation or relocation of the meander corner is important as evidence of the position of the section line. The different rules by which division lines should be run between private owners of riparian accretions are a matter of State legislation, and not subject to a general rule of this office.

71. Fractional section lines.—County and local surveyors being sometimes called upon to restore fractional section lines closing upon Indian, military, or other reservations, private grants, etc., such lines should be restored upon the same principles as directed in the foregoing pages, and checked whenever possible upon such corners or monuments as have been placed to mark such boundary lines.

In some instances corners have been moved from their original position, either by accident or design, and county surveyors are called upon to restore such corners to their original positions, but, owing to the absence of any and all means of identification of such location, are unable to make the result of their work acceptable to the owners of the lands affected by such corner. In such cases the advice of this office has invariably been to the effect that the relocation of such corner must be made in accordance with the orders of a court of competent jurisdiction, the United States having no longer any authority to order any changes where the lands affected by such corner have been disposed of.

RECORDS.

72. The original evidences of the public-land surveys in the following States have been transferred, under the provisions of sections 2218, 2219, and 2220, United States Revised Statutes, to the state

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authorities, to whom application should be made for such copies of the original plats and field notes as may be desired, viz:

Alabama: Secretary of State, Montgomery.
Arkansas: Commissioner of State Lands, Little Rock.
Florida: Commissioner of Agriculture, Tallahassee.
Illinois: Auditor of State, Springfield.
Indiana: Auditor of State, Indianapolis.
Iowa: Secretary of State, Des Moines.
Kansas: Auditor of State and Register of State Lands, Topeka.
Louisiana: (after June 30, 1909) State officers.
Michigan: Public Domain Commissioner, Lansing.
Minnesota: Secretary of State, St. Paul.
Mississippi: Commissioner of State Lands, Jackson.
Missouri: Secretary of State, Jefferson City.
Nebraska: Commissioner of Public Lands and Buildings, Lincoln.
North Dakota: State Engineer, Bismarck.
Ohio: Auditor of State, Columbus.
Wisconsin: Commissioners of Public Lands, Madison.

In other public-land States the original field notes and plats are retained in the offices of the United States surveyors-general.

SUBDIVISION OF SECTIONS.

73. This office being in receipt of many letters making inquiry in regard to the proper method of subdividing sections of the public lands, the following general rules have been prepared as a reply to such inquiries. The rules for subdivision are based upon the laws governing the survey of the public lands. When cases arise which are not covered by these rules, and the advice of this office in the matter is desired, the letter of inquiry should, in every instance, contain a description of the particular tract or corner, with reference to township, range, and section of the public surveys, to enable the office to consult the record; also a diagram show-

ing conditions found, giving distances in chains and links and not in feet.

74. Preliminary to subdivision it is most essential to know the actual boundaries of the section, as it can not be legally subdivided until the section corners and quarter-section corners have either been found, or restored by the preceding methods, and the resulting courses and distances determined by survey. The practice of entering a section to survey a tract from only one or two corners, and those perhaps unreliable, is unwarranted, and may result in litigation.

The order of procedure is: First reestablish the obliterated boundary corners; next, fix the lines of quarter sections; then form smaller tracts by equitable and proportionate division, according to the following rules:

75. Subdivision of sections into quarter sections.—Under the provisions of the act of Congress approved February 11, 1805, the course to be pursued in the subdivision of sections into quarter sections is to run straight lines from the established quarter-section corners, United States surveys, to the opposite corresponding corners. The point of intersection of the lines thus run will be the corner common to the several quarter sections, or, in other words, the legal center of the section.

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76. Upon the lines closing on the north and west boundaries of a township, the quarter-section corners are established by the United States deputy surveyors at 40 chains to the north or west of the last interior section corners, and the excess or deficiency in the measurement is thrown into the half mile next to the township or range line, as the case may be.

77. Where there are double sets of section corners on township and range lines, the quarter corners for the sections south of the township lines and east of the range lines are not established in the field by the United States deputy surveyors, but in subdividing such sections said quarter corners should be so placed as to suit the calculations of the areas of the quarter sections adjoining the township boundaries as expressed upon the official plat, adopting proportionate measurements where the new measurements of the north or west boundaries of the section differ from the original measurements.

78. Subdivision of fractional sections.—Where opposite corresponding corners have not been or can not be fixed, the subdivision lines should be ascertained by running from the established corners due north south, east, or west lines, as the case may be, to the water course, Indian boundary line, or other boundary of such fractional section.

79. The law presumes the section lines surveyed and marked in the field by the United States deputy surveyors to be due north and south or east and west lines, but in actual experience this is not always the case. Hence, in order to carry out the spirit of the law, it will be necessary in running the subdivisional lines through fractional sections to adopt mean courses, where the section lines are not due lines, or to run the subdivision line parallel to the east, south, west, or north boundary of the section, as conditions may require, where there is no opposite section line.

80. Subdivision of quarter sections into quarter quarters.—Preliminary to the subdivision of quarter sections, the quarter-quarter corners will be established at points midway between the section and quarter-section corners, and between quarter corners and the center of the section, except on the last half mile of the lines closing on the north or west boundaries of a township, where they should be placed at 20 chains, proportionate measurement, to the north or west of the quarter-section corner.

81. The quarter-quarter section corners having been established as directed above, the subdivision lines of the quarter section will be run straight between opposite corresponding quarter-quarter section corners on the quarter-section boundaries. The intersection of the lines thus run will determine the place for the corner common to the four quarter-quarter sections.

82. Subdivision of fractional quarter sections.—The subdivision lines of fractional quarter sections will be run from properly established quarter-quarter section corners, with courses governed by the advice in sections 67 and 79, to the lake, water course, or reservation which renders such tracts fractional, or parallel to the east, south, west, or north boundary of the quarter section, as conditions may require.

83. By "proportionate measurement" of a part of a line is meant a measurement having the same ratio to that recorded in the original field notes for that portion as the length of the whole line by actual

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resurvey bears to its length as given in the record. Differences between former and new measurements may generally be expected. They may occur through using a chain of erroneous length, or by careless setting of pins, by neglect of leveling, or by error in transcribing notes, and these should be carefully avoided in retracement as in original surveys. Instead of the old practice of "adjusting the chain" to suit the former measure, the distance taken by a precise method is compared with that of the record, and the shortage or surplus is computed by proportion, producing the same result in a more reliable manner.

84. For example: The length of the line from the quarter-section corner on the west side of sec. 2, T. 24 N., R. 14 E., Wisconsin, to the north line of the township, by the United States deputy surveyor's chain, was reported as 45.40 chains, and by the county surveyor's measure is reported as 42.90 chains; then the distance which the quarter-quarter section corner should be located north of the quarter-section corner would be determined as follows:

85. As 45.40 chains, the government measure of the whole distance, is to 42.90 chains, the county surveyor's measure of the same distance, so is 20.00 chains, original measurement, to 18.90 chains by the county surveyor's measure, showing that by proportionate measurement in this case the quarter-quarter section corner should be set at 18.90 chains north of the quarter-section corner, instead of 20.00 chains north of such corner, as represented on the official plat. In this manner the discrepancies between original and new measurements are equitably distributed.

86. A resurvey must be initiated at some well-defined, identified, and unquestioned starting point on the original surveys. It must terminate at some equally well-known and

identified point; the intermediate corners being placed along that line in proportion as the whole redetermined distance is to the whole distance as originally reported. For example, should a line originally reported to be 160.00 chains be found by resurvey to the 164.00 chain, then the corners, originally reported as being placed 40.00 chains apart, will be placed 41.00 chains apart, and will be so reported by the later surveyor. This it will be seen requires that the whole distance between two well-defined corners (or points) be accurately known, in order to give the intermediate reestablished corners their proper relative positions, or distance apart.

FRED DENNETT,
Commissioner.

DEPARTMENT OF THE INTERIOR,
June 1, 1909.

Approved:
R. A. BALLINGER,
Secretary.

XLVII.

(The copy of this letter of instructions is taken from a typewritten copy. The location of the original is presently unknown, but is most probably in Records Group 49, National Archives.)

DEPARTMENT OF THE INTERIOR.
General Land Office.

Washington, D.C., August 15, 1910.

To U. S. Surveyors General and
U. S. Surveyors.

From the description of land, soil, timber, etc., required by the Manual of 1902, to be stated at the end of the field notes of each mile of line, "descriptive notes" (section 242) are prepared to be filed in local land offices for the use of the public. As ordinarily prepared, these are deemed insufficient for intending settlers on the public lands. There are many other details not generally reported by surveyors, easily obtainable in the course of their work, which, in view of the purpose stated, should have attention.

It is not intened to set aside any considerable space in the notes for this purpose; hence, entries should be as concise as possible yet specific for each portion of the line surveyed, while features common to large portions of the township should, to avoid repetition, appear in the "General Description" at the end of the notes. No additional entries are contemplated in the line-notes proper, other than to more fully record what the Manual already prescribes, when needed for the fuller purpose above stated.

Topographic features should be considered, as affecting the use of the lands, and as exposing to or sheltering from storms or unfavorable winds. The position of the lands relative to adjacent areas, as being higher or lower, and the "exposure" (to the south, east, etc.) as being favorable or otherwise, should be noted. When lands are rolling or hilly, the character of the uplands, slopes, and valleys should be observed, for, quite often, the uplands and slopes are denuded of good soil and the valleys are of small value. Steep slopes are often subject to soil denudation. The systems of natural drainage in several portions of the township should also be stated.

In addition to noting streams or other sources of water, with the character of the latter, the presence in the soil of water

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available for plant use should be observed, and also what can be readily done for lands needing irrigation or drainage. The agricultural value of lands depend to no small extent upon the relations existing between soils and subsoils, the usual excavations at corners will aid in this determination to some extent, and exposures on steep banks and in ravines and drains should also be examined for this purpose.

The ordinary record, as "soil, sandy loam, 3rd rate", should be supplemented whenever possible with a more definite description. In regions where surveys are contemplated, soils, ordinarily speaking, are in general, composed of humus or decomposed organic matter, clay and sand of various kinds, or of a friable mixture of all these called loam, in widely varying proportions; and with the soils may be stones, gravel, broken or partly disintegrated rocks and shales, etc. As the relative amounts of the constituents determine in a large degree a proper use of the land, whatever brief terms with usual significations are employed, although not expected to be quantitatively exact, should be sufficiently descriptive in this respect. Texture, depending on the relative amounts of grains of various sizes, is of importance as affecting the aeration of soils and plant use of moisture. Color is often indicative of constituents. Soils are also popularly described as stiff, friable, strong, weak, rich, poor, dry, wet, cold, warm, sharp, fine or soft, etc. If calcareous that fact should be stated.

If farming is done, DRY OR OTHERWISE, along or near any line, the vegetable or cereal crop should be noted as to kind, condition, yield, etc. In other cases, conclusions should be drawn from facts and conditions observed, as to the agricultural uses of the lands, but care should be taken that this be done only within the surveyor's knowledge of the subject.

A description at the end of the notes of a line surveyed prepared in harmony with the above, may, for instance, be found as follows:

> S. 30 chs., high gently rolling prairie, E. slope; soil, rich dark clay loam, 4 to 8 ins. deep, medium texture, moist, on clay subsoil; good growth bunch grass; N. 50 chs. broken and hilly; ridges with light, poor, sandy loam, washed on slopes, stony; valleys, good brown clay loam with some gravel, drains to NE., subsoil clay and decomposing shales. No timber".

In the "General Description" the geological formations whence come the bases of the soil and subsoil should be noted, if known, and what apparent action of the kind is now in progress.

U. S. Surveyors will observe these instructions supplemental to the Manual of 1902, and order their practice accordingly. Surveyors General will similarly instruct their deputies.

In the "descriptive notes" to be sent to the local land office, surveyors general should state the month and year in which the surveys were made, as incident to a proper understanding of the information furnished.

Very respectfully,
(signed) Fred Dennett,
Commissioner.

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