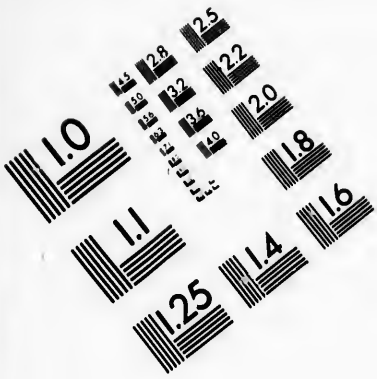

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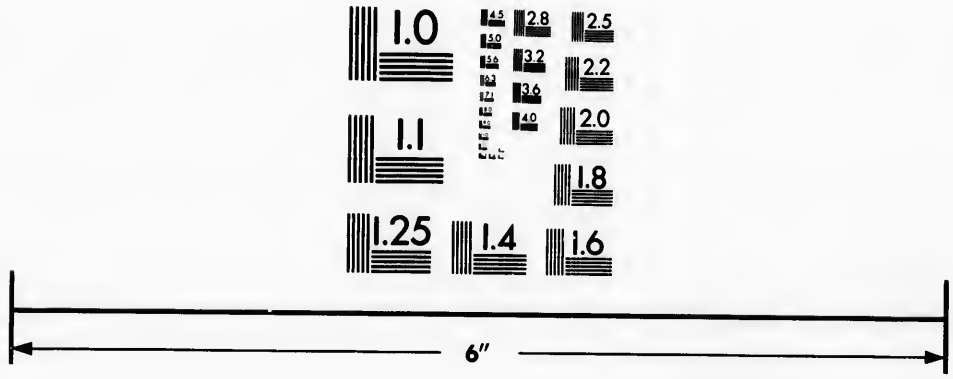

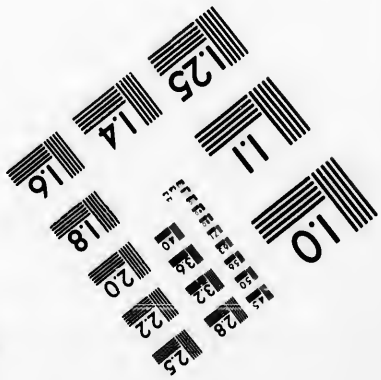

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AZIMUTHS OF
THE NORTH POLE STAR
FOR 1899 AND 1900.

LAT. 48° N. TO LAT. 54° N.

BY

S. A. ROBERTS,

Dominion and Provincial Land Surveyor.

PRICE $1.00.

FOR COPIES ADDRESS:

ROOM NO. 55, FIVE SISTERS' BLOCK,

VICTORIA B. C.

Azimuths of the North Pole Star.

For 1899 and 1900.

With these tables, and a reliable watch, a true meridian, or any other line, can be determined, whenever the North Pole Star is visible; practically, at any hour from sunset to sunrise, superseding the ordinary tedious method of waiting for the elongation. The most favorable times are in the early dawn and evening twilight, for the work can always be done more quickly and accurately by daylight than in the dark. Should the light be rather strong, and the star not easily seen, its place may be found, with a transit instrument, as follows:

After levelling, turn the telescope (by deflection from the magnetic meridian) until it points true north, then direct it upwards at an angle equal to the latitude of the place, and it will point to the North Pole. The star should be somewhere in, or very near the field of view. The observation can then be made, and the Azimuth having been previously ascertained by the rule given below, the direction of the meridian or any other line can be immediately found.

An error in the time will cause an error in the Azimuth, which will be greatest when the Pole Star is near the meridian; as an example:

If the error of the watch is 1 m.

When the Pole Star is from the meridian,	h 0.	h 1.	h 2.	h 3.	h 4.	h 5.	h 6.
	′	′	′	′	′	′	′
Error in Azimuth will be	0·5	·5	·4	·4	·2	·1	0

Other errors in the watch will, of course, produce proportional errors in the Azimuth; and the above example will enable an observer to estimate the amount.

There are various ways of determining the error of a watch; the following is suggested as a simple one: Observe the Pole Star at elongation; and with the Azimuth, lay off a true meridian line, and mark its position. A few hours later observe the star when at transit across this line. Note the exact time, and compare it with the true time of transit; the difference will be the error of the watch.

EXPLANATION OF THE TABLES.

The Azimuths are given to the nearest tenth part of a minute, from Lat. 48° to 54° N.

In calculating these Tables, a mean polar distance of 1°. 13′. 36″. was used. The true polar distance is a variable quantity; and, at certain times of the year, the tabulated Azimuths will be slightly in error. A correction will then be necessary. This correction, with the dates, between which it is to be used, will be found in the Auxiliary table, headed, Corrections to Azimuths.

The culminations of Polaris have been calculated for a meridian 120° or 8 h. W. of Greenwich, as being most convenient for use in British Columbia. Note that there are two Culminations on the 12th October:—

In places to the Eastward, follow the instructions in the note at the foot of the Table.

RULE FOR FINDING THE AZIMUTH.

Find the interval between the time set for Observation, and the preceding Culmination of Polaris.

In the table opposite this Interval, and under the proper latitude, will be found the Azimuth of the Star, which, when necessary, must be modified by the correction.

If the Interval is less than 11 h. 58 m., the Star's Azimuth is W.; if greater, the Azimuth is E.

Long. 8 h. W. of Greenwich.

CULMINATIONS OF THE NORTH POLE STAR.

1899.		1900.
h. m. s.		h. m. s.
6 36 20 p.m.	1 Jan.	6 37 52 p.m.
5 56 52	11	5 58 24
5 17 23	21	5 18 54
4 33 56	1 Feb.	4 35 29
3 54 29	11	3 56 1
3 15 2	21	3 16 34
2 43 29	1 Mar.	2 45 0
2 4 4	11	2 5 36
1 24 43	21	1 26 13
0 41 25	1 Apr.	0 42 55
0 2 5 p.m.	11	0 3 36 p.m.
11 22 48 a.m.	21	11 24 20 a.m.
10 43 34	1 May	10 45 4
10 4 20	11	10 5 50
9 25 8	21	9 26 38
8 42 2	1 Jun.	8 43 32
8 2 52	11	8 4 22
7 23 43	21	7 25 12
6 44 34	1 Jul.	6 46 4
6 5 25	11	6 6 55
5 26 17	21	5 27 46
4 43 13	1 Aug.	4 44 42
4 4 3	11	4 5 33
3 24 53	21	3 26 23
2 41 46	1 Sept.	2 43 16
2 2 34	11	2 4 4
1 23 20	21	1 24 51
0 44 5	1 Oct.	0 45 36
0 4 49	11	0 6 19
{ 0 0 53 a.m. / 11 56 57 p.m. }	12	{ 0 2 24 a.m. / 11 58 28 p.m. }
11 21 35	21	11 23 6
10 38 19	1 Nov.	10 39 50
9 58 58	11	10 0 29
9 19 35	21	9 21 6
8 40 10	1 Dec.	8 41 41
8 0 44	11	8 2 15
7 21 17	21	7 22 48
6 41 49 p.m.	31	6 43 20 p.m.

Diff. for 1 h. varies from 9·8 to 9·9 seconds. Diff. for 24 h. varies from 3 m. 55 s. to 3 m. 57 s.

In Long.:	7 h. W.	Culmin'n,	10	seconds	later
" "	6 h. W.	"	20	"	"
" "	5 h. W.	"	30	"	"
" "	4 h. W.	"	39	"	"

EXAMPLE IN LAT. 50° N.

	h. m. s.	
Time Set for Obser'n	7 30 0	a.m. 2 Dec. 1899
Preceding Culmin'n	8 40 10	p.m. 1 Dec.
Interval,	10 49 50	

Azimuth, 0° 32′·8 W.
Correction, —·2 (Subtract.)

True Azimuth, 0° 32′·6 W.

EXAMPLE IN LAT. 54° N.

	h. m. s.	
Time Set for Obser'n	8 45 0	p.m. 1 July 1900
Preceding Culmin'n	6 46 4	a.m. 1 July.
Interval,	13 58 56	

True Azimuth, 1° 1′·7 E. (no corr'n required.)

AUXILIARY TABLE.

Corr'n to Azimuths

Jun. July Aug. 1899, Nov. 1899 to 1 Apr. 1900 — Add
Sep. Oct. 1900 — Sub
Nov. Dec. 1900 double — Add

Interval	Corr'n	Interval
h. m.	° ′	h. m.
0	0 0·0	23 56
1	·1	23
2	·3	22
3	·3	21
4	·4	20
5	·5	19
6	·5	18
7	·5	17
8	·4	16
9	·3	15
10	·3	14
11	° ′·1	13
11 58	0 0·0	11 58

Azimuths of the North Pole Star for 1898 and 1899.

Interval since Culmination.	Lat. 48° N.	49°	50°	51°	52°	53°	54°	Interval since Culmination.
H. M.	° ′	° ′	° ′	° ′	° ′	° ′	° ′	H. M.
0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	23. 56
5	2·5	2·5	2·6	2·6	2·7	2·7	2·8	51
10	4·9	5·0	5.1	5·2	5·4	5·5	5·7	46
15	7·4	7·5	7·6	7·8	8·1	8·3	8·5	41
20	9·8	10.0	10·2	10·4	10·7	11·0	11·3	36
25	12·3	12·5	12·8	13·1	13.4	13·7	14·1	31
30	14.7	15·0	15·4	15·7	16·1	16·5	16·9	26
35	17·2	17·5	17·9	18·3	18·8	19·2	19·7	21
40	19·6	20·0	20·5	20·9	21·4	21·9	22·5	16
45	22·0	22·5	23·0	23·5	24·0	24·6	25·2	11
50	24·4	24·9	25.5	26·0	26·6	27·3	28·0	6
55	26·8	27·4	28·0	28·6	29·3	30·0	30·7	23. 1
1. 0	29·2	29·8	30·5	31·2	31·9	32·6	33·4	22. 56
5	31·6	32·2	32·9	33·6	34·4	35·3	36·2	51
10	34·0	34·7	35·4	36·2	37·0	37·9	38·8	46
15	36·3	37·0	37·8	38·7	39·6	40·5	41·5	41
20	38·6	39·4	40·2	41·1	42·1	43·1	44·1	36
25	40·9	41.7	42·6	43·6	44·6	45·7	46·8	31
30	43·1	44·0	45·0	46·0	47·1	48·2	49·4	26
35	45·4	46·3	47·3	48·4	49·5	50·7	52·0	21
40	47·6	48.6	49·6	50·7	51·9	53·2	54·5	16
45	49·8	50·8	51·9	53·1	54·3	55·6	57·0	11
50	52·0	53·1	54·2	55·4	56 7	0° 58·1	0° 59·5	6
55	54·1	55·3	56·5	0° 57·8	0° 59·1	1° 0·5	1° 2·0	22. 1
2. 0	56·3	57·5	0° 58·7	1° 0·0	1° 1·4	2·9	4·4	21. 56
5	0° 58·4	0° 59·6	1° 0.0	2·2	3·6	5·2	6·8	51
10	1° 0·4	1° 1·7	3·0	4·4	5·9	7·5	9·2	46
15	2·5	3·8	5·1	6·6	8·1	9·8	11·5	41
20	4·5	5·8	7·2	8·7	10·3	12·0	13·8	36
25	6·5	7·9	9·3	10·8	12·4	14.2	16·0	31
30	8·4	9·8	11·3	12·9	14·5	16.3	18·2	26
35	10·3	11·8	13·3	14·9	16·6	18·5	20·4	21
40	12·2	13·7	15·2	16·9	18·7	20·6	22·5	16
45	14·0	15·5	17·1	18·8	20·7	22·6	24·6	11
50	15·8	17·4	19·0	20·7	22·6	24·6	26·7	6
55	17·6	19·2	20·8	22·6	24·5	26·5	28·7	21. 1
3. 0	19·3	20·9	22·6	24·5	26·4	28·5	30·6	20. 56
4	20·6	22·3	24·0	25·8	27·8	29·9	32·1	52
9	22·3	24·0	25·7	27·6	29·6	31·7	34·0	47
14	23·9	25·6	27·4	29·3	31·3	33·5	35·8	42
19	25·4	27·2	29·0	30·9	33·0	35·2	37·6	37
24	26·9	28·7	30·6	32·6	34·7	36·9	39·3	32
29	28·4	30·2	32·1	34·1	36·3	38·6	41·0	27
34	29·9	31·7	33·6	35·6	37·8	40·1	42·6	22
39	31·3	33·2	35·1	37·1	39·3	41·7	44·2	17
44	32·6	34·5	36·5	38·6	40·8	43·2	45·7	12
49	33·9	35·8	37·8	39·9	42·2	44·6	47·2	7
54	35·1	37·1	39·1	41·3	43·6	46·0	48·6	20. 2
3. 59	36·3	38·3	40·4	42·6	44·9	47·4	50·0	19. 57
4· 9	38·6	40·6	42·7	44·9	47·3	49·8	52·5	47
19	40·6	42·7	44·8	47·1	49·5	52·1	54·8	37
29	42·5	44·6	46·7	49·0	51·6	54·1	56·9	27
39	44·1	46·2	48·5	50·8	53·3	56·0	1° 58·8	17
49	45·6	47·7	50·0	52·4	54·9	57·6	2° 0·4	19. 7
4. 59	46·9	49·0	51·3	53·7	56·3	1° 59·0	1·8	18. 57
5. 19	48·7	50·9	53·2	55.7	58·3	2° 1·0	3·9	37
39	49·8	52·0	54·3	56·8	59·4	2·1	5·0	18. 17
5. 59	1° 50·0	1° 52·2	1° 54·5	1° 56·9	1° 59·5	2° 2·3	2° 5·2	17. 57

Azimuths of the North Pole Star for 1899 and 1900.

Interval since Culmination.	Lat. 48° N.	49°	50°	51°	52°	53°	54°	Interval since Culmination.
H. M.	° ′	° ′	° ′	° ′	° ′	° ′	° ′	H. M.
23. 56								
51								
46								
41								
36								
31								
26								
21								
16								
11								
6								
23. 1								
22. 56								
51								
46								
41								
36								
31								
26								
21								
16								
11								
6								
22. 1								
21. 56								
51								
46								
41								
36								
31								
26								
21								
16								
11								
6								
21. 1								
20. 56								
52								
47								
42								
37								
32								
27								
22								
17								
12								
7								
0. 2								
9. 57								
47								
37								
27								
17								
9. 7								
8. 57								
37								
8. 17								
7. 57.								
H. M.								H. M.
5 59	1 50·0	1 52·2	1 54·5	1 56·9	1 59·5	2 2·3	2 5·2	17 57
6 19	49·3	51·5	53·8	56·2	58·8	1·5	4·4	37
39	47·9	50·0	52·2	54·7	57·2	1° 59·8	2·6	17 17
6 59	45·5	47·6	49·8	52·2	54·6	57·2	2° 0·0	16 57
7 9	44·1	46·2	48·3	50·6	53·0	55·6	1° 58·3	47
19	42·5	44·5	46·6	48·9	51.3	53·8	56·4	37
29	40.6	42·6	44·7	46·9	49·2	51·7	54·3	27
39	38·6	40·5	42·6	44·7	47·0	49·4	52·0	17
49	36·4	38·3	40·3	42·4	44·6	46·0	49·5	16 7
7 59	34·1	35·9	37·8	39·9	42·0	44·4	46·8	15 57
8 4	32·8	34·6	36·5	38·6	40·7	43·0	45·3	52
9	31·5	33·3	35·2	37·2	39·3	41·6	43·9	47
14	30·2	31·9	33·8	35·8	37·8	40·1	42·4	42
19	28·6	30·5	32·3	34·3	36·3	38·5	40·8	37
24	27·4	28·1	30·8	32·7	34·7	36·9	39·1	32
29	25·9	27·6	29·3	31·2	33·2	35·3	37·4	27
34	24·4	26·1	27·8	29·6	31·5	33·6	35·7	22
39	22·9	24·5	26·2	28·0	29·8	31·9	34·0	17
44	21·3	22·9	24·5	26·3	28·1	30·1	32·2	12
49	19·7	21·2	22·8	24·5	26·3	28·3	30·3	7
54	18·0	19·5	21·1	22·8	24·6	26·5	28·4	15 2
8 58	16·6	18·1	19·7	21·3	23·1	25·0	26·9	14 58
9 3	14·9	16·4	17·9	19·5	21·2	23·1	25·0	53
8	13·2	14·6	16·1	17·7	19·3	21·1	23·0	48
13	11·4	12·8	14·2	15·8	17·4	19·2	21·0	43
18	9·6	11·0	12·3	13·8	15·4	17·1	18·9	38
23	7·8	9·1	10·4	11·9	13·4	15·1	16·8	33
28	5·9	7·2	8·5	9·9	11·4	13·0	14·7	28
33	4·0	5·2	6·5	7·9	9·3	10·9	12·5	23
38	2·1	3·2	4·5	5·8	7·2	8·7	10·3	18
43	1° 0·1	1° 1·2	2·4	3·7	5·1	6·6	8·1	13
48	0° 58·1	0° 59·2	1° 0·4	1° 1·6	2·9	4·3	5·8	8
53	56·1	57·1	0° 58·3	0° 59·5	1° 0·7	1° 2·1	3·5	14 3
9 58	54·0	55·0	56·1	57·3	0° 58·5	0° 59·8	1° 1·2	13 58
10 3	52·0	52·9	54·0	55·1	56·3	57·5	0° 58·8	53
8	49·9	50·8	51·8	52·9	54·0	55·2	56·5	48
13	47·7	48·7	49·6	50·6	51·7	52·9	54·1	43
18	45·6	46·5	47·4	48·4	49·4	50·5	51·7	38
23	43·5	44·3	45·2	46·1	47·1	48·1	49·2	33
28	41·3	42·1	42·9	43·8	44·8	45·8	46·8	28
33	39·1	39·9	40·6	41·5	42·4	43·3	44·3	23
38	36·9	37·6	38·3	39·1	40·0	40·9	41·8	18
43	34·7	35·3	36·0	36·8	37·6	38·4	39·3	13
48	32·4	33·0	33·7	34·4	35·1	35·9	36·7	8
53	30·2	30·7	31·4	32·0	32·7	33·4	34·2	13 3
10 58	27·9	28·4	29·0	29·6	30·2	30·9	31·6	12 58
11 3	25·6	26·1	26·6	27·2	27·8	28·6	29·0	53
8	23·3	23·8	24·2	24·7	25·3	25·8	26·4	48
13	21·0	21·4	21·8	22·3	22·8	23·3	23·8	43
18	18·7	19·1	19·4	19·8	20·3	20·7	21·2	38
23	16·4	16·7	17·0	17·4	17·7	18·1	18·6	33
28	14·1	14·3	14·6	14·9	15·2	15·5	15·9	28
33	11·7	12·0	12·2	12·4	12·7	13·0	13·3	23
38	9·4	9·6	9·8	10·0	10·1	10·3	10·6	18
43	7·1	7·2	7·3	7·5	7·6	7·8	8·0	13
48	4·7	4·8	4·9	5.0	5·1	5·2	5·3	8
53	2·3	2·4	2·4	2·5	2·5	2·5	2·6	12 3
11 58	0° 0·	0° 0·	0° 0·	0° 0·	0° 0·	0° 0·	0° 0·	11 58