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PUBLIC LANDS OF CANADA

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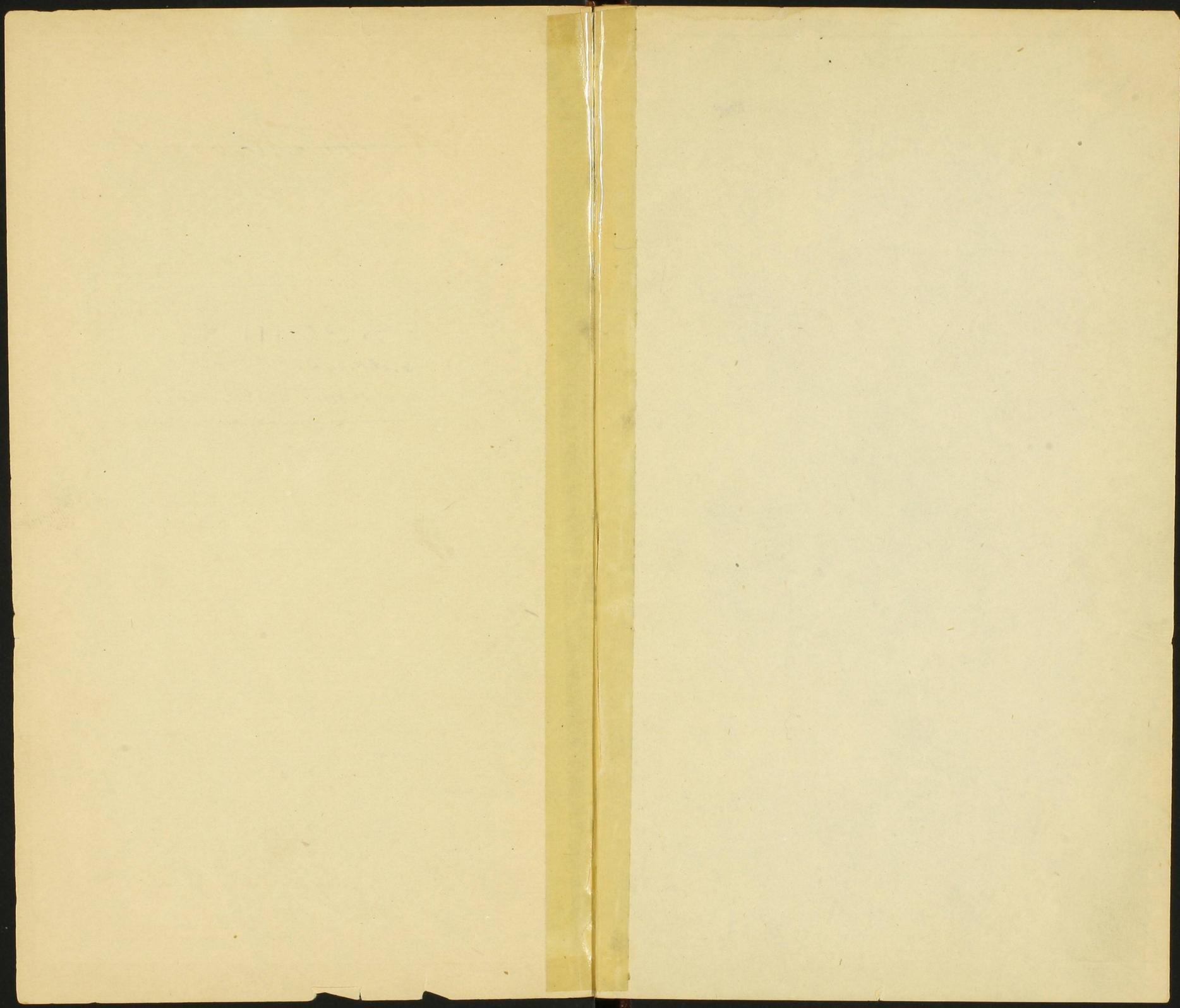
~~A. Furwood~~

CANADA LANDS SURVEYS RECORDS

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MANUAL  
SHEWING THE  
SYSTEM OF SURVEY  
ADOPTED FOR THE  
PUBLIC LANDS OF CANADA  
IN  
MANITOBA AND THE NORTH-WEST TERRITORIES,  
WITH  
*INSTRUCTIONS TO SURVEYORS,*  
**ILLUSTRATED BY DIAGRAMS.**

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PUBLISHED BY AUTHORITY OF THE HONORABLE THE SECRETARY OF STATE FOR  
CANADA.

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NOTE.

*In preparing the accompanying Instructions to Deputy Surveyors, use has been made, where the same would apply to the system of Survey adopted by the Dominion, of the very complete Manual, published by order of the Commissioner of the United States' General Land Office, dated 1855:—and subsequent instructions to Surveyors General of the United States by that Officer, dated 1864.*

J. S. D.

DEPARTMENT OF STATE FOR CANADA,  
DOMINION LANDS BRANCH,  
OTTAWA, May 1, 1871.

This Manual is published with the view of describing the system adopted for the Survey and subdivision of the Public Lands in Manitoba and the North-West Territories, and of providing instructions for the guidance of surveyors in all field operations connected therewith.

It will be observed, that while based upon the general principles of the surveying system in vogue in the United States, the method adopted for the Dominion Lands differs from it in some important particulars, and it is thought expedient to refer to the same to prevent deputies, who may have had experience of the one, and who may be employed in surveys under the other, from being led into error by assuming the systems to be similar.

The principal points of difference may be stated as follows :—

1. The dedication in the Canadian method of highways of one and a half chains in width throughout, on all township and section lines.

2. The equalization of the area of townships.

This results from the system of adopting the Township lines half-way between the bases as the closing or correction lines. In every group of four Townships lying between the same meridians, the convergence in the two north of the base, is compensated by the corresponding divergence in the two to the south of that line.

3. In this system the Townships are bounded east and west by meridians, and north and south by parallel lines, which parallel lines represent the chords of the arcs of ~~the~~ circles of latitude passing through the east and west angles of the township.

4. By the United States' system, there being no roads allowed in the survey, a single row of posts designates the corners of the townships, sections, or quarter sections as the case may be, excepting on the standard parallel and base lines, on which, though in the same line, there are both closing corners and starting corners.

By the Dominion method, the lines will invariably be run on the west and south sides of the one-and-a-half chains road allowance; and excepting on the correction lines as hereinafter referred to, but one row of posts or monuments will be placed.

The posts or monuments in this one row will in every case be common to, and will govern the corresponding Township, section, or quarter section subdivision on the opposite side of the road allowance.

The exception above referred to is in the case of the posts or monuments on the closing or correction lines halfway between the bases. On these lines the posts or monuments to mark the Township, section, or quarter-sections for the Townships on the south will be planted in the south limit of road allowance, while those for the Township, section, and quarter section corners lying to the north will be planted in the north limit of such allowance.

The survey and subdivision of the Public Lands in Manitoba and the North-West, excepting in the settled portions of the Territory, will be performed by contract, at a certain rate per mile or per acre.

Land Surveyors who shall have been duly qualified to survey the Crown Lands in any one of the Provinces in the Dominion, will be eligible for employment in surveying the Dominion Lands.

The term Deputy-Surveyor will be applied to all Surveyors so employed.

A surveyor upon obtaining a contract will be required to enter into a bond jointly with two sureties (see Form No. 10 Appendix), to the Crown, in double the amount of the contract for the due and faithful fulfilment thereof.

The lines embraced in any survey under contract must be run by the contracting deputy in person, and no payment will be made on such contract work if otherwise performed.

Inspections of the work in the field will be made from time to time, and any impropriety or unfaithfulness in the execution of surveying contracts will subject the offending surveyor and his sureties to the penalty of the Bond to the Crown, and will further debar such surveyor from future employment on the public surveys.

The attention of Deputy Surveyors is called to the clause in the form of bond, by which this manual and the instructions herein contained, are to be taken and deemed a part and parcel of every contract for surveying the Public Lands of the Dominion.

Deputy-Surveyors, therefore, prior to entering upon any contract for surveys in the Province or Territory to which these instructions apply, are required to make themselves perfectly conversant with the same in all their particulars.

By order of the Honorable the Secretary of State for Canada.

J. S. DENNIS,  
Surveyor-General.

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## APPENDIX.

- DIAGRAM No. 1.—Plan of township, shewing size and numbering of sections, and angle of north and south boundaries of townships with east and west limits.
- DIAGRAM No. 2.—Skeleton plan, shewing bases, correction lines, and meridian exteriors, also convergence of meridians and illustrating division into four township blocks.
- DIAGRAM No. 3.—Shews how single line of posts or monuments is to govern corners on both sides of road.
- DIAGRAM No. 4.—Shews manner of posting or defining the corners on both limits of road allowance on correction lines.
- DIAGRAM No. 5.—Illustrates stake and stone corners.
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- DIAGRAM No. 7.—Specimen page of field notes.
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- No. 9.—Printed form of contract for survey.
- No. 10.— Do bond connected therewith.

## SYSTEM OF SURVEY.

1. The Public Lands in Manitoba and the North-West Territory are to be laid off in rectangular Townships and sections, containing thirty-six sections of one mile square in each, together with road allowances between all Townships Roads. and sections of one chain and fifty links in width.
2. The Township, therefore (for plan of which see Diagram No. 1 Appendix) will, subject to deficiency or surplus Outer dimensions of Township. from converging or diverging meridians, as the case may be, measure on each side, from centre to centre of the road allowances bounding the same, four hundred and eighty-nine chains.
3. The Townships will number in regular order northerly How from the international boundary or forty-ninth parallel numbered. of latitude, and will lie in ranges and be numbered, in Manitoba, east and west from a certain principal meridian run in the year 1869, styled the "Winnipeg Meridian," which starts from the said forty-ninth parallel at a point ten miles or thereabouts westerly from Pembina.
4. The said forty-ninth parallel or international boundary Base lines in is the first base, or that for Townships one and two. the system. The second base will be between Townships four and five, the third between Townships eight and nine, the fourth between Townships twelve and thirteen, the fifth between Townships sixteen and seventeen, and so on northerly in regular succession.
5. The correction lines, or those upon which will be Of correction allowed the "jog" resulting from want of parallelism of lines. meridians, will be as follows, that is to say:—On the line between Townships two and three, on that between six and seven, on that between ten and eleven, and so on. In other words, they will be those east and west Township lines which are equidistant from the bases. See Diagram No. 2, Appendix.
6. In the survey of any and every Township, the deficiency Where errors or surplus, as the case may be, resulting from convergence in closing are or divergence of meridians is to be set out and allowed in to be placed.

the range of quarter sections adjoining the west boundary, and the north and south error in closing on the correction lines from the north or south is to be allowed in the ranges of quarter-sections adjoining, and north or south respectively of the said correction lines.

Broken sections

7. The dimensions and area of the irregular quarter sections resulting as above, whether the same shall be deficient or in excess, must, in all cases, be returned by the surveyor at their actual measurements and contents.

Country to be laid out in blocks previous to subdivision.

8. Preliminary to the subdivision into Townships and sections of any given portion of country proposed to be laid out for settlement, the same will be laid out into blocks of four Townships each, by projecting the base and correction lines, and north and south lines (to be designated "Meridian Extérieurs") on the principle shewn in Diagram No. 2, Appendix.

9. On these lines, at the time of such survey, all Townships, sections, and quarter section corners are to be marked, which corners are to govern, respectively, in the subsequent subdivision of the block.

One row of posts only to be planted.

10. Only a single row of posts or monuments to indicate the corners of Townships, or sections, (except as hereinafter provided), will be placed on any survey line. These posts or monuments, as an invariable rule (with the exception referred to above), are to be placed in the *west* limit of the road allowances, on north and south lines; and in the *south* limit of road allowances, on east and west lines; and in all cases will fix and govern the position of the boundary corner between the two adjoining Townships, sections, or quarter sections on the opposite side of the road allowance. (See Diagram No. 3, Appendix.)

Same to govern corners on both sides of road allowance.

11. The exception referred to, is in the case of the Township, section, and quarter section corners on the correction lines, which in all cases will be planted and marked independently for the Townships on either side; those for the Township north of the line, in the north limit of the road allowance; and those for the Township south, in the south limit. (See Diagram No. 4, Appendix.)

Exception to the above rule.

### OF THE MANNER OF CONDUCTING THE FIELD OPERATIONS.

Surveys to be astronomical.

1. The land surveys of Manitoba and the North-West Territory, are to be astronomical—that is to say, performed independently of the magnetic needle.

2. With this view Surveyors will avail themselves of every opportunity to check, and if necessary, correct the direction of the line they may be running, by careful observation.

3. This will require to be especially done by those who may be projecting base and exterior lines. These lines should be checked by observation, at least, on every Township line.

4. In running the base and correction lines and meridian exteriors, as they will require to be drawn with great accuracy, instruments of the best make, graduated on silver to at least ten seconds, must be used. The transit theodolite, without vertical circle, and with six inch limb, graduated as above, is recommended to be used for the above lines.

Instruments to be used on base lines.

5. For the subdivision of the four Township blocks: a transit, theodolite, or solar compass, reading to minutes, will be sufficient. One of these instruments also will be used in the traverses of rivers and lakes—the courses in which will be referred to, and laid down in the notes according to the true meridian.

Instruments to be used in subdividing. And in traverses of rivers and lakes.

6. All measurements will be made with the ordinary four pole chain, and iron or steel tally pins. The chain is to be tested and corrected, at least, every other day during use, by a standard measure which shall have been previously compared and approved by the Surveyor General. In chaining, every possible precaution should be taken to prevent the occurrence of a mistake in the tally. With this view the hind chainman coming up at the call of tally, *the two* should register the same *before counting the pins*, by entering it in a book, or by notching a small stick severally carried by each. Or a better plan is to slip a ring of brass, or loop of leather, on a belt which each chainman should wear for the purpose. The pins then being counted and found correct, the chainman behind in the last tally takes the forward end of the chain and proceeds to set the pins, and so on in regular rotation. This is a further check, as the same man must be forward in all the odd, and the other forward in all the even tallies.

Precautions against making mistakes.

7. In chaining over uneven ground, should the same be so broken as not to permit of the full chain being levelled, the measurement should be made with such portion thereof as may be easily levelled, and particular care should be taken at such times in plumbing and dropping the pins, in order to obtain the accurate horizontal measurement.

Precautions in chaining over broken ground.

## METHOD OF SURVEY INTO BLOCKS.

How to proceed in Surveying base lines and correction lines, and meridian exteriors.

1. In projecting the base lines and meridian exteriors—that is to say, in laying out any portion of Country into four Township blocks; as for instance, the tract lying between the first and second correction lines, and west of the meridian, the base for which, known as the “first base,” is the line between Townships four and five, the Surveyor will take up the survey of the base, where the same may have previously terminated, as at (a), being the N.E. corner of Township 4, range 1, west. (See Diagram No. 2, Appendix.)

2. Commencing his survey from this point, he will produce the base westerly on the true course thereof, and measuring from (a) lay off section 36, of 80 chains (marking the  $\frac{1}{4}$  section at 40 chains), and then 1 chain 50 links for road allowance. This brings him to the N.E. corner of section 35, where he will establish the post or monument for the same. He will then continue across 35, marking as before, the  $\frac{1}{4}$  sections at 40 chains, measuring the 80 chains for north limit of section 35, lay off 1 chain 50 links for road allowance, and then mark true corner of section 34, and so on across the Township, setting off alternately sections of 80 chains, with mounds at the centre points to mark the  $\frac{1}{4}$  sections, and road allowances of 1 chain 50 links, until he arrives at (b), where he erects the necessary boundary to mark the N.E. corner of section 36, Township 4, range 2, west. Here the bearing is corrected by observation, and the Surveyor continues across the next Township, laying out alternately sections (always marking the centre point of the 80 chains) and road allowances till he reaches the point (c) where the iron boundary is placed to mark the N.E. corner of section 36, Township 4, range 3, west. At (c), being in the west limit of the allowance for road between the 2nd and 3rd ranges west, he will turn north, and running on a true meridian, by observation, produce the line across two Townships—that is to (d). In this case he lays off the road allowance first, from (c) then 80 chains to N.E. corner, section 1, where he erects the

boundary—then lays off 1 chain 50 links road allowance then 80 chains to the N.E. corner of section 12 (always marking the centre point of the section), then road allowance, then section (in all cases planting and marking the permanent corners), and so on across Townships 5 and 6 to (d) aforesaid—that is to say, to the south limit of road allowance on the correction line between Townships 6 and 7, at the N.E. corner of section 36, Township 6, range 3, west.

3. It may be that this correction line may have been run previously in connection with the next base to the north, if so, the Surveyor will be governed by such survey, and will establish the corner, an iron bar, at (d) in accordance therewith, noting the deficiency or surplus in measurement of the northerly  $\frac{1}{4}$  section of 36; and also ascertaining exactly and entering in his notes, how far east or west, his line intersected the correction line from the corresponding Township corner on the north side of the road.

4. He will then measure east along the south limit of the road allowance on correction line, as previously surveyed, to (f), and having ascertained the east and west error, will lay off and mark the permanent section and  $\frac{1}{4}$  section corners, for the north limit of Township 6, in the 1st and 2nd ranges, placing the monument at (e)—that is to say, the N.E. corner of section 36, Township 6, range 2, west, exactly half way (making due allowance for roads) between (d) and (f), leaving the westerly range of  $\frac{1}{4}$  sections in each Township to contain half the deficiency from convergence, as hereinbefore provided.

5. Should this correction line not have been previously run, the Surveyor will run a trial line from (d) to (e) and thence to (f), and returning on the true course, will establish the corners as above directed from (f) to (d).

6. If not previously run, he will then continue the correction line westerly from (d) to (g), planting the permanent corners throughout on the south limit of road allowance for the Townships south of the line, throwing into the westerly range of  $\frac{1}{4}$  sections in Township 6, range 3, and also in the corresponding range of  $\frac{1}{4}$  section in the adjoining township to the west, the appropriate theoretical deficiency for convergence, and place a temporary mark at (g).

7. The Surveyor will then return to (c) on the base line, from which point he will run the meridian exterior between ranges 2 and 3, southerly, laying off the sections and roads in regular succession, and establishing the permanent corners to (h) in the north limit of road allow-

ance on the correction line between Townships 2 and 3. From here he will proceed in the manner indicated above, as between (d) and (f), to definitely run and mark the corners between (h) and (i); he will then run the correction line, keeping on the north limit of road allowance, westerly (being governed by the same rules as above in surveying from (d) to (g), to (k), leaving at the latter point a temporary mark.

8. He will then return to (c), and repeating the same operation precisely as from (a) to (c), continue the base to (l); from here he will run and mark (l) (g) to the north, and (l) (k) to the south, in the same manner respectively as was done from (c) to (d), and from (c) to (h), throwing the error in northing and southing, in the northerly and southerly ranges of  $\frac{1}{4}$  sections, joining upon the respective correction lines; while at (g) and (k), the respective correction lines may be continued westerly; then the base, then the meridian exteriors between ranges 6 and 7, and so on to the extent of the contract.

9. No detailed instructions are given for surveying base lines and meridian exteriors east of the meridian, as the surveyor will be governed by the same general rules as those given above. The same principle is, in fact, applied to the extension of the surveys to the east, as well as to the west.

#### METHOD OF SUBDIVIDING BLOCKS.

1. Preliminary to subdividing the Townships comprising a block into sections and quarter-sections, the surveyor will in all cases first accurately draw on the ground and mark by section and quarter-section corners the transverse Township lines, quartering such block.

2. To do this he will simply, by random, and then by true lines, connect the opposite Township corners, as the same shall have been previously fixed in the survey of the base and other exterior lines surrounding the block. Having thus defined the exterior lines of each Township, he will proceed to the subdivision as follows:—

##### TOWNSHIPS NORTH OF THE BASE.

3. The first mile both of the south and east boundaries of the Township he is about to subdivide, is to be carefully traced and measured before he enters on the subdivision thereof. This will enable him to compare his

First to be divided by drawing Township lines.

chaining with that of the outer lines previously run. Any discrepancy arising from difference of measurement is to be carefully entered in the field-notes.

4. He will then commence at the corner to sections 1, 2, and 35, 36, and setting off one chain and a half for the road, run a line north parallel to the easterly limit forty chains, where he will establish the quarter-section corner, and continuing the line forty chains farther, he will establish the corner to sections 1, 2, 11, 12.

5. From the section corner last named, run a random line, east, parallel to south boundary, to section corner between 1 and 12, in east boundary, and at 41 chains 50 links from the starting point, put a mark for temporary section corner. If the line intersects exactly at the corner, he will blaze it back and establish it as the true line, but if his random line intersects the said east boundary, either north or south of the said corner, he will measure the distance of such intersection, and calculating therefrom the proper course, by table on page 32, will run a true line back to the corner from which his random started.

6. He will establish the permanent quarter-section corner at a point equi-distant from the two terminations, making due allowance for the one chain fifty links of road provided for as above in the westerly quarter-section.

7. From the corner of sections 1, 2, 11, 12, continue the line north parallel to the east boundary as aforesaid, first laying off the road and making the quarter-section corner as before at forty chains, and at eighty chains, establishing the corner of sections 11, 12, 13, 14, then run a random line east for the corner of sections 12, 13, on east boundary, placing temporary quarter-section mark at 41 chains 50 links, correcting back and establishing permanent quarter-section corner in the manner directed above on the line between sections 1 and 12.

8. In this manner he will proceed with the survey of each successive section in the first tier, until he arrives at the north boundary of the township, which he will reach by running up a random line from the corner 25, 26, 35, 36. If this random line should not intersect at the corner for sections 1, 2, 35, 36, upon the Township line, he will note the distance he will fall east or west of the same, and from the said distance calculate a course that will run a true line south to the corner from which his random started. In running this true line south, he will establish the quarter-section corner equi-distant from the extremities of the section.

How to subdivide a Township north of, and adjoining the base.

9. The first tier of sections being laid out and surveyed, he will survey the second tier, working southerly from the corner 34, 35, 2, 3, pursuing exactly the same course, only working south instead of north, as followed above in the survey of the first tier, closing in each case upon the section corners of the latter. The third tier he will survey north, closing to the east upon the corners of the 2nd, in the manner as first described.

10. The fourth tier he will survey southerly in the manner as described for the second.

11. The fifth he will survey northerly, and while doing so, in addition to closing to the east upon the corners of the fourth tier, he will run the section lines westerly, closing the same respectively upon the corresponding corners established along the west boundary of the Township, being careful in surveying this westerly tier of sections to make the easterly range of quarter-sections exactly forty chains in width, and throw the deficiency or surplus, as the case may be, resulting from convergence or divergence of meridians in the westerly tier of quarter-sections.

TOWNSHIPS SOUTH OF BASE.

12. In subdividing Townships south of the base, the Surveyor will proceed in a manner corresponding to that above described, surveying the tiers north and south alternately, first surveying southerly from the section corner 1, 2, 35, 36. In all cases as hereinbefore instructed, any north and south error in the two Townships lying north or south of, and adjoining the correction lines, being the result of a closing error in laying out the blocks, will be carried into and appear in the tier of quarter-section adjoining upon such correction line.

13. Quarter sections will be given in each case on north and south lines, the net width of forty chains, and on east and west lines the corners will be so placed as equally to divide the sections, always excepting the case of the tier closing upon the north or south of the boundaries as the Townships may be north or south of the base—and that of the tier joining on the west boundary of every Township as hereinbefore described.

14. It follows from the above that every north and south section line, except in those cases mentioned, will be eighty chains in length. The east and west section lines, excepting those as aforesaid terminating on the west boundary of the Township, must be within fifty links of eighty chains in length, and the north and south boun-

To subdivide Townships south of the base.

daries of any one section, excepting the extreme western tier, are to be within fifty links of equal length. The traverse within each fractional section, or between any two traverse points on section lines, or of a pond or island in the interior of a section, must close within one chain.

15. In running random lines across two Townships in laying out blocks of four Townships, as hereinbefore described, if such random line fail to intersect the proper point by an error equal to two chains, the several lines must be retraced, if necessary, and the cause of the discrepancy discovered and corrected.

BOUNDARY CORNERS.

Having ascertained by exact running and measurements the proper point for establishing the Township, section, or quarter section corner, as the case may be, the Surveyor in marking or perpetuating the same is to be governed by the following directions.

1. In a timbered country should a tree be found at the precise spot indicated, it is to be squared and marked for the corner, if not, a post is to be firmly planted thereat, and the position of such post is to be defined by ascertaining the bearing and distance therefrom of one or more adjacent trees, which tree or trees are to be blazed and marked B.T. on the side next the post, and the size and description of the same, as well as the bearing and distance, are to be duly entered in the Field Notes. (See specimen field-notes, Diagram 7, Appendix.)

How to be marked and perpetuated. The corner to be a tree if possible, if not a post. Bearing trees.

2. In a region where stone abounds, the Township corner will be a single stone planted and marked, with a small pyramid of stones beside it; the section corners will be marked by a single stone planted at the point indicated. The position of such stone corners will also be defined by reference to bearing trees where the latter may be conveniently near.

Under certain circumstances stone to be used. Defined.

3. In Prairie country it will often prove very difficult to get timber. Posts must be had, however, excepting for corners which will be of iron, as hereinafter described, even although their carriage for many miles may be involved. After planting, the post will be surrounded by a mound of pyramidal form, as shewn by Diagram, No. 6 Appendix.

Mound to be used in Prairie country.

4. Where it may be inconvenient to get timber or stone, the quarter-section point may be marked by throwing up a mound of earth the size hereinafter prescribed.

Size and height of mounds. 5. These mounds will be, in form, rectangular pyramids. The mound thrown up at the corner of a Township will be three feet in height, with sides of base six feet; at section, and quarter-section corners the sides of the base will be five feet and the height two and a half feet.

Earth to be taken from pits. 6. In the formation of mounds the earth will be taken from four several "pits," the centres of which pits should be, wherever practicable, two feet six inches outside, and opposite the centre of the respective bases. (See Diagram No. 6, Appendix.)

To be covered with sod. 7. Mounds are to be formed of solid earth, sod and all foreign substance being excluded, the earth to be well pressed down with the spade during the process, and covered, when the same can be conveniently obtained, with sod, grass side up.

8. Posts in mounds must shew above the top, at least, ten inches.

Witness mounds. 9. If a Township or section corner, in a situation where a bearing tree is not to be found within a reasonable distance, shall fall in a ravine, bed of a stream, or in any other situation where the character of the locality may be unfavorable to the planting of a post or the erection of a mound, the Surveyor will perpetuate such corner by erecting a bearing or witness mound, in the manner above directed, at the nearest suitable point, and will give in his Field Book the bearing and distance of the site of the true corner from such mound, and all other particulars connected therewith.

Angles of mounds to be towards the Cardinal points. 10. On all north and south, and on all east and west survey lines, excepting the correction lines, corner posts and mounds will be so placed that lines connecting the cardinal points will pass through the angles. (Diagram 6, Appendix.)

Except on correction lines in which case they will stand square with the lines. 11. The mounds which may be erected to mark the corners in either limit of Road allowance on the correction lines, will, in order to distinguish these as the only lines on which double corners are found, be placed so that lines connecting the cardinal points will pass through the centre of the bases. The posts will also stand square on these lines. (Diagram 6, Appendix.)

A single row of corners only to be planted, which are to govern sections on both sides. 12. As hereinafter stated, with the exception of correction lines, a single row of corners, placed invariably on the west limit of road allowance upon meridian lines, and on the south side of such allowance on east and west lides, will govern the position of the corresponding town-ship,

section, or quarter-section corner on the opposite side of road allowance. For instance a point one chain and fifty links due east of the corner, placed and marked in the original survey for the easterly angle between sections 24 and 25, is intended to indicate unalterably, the corner between sections 19 and 30 of the Township adjoining on the east side of the road allowance. So also that planted for the northerly angle between sections 33 and 34, will in a corresponding manner, fix and govern the site of the corner between sections 3 and 4 on the north side of the road allowance between the Townships. (See Diagram No. 3, Appendix.)

13. The correction lines, being those on which the "jog," or meridional convergences are adjusted, will be distinguished by a double row of corners as hereinafter alluded to, to mark the Townships, sections, and quarter-sections on the north and south sides, respectively, of the road allowance. These corners will be placed in the course of the survey of the respective Townships, and as to easting and westing will be entirely independent of each other, at the same time the two lines of corners must be parallel, and precisely the width of road, *i. e.*, one chain and fifty links (measured on the meridian) distant from each other. (See Diagram No. 4, Appendix.)

Exception, on correction lines when double row will be placed.

#### IRON BOUNDARIES.

14. In projecting the base and correction lines and meridian exteriors, or in other words, running out the four Township blocks, *where the same may be in Prairie*, an iron boundary will be placed to mark each of the four corners—that is to say, at the points c. a. f. d. i. h. g. l. k. &c. (See Diagram No. 2, Appendix.)

15. This will consist of a pointed iron bar 5 feet long, to be  $1\frac{3}{8}$  inches square, the corners ragged for three feet up from the point, driven perpendicularly with a sledge, to within fifteen inches of the top.

16. The appropriate marks and numbers as hereinafter directed to be stamped thereon with steel punches.

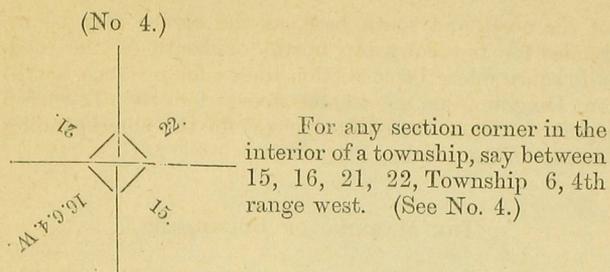
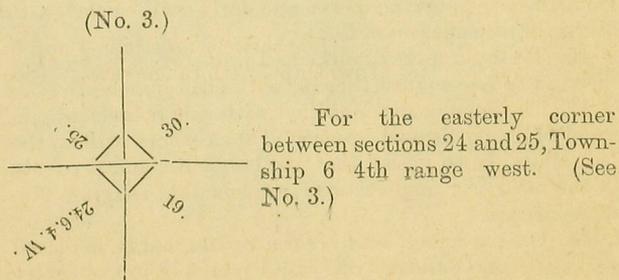
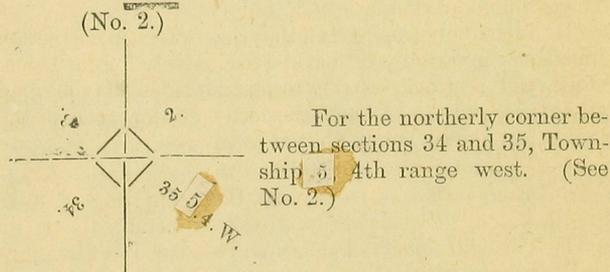
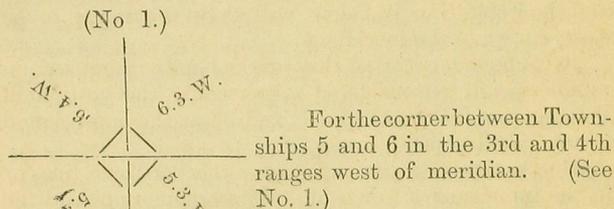
17. The mounds in connection with iron boundaries, instead of being thrown up around the corners, will on the base lines, be so placed that the bar will stand precisely at the northerly angle thereof, as shewn on Diagram No. 6, Appendix.

18. On the correction lines the mound will be so placed that the iron boundary will stand precisely in the centre

of the north and south base, as the corner may be intended for the Township north or south of the road—allowance upon the correction lines—for instance, at (b) on Diagram No. 4, see Appendix, for the Township corner north of the road, or at (a) for the corresponding corner on the south.

THE MARKING OF BOUNDARIES.

Boundary corners how to be marked. 19. Boundary trees, posts, or stones will be marked to indicate the corners they may be intended to represent, in manner as shewn below, that is to say :—

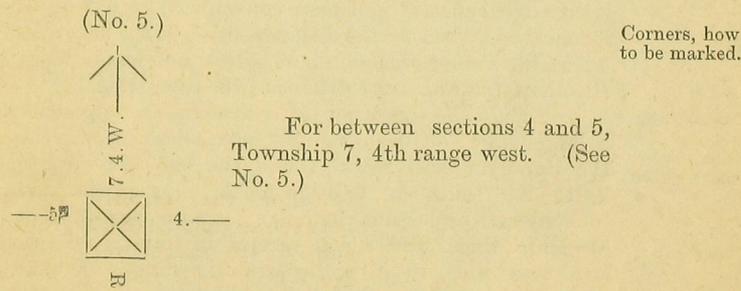


Or, in other words, on township corners the upper figure on a given side will indicate the Township, the next the range, and the letter E or W below, will shew the range to be east or west of the meridian.

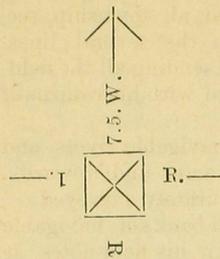
20. A boundary corner thus marked and without section numbers, will be considered as governing the position of the angles of sections 1, 6, 31, and 36 at the intersection of any two Township lines.

21. On all other section corners either on Town lines or in the interior of a Township, the simple numbers of the sections will be placed upon the corresponding face of the tree or post, and in addition, on a certain one of the sides thereof will be marked the number and range of the Township (as in sketches 2, 3, and 4).

21. It is to be borne in mind that the corners on correction lines must invariably be marked exclusively for the Townships and sections on the respective sides of the road allowance, and are to have the letter R. for road in the manner as shewn below, that is to say :—



(No. 6.)



For south east corner of Township, 7, between 4rd and 5th ranges west. Iron boundary. (See No. 6.)

23. The corresponding corner to that shewn in sketch No. 6 above would be the iron boundary at (g) the N. E. angle of Township 6, 5th range west. This would be, by calculation, 14 chains, 12 links east of the above, and in the *south* limit of the road allowance and would be marked R. for road on the north and east sides, 6, 5 W., on the south, and 36, for section, on the west.

24. The figures and letters on trees and posts are to be cut neatly and distinctly with a scribing iron which is to be kept in good order by a whetstone and small round file to be carried for the purpose. The marks on Township and Section corner stones will be effected with a cold chisel. The Deputy will be careful to provide himself with these very indispensable implements before leaving for his survey.

#### OBSTACLES ON LINE.

To pass obstacles on the survey line. 1. In case the survey line be obstructed by a lake, pond, deep marsh, or other obstacle, the Deputy will pass it by right angled offsets, or, if more convenient, by a Trigonometrical operation for the distance, using in the latter case where the same can be obtained, a base not less in length than half the estimated distance to be calculated.

To carry a base line past a large lake or other obstacle. 2. Should the extension of a *base line* be opposed by a large lake or deep marsh impossible to traverse, the Surveyor will work round the same by passing it to the south or to the north as may be most convenient, projecting for the purpose the adjacent township lines, and being careful in laying off east and west lines to give the westerly ranges of half-sections the proper calculated width according to the number of such Township. In working round upon the Town lines in this way to arrive at and take up the con-

tinuation of the base on the opposite side of the obstruction the Surveyor will regularly post off and mark, according to the manner hereinbefore prescribed, all township, section, and quarter-section corners on the several lines, reporting the circumstances fully, and sending all the field-notes of such additional work, forward with his returns of survey.

3. In subdividing Townships, all navigable rivers, and lakes and deep ponds of twenty-five acres and upwards, found within the same, are to be accurately surveyed. Rivers, lakes, and ponds to be surveyed.

4. The Surveyor will traverse both banks of navigable streams, referring to such traverses in his field-notes as on the "right" or "left" bank, as the same would be on his right or left respectively looking down the stream. Both sides of navigable streams to be surveyed.

5. At those points where Township or section lines intersect the banks of a navigable stream, temporary posts or marks are to be established, and the distance across the river between the same ascertained trigonometrically or otherwise, at the time of running such lines. Such temporary posts or marks will be called traverse points, and the survey of a stream will be effected by connecting them with traverse lines and offsets, on the respective sides of the river, the bearing of such lines being checked at the intersection thereof by each Township or section line. To fix traverse points. Manner of making traverse.

6. To obtain the extent and relative position in the survey, of an Island, the Surveyor will measure a base from the traverse point nearest thereto, and observing the angles from such base to some fixed point on the island, calculate the distance across, and then from such fixed point traverse the same. To survey islands.

7. To traverse a lake or pond lying entirely within the bounds of a section, the Surveyor will run and measure two lines to the same from the nearest section or quarter-section corner on opposite sides thereof; in each case where such lines intersect the margin, he will erect traverse points, and connect the same by courses and distances on both sides of the sheet of water. To survey small lakes or ponds.

8. No blazes or marks of any description are to be made on traverse lines between the points on Township or section lines which intersect the same. No marks to be left on traverse lines.

## THE FIELD BOOK.

Of the Field-book.

1. The first page will give its title, shewing the nature of the survey, the Province in which such blocks or Townships are situated, by whom surveyed, and the dates of the commencement and completion of the work. The second page will contain the names and duties of all assistants, and wherever a new assistant is employed, or the duty of any one changed, an appropriate entry thereof with the reasons therefor, will be made in the Field-book previous to entering any notes under the changed arrangements. The third page will contain a skeleton diagram with each section or traverse line numbered to correspond with the page of the notes.

2. The field-notes must be a faithful, distinct, and minute record of everything officially done and observed by the Surveyor and his assistants pursuant to instructions, in relation to running, measuring, and marking lines, establishing boundary corners, laying off road allowances, &c., and present, as far as possible, a full and complete topographical description of the country surveyed.

3. There will be sundry distinct Field-books of surveys, as follows:—

1. Field-notes taken on base lines, meridian exteriors, and correction lines.

2. Field-notes of the subdivision of blocks into Townships, sections, and quarter-sections, in which will also appear the notes taken in traversing streams, lakes, and ponds within such blocks.

4. The Field-notes of every section line surveyed, whether in laying out the blocks or in the subdivision thereof, must be complete *in itself*, and be laid down on a separate page, as illustrated by the specimen notes. (See Diagram No. 7, and Form 8, Appendix.) The following abbreviation of words, but no others will be allowed in the notes, that is to say:—“*sec.*” for “*section*,” “*in diam.*” for “*in diameter*,” “*chs.*” for “*chains*,” “*lks.*” for “*links*,” “*dist.*” for “*distance*” or “*distant*,” “*Tp.*” for “*Township*,” “*R.*” for “*Range*,” “*W.*” for “*West*,” “*N.*” for “*North*,” “*S.*” for “*South*,” “*E.*” for “*East*,” and “*P. in M.*” for “*Post in Mound*.”

5. The Field-notes are to give the following information in relation to the survey:

1. The length of every line ran, noting all necessary offsets therefrom, with the reasons for the same.

2. The kind and diameter of all “bearing trees,” or “witness mounds,” with the course and distance of the same from their respective corners.

3. The character of corner boundaries, whether iron, tree, post, or stone, and if indicated by stone mound the fact to be stated.

4. The distances at which the line intersects, and also where it leaves settler's claims or improvements, lakes, ponds, rivers, bottom lands, swamps, marshes, also the beginning of ascent, the top, and the foot of descent, of all remarkable hills or ridges, with their estimated height in feet above the bottom lands near which they may be situated.

5. The distance at which creeks are intersected, their course, average width and depth, and the character of their water, whether the same is fresh, salt, or stagnant, the character of the water in the lakes also, which may fall within the survey.

6. The land's surface, whether the same may be level, rolling, broken, or hilly.

7. The soil, whether the same may be, in his opinion, first, second, third, or fourth rate; and entering the class on each quarter-section in the notes where indicated, *at the time of the survey*.

8. If in timber, the kinds and general character thereof.

9. Rapids or falls of water affording mill sites, with estimated fall and supply of water in general terms.

10. Coal deposits, minerals, transmitting specimens of the same, and salt springs, &c., &c.

11. Wherever fixed rock is met with, the Surveyor will transmit a specimen thereof, containing not less than two cubic inches, ticketed and numbered to correspond with the entry in his Field-book.

6. The field-notes must be distinctly and neatly made out in language precise and clear, and their figures, letters, words, and meaning are always to be unmistakable. Field notes to be neat and distinct.

7. Besides the ordinary notes taken on the line (which notes must always be written down on the spot, leaving nothing to be supplied from memory), the Surveyor will subjoin at the conclusion of his field-notes, in a concise Report, such further description or information connected Report to accompany the field-notes in each case.

with the Township (or other survey), as he may be able to afford, which may be useful or necessary to be known, with a *general description* of the Township as respects the face of the country, its soil and geological features, timber, minerals, waters, &c.

8. In reporting on the survey of blocks the Deputy will, in each case, describe the general character of the several Townships composing the same, and particularize those which, in his opinion, it would not be worth while to subdivide.

Surveyor to make affidavit to notes and report.

9. Following the Field-notes, the Deputy will make affidavit according to the form following, as to the accuracy thereof.

(FORM OF AFFIDAVIT.)

I, A. B., of the \_\_\_\_\_ of \_\_\_\_\_, Deputy Surveyor, make oath and say that the foregoing Field-notes are correct and true in all their various particulars to the best of my knowledge and belief. So help me God.

(Signed,) A. B.

Sworn before me at \_\_\_\_\_, }  
this \_\_\_\_\_ of \_\_\_\_\_ 18 \_\_\_\_\_, } J. P., or Commissioner,  
(as the case may be.)

PLANS OF SURVEY.

1. In returning the field-notes taken in the survey of the base and correction lines, and meridian exteriors, the Deputy Surveyor will submit also a plan on a scale of forty chains to the inch, on which must be noted the precise measurement of the irregular quarter-sections, all the objects of topography necessary to illustrate the field-notes—that is to say, the crossing of streams, and the direction of each by an arrow-head pointing down the same; also the intersection by the line, of prairies, marshes, swamps, ravines, ponds, lakes, hills, and all other features indicated by the notes to the fullest extent practicable.

A copy thereof to be furnished the Deputy who divides such block.

2. The Deputy, whose duty it may be to sub-divide a block of Townships, will be furnished with a diagram on the scale above mentioned of the exterior lines of the block to be sub-divided, upon which will have been laid down the measurements of each of the section lines on such boundaries whereon he is to close, the water-crossings and other principal features, and a particular description of each corner.

3. On sending in his returns of the sub-division, such Surveyor will transmit, as part thereof, a separate and complete plan of each Township on the above scale, which plan will exhibit the length of all section lines; also of irregular quarter-sections, together with the area of the latter in each case in acres and hundredths; it will also contain a table exhibiting the area of the Township, thus—

	Acres.
Nett area (less roads) .....	
Roads .....	
Water .....	
<hr/>	
Total area.....	
<hr/>	

also all the objects of topography crossed by the various section lines, as referred to in the field-notes, and will further have laid down thereon, copied from the diagram above indicated—the features of the exterior lines, and the various crossings of water, the same being connected and set forth in such a manner as to give the most accurate possible idea of the physical character of the surface of such Township.

METHOD OF DEFINING A MERIDIAN LINE.

The best practical method of determining a true meridian line north of the Equator, is by observing the Polar 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, nearly equal to a degree and a half, it performs a revolution about the Pole in a circle, the time of revolution being 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 56 minutes, and is then said to be in the meridian. When it departs from the meridian, it apparently moves east or west for 5 hours and 59 minutes, and then returns to it 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 shew the times of its greatest eastern or western elongations :—

EASTERN ELONGATIONS.

Table with 7 columns: Days, April, May, June, July, August, Sept. and 7 rows of data.

WESTERN ELONGATIONS.

Table with 7 columns: Days, Oct, Nov, Dec, Jan, Feb, March. and 7 rows of data.

Eastern and Western elongations.

The eastern elongations are put down from the 1st April to the 1st October, and the western from the 1st October to the 1st 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 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. In such case if it be necessary to determine the meridian at that particular season of the year, let 5 hours and 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 a vertical plane passing through the pole star, when at its greatest eastern or western elongation—such angle is called the Azimuth. The azimuth. The mean angle is put down, being calculated for the 1st July of each year :—

AZIMUTH TABLE.

Containing the Azimuth of the Pole Star, from 1871 to 1880, both inclusive ; and for each whole degree of latitude from 49° to 60°, both inclusive.

Large table with columns for Year, Lat. 49°, Azimuth, Lat. 50°, Azimuth, Lat. 51°, Azimuth, Lat. 52°, Azimuth, Lat. 53°, Azimuth, Lat. 54°, Azimuth, Lat. 55°, Azimuth, Lat. 56°, Azimuth, Lat. 57°, Azimuth, Lat. 58°, Azimuth, Lat. 59°, Azimuth, Lat. 60°, Azimuth.

NOTE.—The Latitude of any given East and West line between Townships, for the purpose of obtaining the Azimuth, may be got sufficiently near by multiplying 5' 18" 4, the arc of Latitude covered by a single Township, by the number of Townships, and adding the result to 49°.

The use of the above tables in ascertaining the meridian, will presently be apparent.

## TO LAY DOWN A TRUE MERIDIAN WITH THE THEODOLITE.

About twenty-five minutes before the time of the greatest eastern or western elongation of the Pole star, as shown by the table of elongations, let the theodolite be placed, (the legs being firmly fixed in solid ground) at a convenient point, and levelled with exactness. To test an existing line, the instrument should be placed *in* such line. Now faintly illumine the spider lines in the telescope by the lamp belonging to the instrument, or by an assistant holding a small lamp or other light near the object glass.

Let the intersection of the spider lines in the axis of the telescope be brought to bear exactly on 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 intersection of the spider's lines for a short 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 must be taken that the instrument be not disturbed. Now let a staff with a candle or small lamp, fastened upon the side next to the instrument, be arranged at a convenient distance (not less than 150 or 200 yards, if practicable) from the theodolite, and in the same vertical plane with the intersection of the spider's lines in the axis of the telescope, and then mark the point directly under and in the vertical axis of the theodolite; the line passing through this point and the staff makes an angle with the true meridian equal to the azimuth of the star.

From the table of Azimuths take the Azimuth corresponding to the year and nearest latitude, having if necessary corrected the latter as pointed out in note.

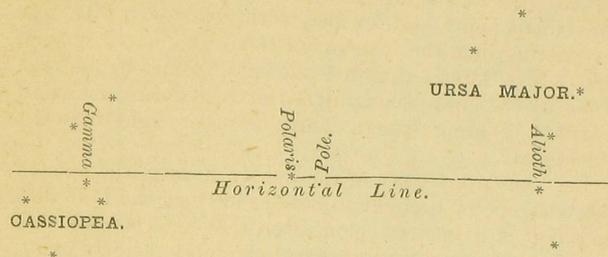
If the observed elongation is east, the true meridian lies on the west of the line which has been found. If the elongation was west, the true meridian lies on the east of the meridian, and in either case by laying off the Azimuth angle with the theodolite, the Surveyor will obtain the true meridian.

A very near approximation to the time when the Pole star will be at its greatest eastern or western elongation, may be had by observing it at the precise moment when

To obtain a meridian with the Theodolite.

Method of approximating to the time of

a horizontal line passing through it most nearly approaches to the two stars: one known as Gamma in the constellation of Cassiopeia, the other as Alioth in the constellation of Ursa Major. For the illustration of which see the following Diagram:—



It will be remarked from the Diagram that the Pole star is on the opposite side of the Pole from Alioth. When the latter star, therefore, is to the right of the observer, who stands facing the north, the Azimuth will require to be laid off to the east, and *vice versa*, if Alioth is on the left hand of the observer, the latter standing as aforesaid.

TABLE

Shewing the departure in running 81 chains 50 links  
(being the distance between two section corners  
with road allowance included) at any course from  
1 to 60 minutes.

Min.	Links.	Min.	Links.	Min.	Links.
1	2·38	21	49·79	41	97·21
2	4·75	22	52·16	42	99·58
3	7·12	23	54·53	43	101·47
4	9·49	24	56·90	44	104·18
5	11·85	25	59·27	45	106·89
6	14·22	26	61·64	46	109·61
7	16·60	27	64·01	47	111·32
8	18·96	28	66·38	48	113·03
9	21·34	29	68·75	49	116·74
10	23·71	30	71·12	50	118·46
11	26·08	31	73·50	51	120·17
12	28·45	32	75·87	52	123·88
13	30·82	33	78·24	53	125·59
14	33·19	34	80·61	54	128·30
15	35·56	35	82·98	55	130·01
16	37·93	36	85·35	56	132·73
17	40·31	37	87·72	57	135·44
18	42·68	38	90·09	58	137·15
19	45·04	39	92·46	59	139·87
20	47·42	40	94·83	60	142·58

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APPENDIX.

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(No. 9.)

FORM OF CONTRACT.

This Agreement, made this \_\_\_\_\_ day of \_\_\_\_\_, 187 ,  
between \_\_\_\_\_ of the \_\_\_\_\_ of

Deputy Surveyor of the one part, and Her Majesty the  
Queen represented and acting herein by the Honorable \_\_\_\_\_  
\_\_\_\_\_, the Secretary of State for Canada of  
the other part.

Witnesseth, That the said \_\_\_\_\_, for and in  
consideration of the conditions, terms, provisions, and covenants  
hereinafter expressed, and according to the true intent and meaning  
thereof, doth hereby covenant and agree with Her Majesty, that  
the said \_\_\_\_\_ in \_\_\_\_\_ own proper person,  
with the aid of such chainmen, and other assistants as may be  
necessary, the same to be provided and paid for at the sole cost of  
the said \_\_\_\_\_, and in strict conformity with  
the printed Manual of Surveying Instructions issued from the De-  
partment of State for Canada, and which is hereby incorporated  
with and made part of this contract, together with such special  
instructions as \_\_\_\_\_ may receive from the Secretary of State  
for Canada, or the Surveyor General of Dominion Lands, in con-  
formity therewith, will well, truly, and faithfully

and that \_\_\_\_\_ will complete these surveys, in the manner aforesaid,  
and return the plan and the true and original field notes thereof  
to the Department of the Secretary of State for Canada, on or before  
the \_\_\_\_\_ day of \_\_\_\_\_ next ensuing the date hereof.

And Her Majesty covenants and agrees with the said \_\_\_\_\_  
\_\_\_\_\_, that on the completion of the surveys above-named,  
in manner aforesaid, and to the satisfaction of the Secretary of  
State for Canada, there shall be paid to the said \_\_\_\_\_,  
upon the receipt of \_\_\_\_\_ account at the office of the Secretary  
of State for Canada, properly certified and accompanied by the  
approved plans and field-notes of the surveys for which the ac-  
count is rendered, as a full compensation for the whole expense of  
surveying and making return thereof, \_\_\_\_\_, per  
mile, for every mile and part of a mile actually run and marked in  
the field, random lines and offsets not included.

And it is further understood and agreed, between the parties to this agreement, that the said surveys will not be approved by the said \_\_\_\_\_, in his capacity aforesaid, unless they shall be found to be in exact accordance with the requirements in the above mentioned printed Manual of Surveying Instructions; Provided, No sub-contractor shall have any part in this contract, and that no payment shall be made for any surveys not executed by the said Deputy Surveyor, \_\_\_\_\_ in \_\_\_\_\_ own proper person.

In testimony whereof, The parties to these articles of agreement have hereunto set their hands and seals, the day and year first above written.

Signed, sealed, and acknowledged }  
before us.

\_\_\_\_\_  
\_\_\_\_\_

Deputy Surveyor.

\_\_\_\_\_  
Secretary of State for Canada.

Countersigned.

\_\_\_\_\_  
Surveyer General.

I, \_\_\_\_\_, Deputy Surveyor, do solemnly \_\_\_\_\_ that will faithfully and impartially execute the surveys mentioned in the foregoing contract, to the best of \_\_\_\_\_ skill and ability.

Sworn to and subscribed before me at \_\_\_\_\_, in \_\_\_\_\_

the \_\_\_\_\_ of \_\_\_\_\_, 187 \_\_\_\_\_

\_\_\_\_\_  
Deputy Surveyor.

(No. 10.)

FORM OF BOND.

Know all men by these Presents, That we

\_\_\_\_\_ Deputy Surveyor, as principal,

and \_\_\_\_\_ of the \_\_\_\_\_ of \_\_\_\_\_

and \_\_\_\_\_ of the \_\_\_\_\_ of \_\_\_\_\_

(1)  
Being double the estimated amount which would be due by the said Dominion on the completion of the surveys named in the foregoing contract.

as sureties, are held and firmly bound unto Her Majesty, the Queen, Her sucesors and assigns, in the sum of (1) \_\_\_\_\_ dollars, lawful money of Canada, to be paid to Her Majesty, Her Heirs and Successors, for which payment, well and truly to be made, we bind ourselves, our heirs, executors, and administrators, and each and every of us and them jointly and severally, firmly by these presents, signed with our hands and sealed with our seals, this \_\_\_\_\_ day of \_\_\_\_\_, 187 \_\_\_\_\_.

The condition of the above Obligation is such, That if the above bounden

\_\_\_\_\_ shall well and truly and faithfully, according to the instructions of the Secretary of State for Canada, and in strict conformity with the printed Manual of Surveying Instructions, mentioned in the said contract, make and execute the surveys which are required of

\_\_\_\_\_ to be made by the foregoing contract, and return the plans and field notes of the said surveys to the Secretary of State for Canada in the manner and within the period named in the said contract, then this obligation to be void, or otherwise it shall remain in full force and virtue.

Signed, sealed, and acknowledged before us.

\_\_\_\_\_  
Deputy Surveyor.

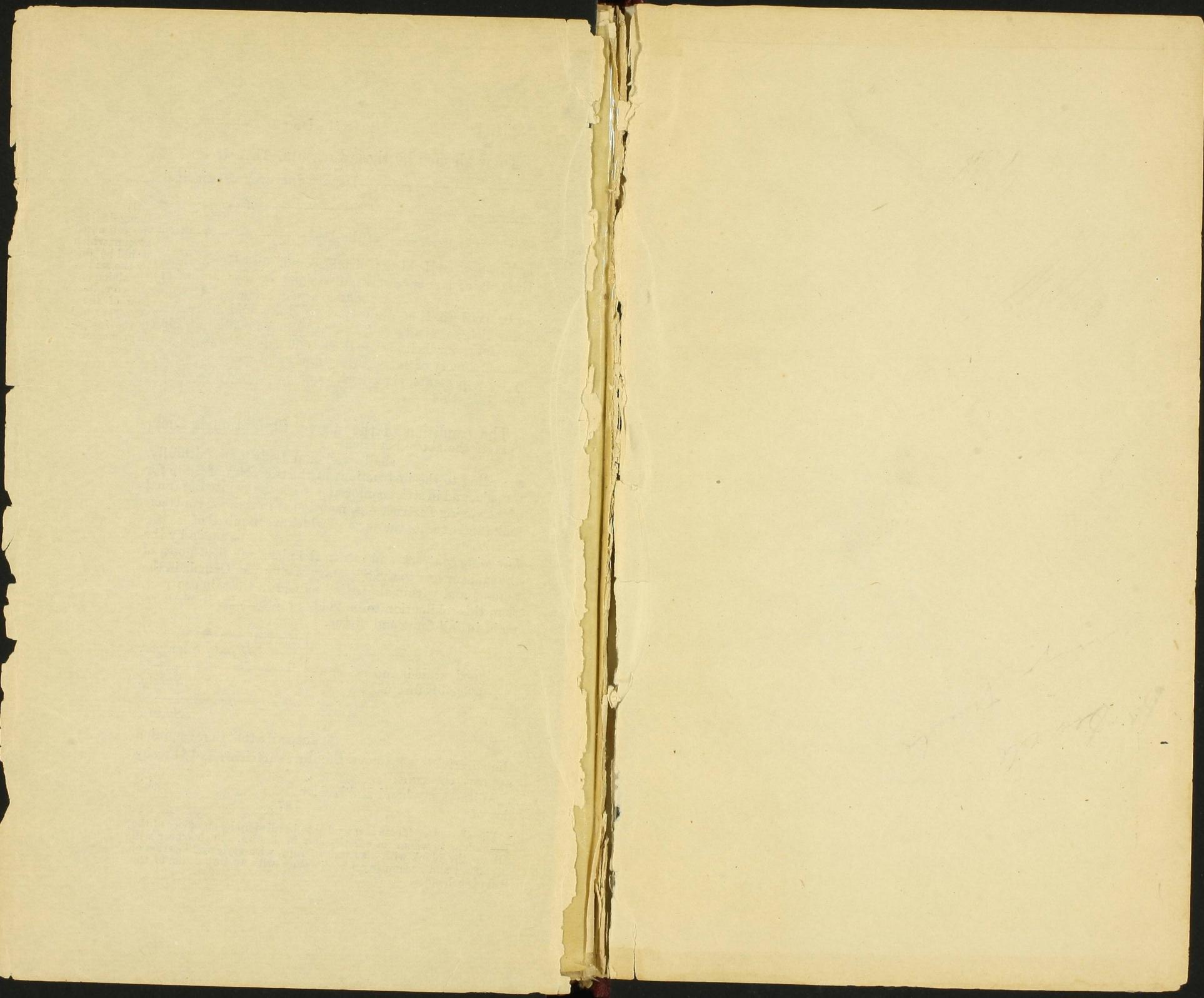
\_\_\_\_\_  
Surety.

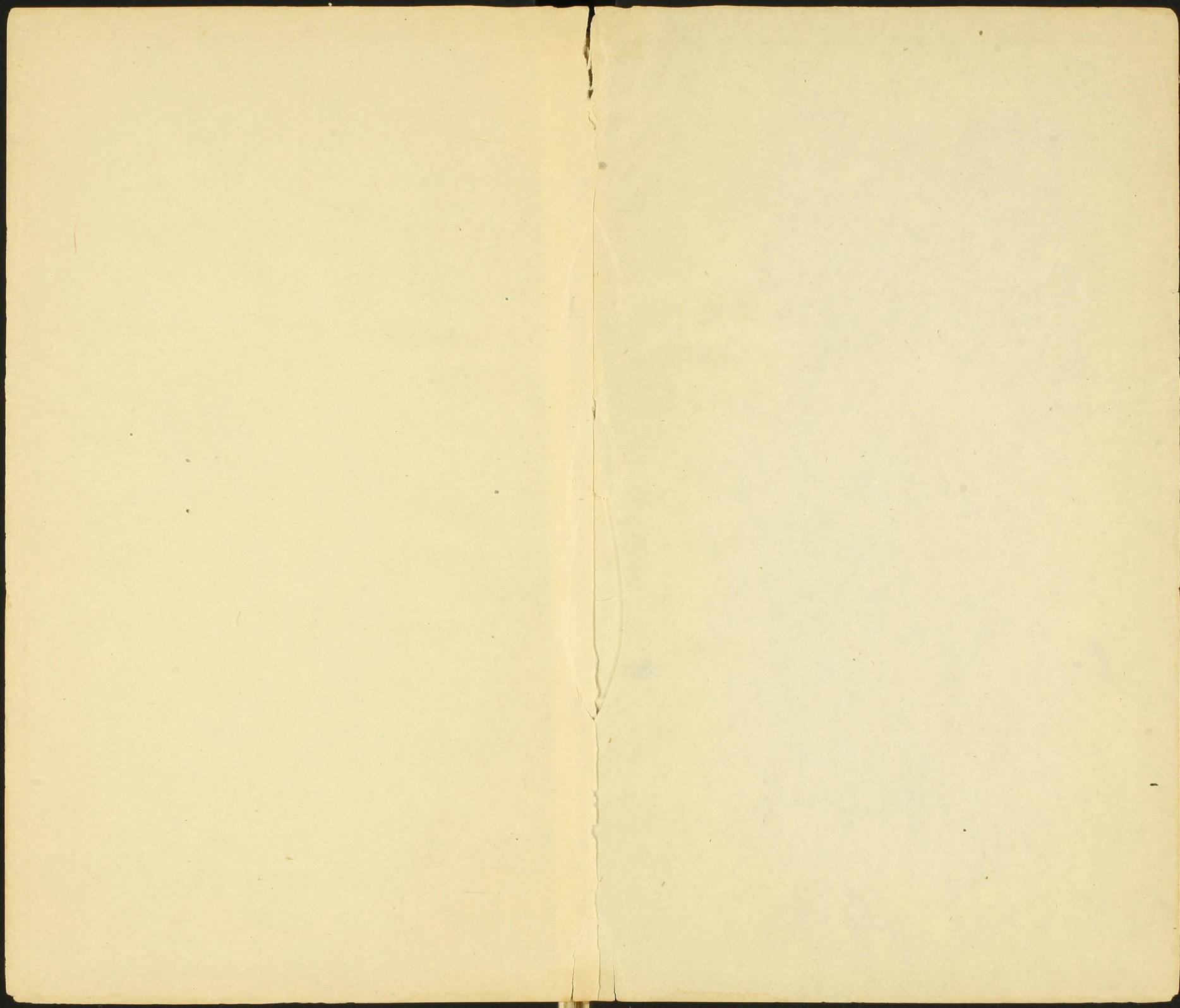
\_\_\_\_\_  
Surety.

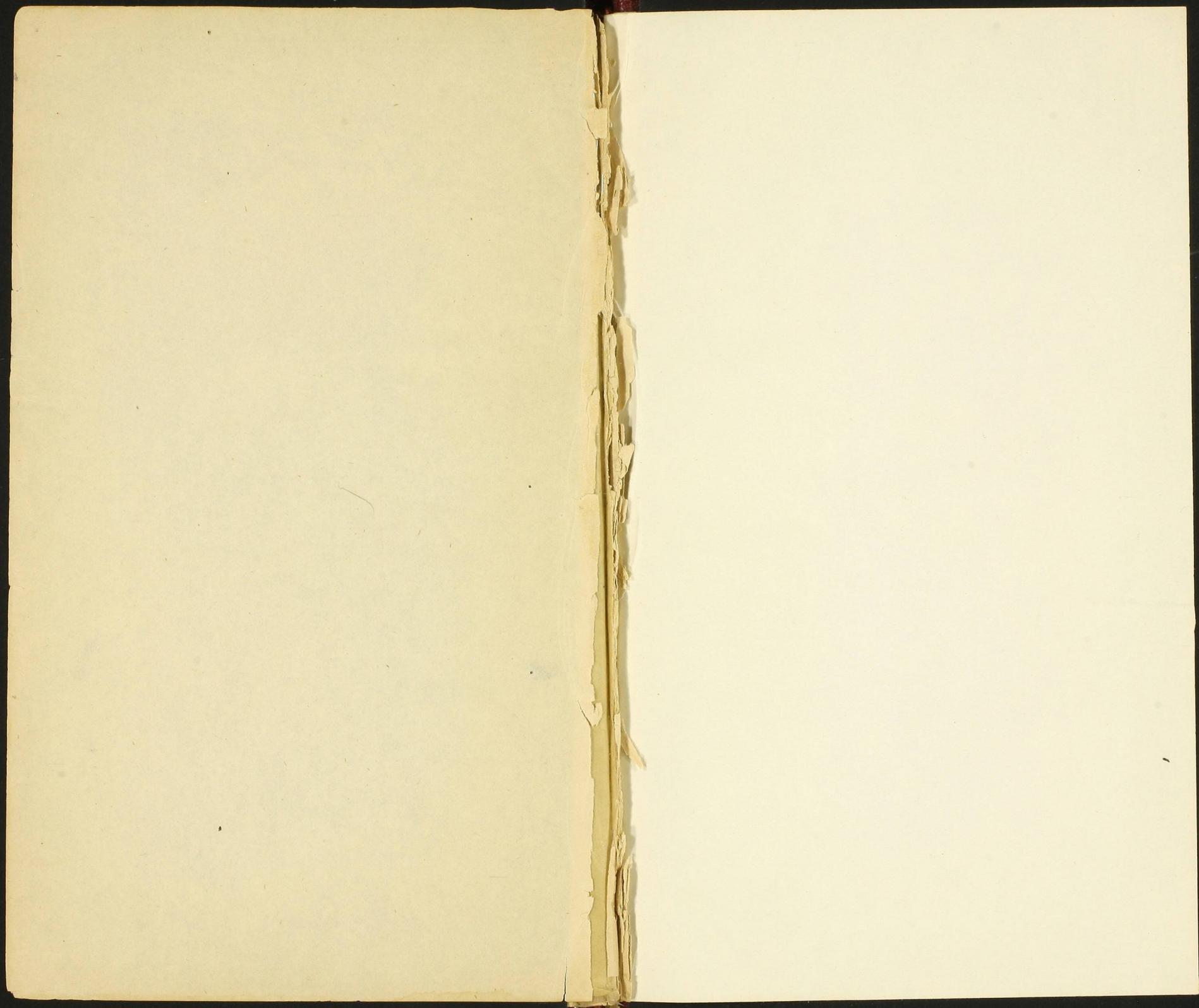
I, \_\_\_\_\_ do certify that in my opinion the sureties to the above Bond are sufficient, and I hereby approve the same.

Witness my hand and seal at \_\_\_\_\_, this day of \_\_\_\_\_, 187 \_\_\_\_\_.

The above Certificate is intended to be filled up by an officer of the Dominion, to whom the sureties may be known. Such officer will fill up the blank with his name in full, with style and location of his office; and accompany his signature with an impression of the seal of such office.







1