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CANADA

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OTTAWA

R. MELDRUM STEWART, *Director*

Volume VIII

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CONTENTS OF VOLUME VIII

NO.		PAGE
1.	The Spectroscopic System Theta Ophiuchi, by F. Henroteau	1
2.	The Location of Epicentres, by W. W. Doxsee	11
3.	The Spectroscopic System Beta Canis Majoris, by F. Henroteau	29
4.	The Spectroscopic System Sigma Scorpii (Second Paper), by F. Henroteau	43
5.	A Spectroscopic Study of Stars of Classes A and F, by F. Henroteau	59
6.	Gravity in Northwestern Canada, by A. H. Miller	83
7.	Photometry with a 6-inch Doublet, by R. M. Motherwell	111
8.	Magnetic Results 1921-1923, by C. A. French and R. G. Madill	135
9.	Gravity in Western Canada, by A. H. Miller	241
10.	Magnetic Results, 1924-1926, by C. A. French and R. G. Madill	331

DEPARTMENT OF THE INTERIOR
CANADA

HON. CHARLES STEWART, *Minister* W. W. CORY, C.M.G., *Deputy Minister*

PUBLICATIONS

OF THE

Dominion Observatory

OTTAWA

OTTO KLOTZ, LL.D., D.Sc., *Director*

Vol. VIII, No. 1

The Spectroscopic System Theta Ophiuchi

BY

F. HENROTEAU, PH.D.

OTTAWA
GOVERNMENT PRINTING BUREAU
1922

THE SPECTROSCOPIC SYSTEM THETA OPHIUCHI

BY F. HENROTEAU, PH.D.

The star θ Ophiuchi ($\alpha = 17^h\ 15^m.9$; $\delta = -24°\ 54'$) was discovered by the writer to be of the β Canis Majoris type[1]. It was already mentioned as situated in one of the most beautiful regions of the sky, and its position at the intersection of well-marked dark currents is significant, suggesting that stars of this type are situated in the midst of large clouds of nebulous matter. Possibly the rapid shift of the spectral lines is due to the influence of these clouds or it is merely the effect of the semi-giant nature of these stars, having densities and periods of rotation so related, that free rotation would give the star a Jacobian ellipsoidal shape. It may be that a combination of these conditions is responsible.

The spectrum of θ Ophiuchi has rather diffuse lines and is much poorer than that of δ Ceti or of β Canis Majoris. The rather large southern declination also prevents adequate study of the star here at Ottawa. The front page photograph was taken by Mr. Thorn with our Zeiss camera (lens, four inches aperture and twelve inches focal length) with an exposure of two and a half hours on June 19, 1922. The very bright object on this photograph is the planet Mars, which at the time was nearly in opposition. The two dark lanes that seem to extend from θ Ophiuchi on the left and on the right are conspicuous. Theta is the bright star at the centre of the plate.

In the present spectroscopic study in which Mr. J. F. Frédette's assistance is acknowledged it is found that θ Ophiuchi is definitely to be classified among the stars of the β Canis Majoris type, but the object of the paper is to show the great probability that many of these stars are connected with extensive absorbing clouds. The idea that nebulous clouds have a certain rôle in the mechanism of stellar systems is not new and it is interesting to refer here to the article "Nebulous Double Stars"[2], by Miss Clerke. This great English woman, who has given us in her books a wonderful conception of modern astrophysics, advanced the proposition that nebulous matter would have largely to be considered in sidereal dynamics.

Among the principal paragraphs of Miss Clerke's article we might cite the following:

(1) "At last we seem to be fairly confronted with the pregnant question whether nebulous matter can effectively impede motion. It has long been hovering on the verge of astronomical consciousness. Stars plunged in diffuse nebulosities could not be supposed stuck fast like fruits in a jelly; but their velocities, and the changes possibly impressed upon them, remained conjectural."

(2) "Chiefly through the researches of Professors Frost and Adams, with the Bruce Spectrograph, into the radial velocities of stars of helium type, we have been made acquainted with at least seven swiftly circulating pairs, the actual envelopment of which in nebulosity is scarcely open to question. We have accordingly, to choose between two alternative views. Either such systems are not destined for permanence, the canker of a resisting medium lying at their root; or matter can exist in the state of frictionless fluid."

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[1]Pub. Dom. Obs., Vol. V, p. 343.

[2]The Observatory, Vol. 27, 1904, p. 303.

(3) "Most of our readers still vividly recall the surprise which greeted the announcement, in 1885, that Maia (20 Tauri) in the Pleiades appeared on the Henry plates of four hours exposure to be adorned with a nebulous appendage in the shape of a squirrel's tail. Professor Adams now enrols the star among close binaries".[1]

(4) "And a range of 50 kilometres has since been determined for changes in the velocity of σ Scorpii by Mr. Slipher, of the Lowell Observatory. This star was described by Professor Barnard in 1897[2] as forming the nucleus of a conspicuously dense region of the great nebulous field centered on θ Ophiuchi. Prongs of inchoate stuff extend far to the north and southwest of the spectroscopic binary, and may be inferred to issue more or less immediately from it."

(5) "Seven star couples are thus so far known to circulate rapidly in a nebulous medium; the circumstances of their revolutions have, however, still to be ascertained; and the critical details will need careful and unprejudiced consideration. The supposition is admissible that the widening of their orbits through tidal friction might, for a long time, serve to neutralize the accelerative effects of resistance, if resistance to their motion be indeed offered. But the equilibrium would not be permanent; the momentum of the system would be subject to a two-fold waste; and eventual collapse should ensue. Only its postponement could, in this way, be brought about. The alternative hypothesis that nebulous matter does not, in any degree, check motion, though strange to our experience and bewildering to our conceptions, should not therefore be peremptorily rejected. Strictly terrestrial ideas of what is possible inevitably widen in scope as we search the skies."

A fairly large number of stars of the β Canis Majoris type have now been found, all of them in or near the Milky Way; one of these, σ Scorpii, which was mentioned by Miss Clerke as most likely plunged in an enormous nebula, seems to show us surprising anomalies in its motion.[3] In θ Ophiuchi we have an instance strongly suggesting nebular influence. At present a great deal of doubt exists as to the very short-period binary nature of the stars of the β Canis Majoris type, involving two bodies performing one revolution around their common center of gravity in four or six hours. In explanation of the nature of the phenomenon producing the oscillations of the spectral lines, two hypotheses now present themselves. It may be an effect of the giant size of stars, bodies of exceedingly large volumes and low densities, or it may be due to the influence of nebulous or other material forming extensive surrounding clouds. Perhaps both circumstances contribute.

A study, undertaken here, of later class giant stars has not yet indicated very rapid radial velocity variations, particularly among those away from the Milky Way. Few stars as late as Class F have been identified with the β Canis Majoris type and they usually have rather diffuse lines. Among them we might mention τ Cygni and δ Aquilae (the latter having been discovered by the writer) both in the Milky Way. The surroundings of δ Aquilae on Barnard's photographs[4] are indicative of absorbing matter. A most remarkable fact found on some plates taken here is that the little stars which surround τ Cygni seem to be disposed in three spiral branches originating at τ and extending in the same direction. The vacant spaces between the three spirals seem to be nebulous; a photograph from a large reflector of this field would, however, be required to ascertain this.

It is of interest to consider what might be the influence of an interstellar cloud on the motion of a giant star which it surrounds.

The problems of gravitational attractions, even when not complicated by other influences, are so difficult that celestial mechanics has only been able to solve the very simplest of them. Probably the density of an interstellar cloud is very small, so that

[1]Ap. J. Vol. 19, p. 341. See also Pub. Dom. Obs., Vol. V, p. 50.
[2]Pop. Ast., Sept. 1897, pp. 229, 232.
Pub. Dom. Obs., Vol. V, p. 303.
[4]Pub Lick Obs., Vol. XI, 1913, plate 67.

its resistance to the motion of a body is almost negligible. Its total mass, however, must be considerable, and it is not impossible, on account of the form taken, frequently long and narrow lanes, that it would have a great influence on the shape of the body. The latter possibly assuming a spherical shape, if isolated in space and devoid of rotation, would alter this shape considerably when plunged in one of the cosmic nebulosities or acted upon by dense stellar clouds of the Milky Way. Planetary nebulae, for instance, are usually not spherical and an idea of their appearance may be gathered from the very interesting memoir of Dr. H. D. Curtis on these objects.[1]

As only sufficient data have been obtained to suggest further study of θ Ophiuchi by observers more favourably situated, no theory will be developed here. In a paper on β Canis Majoris some mechanical suggestions will be brought forward.

The table of radial velocities of θ Ophiuchi obtained here is now given; it is followed by the detailed measures of some of the spectrograms.

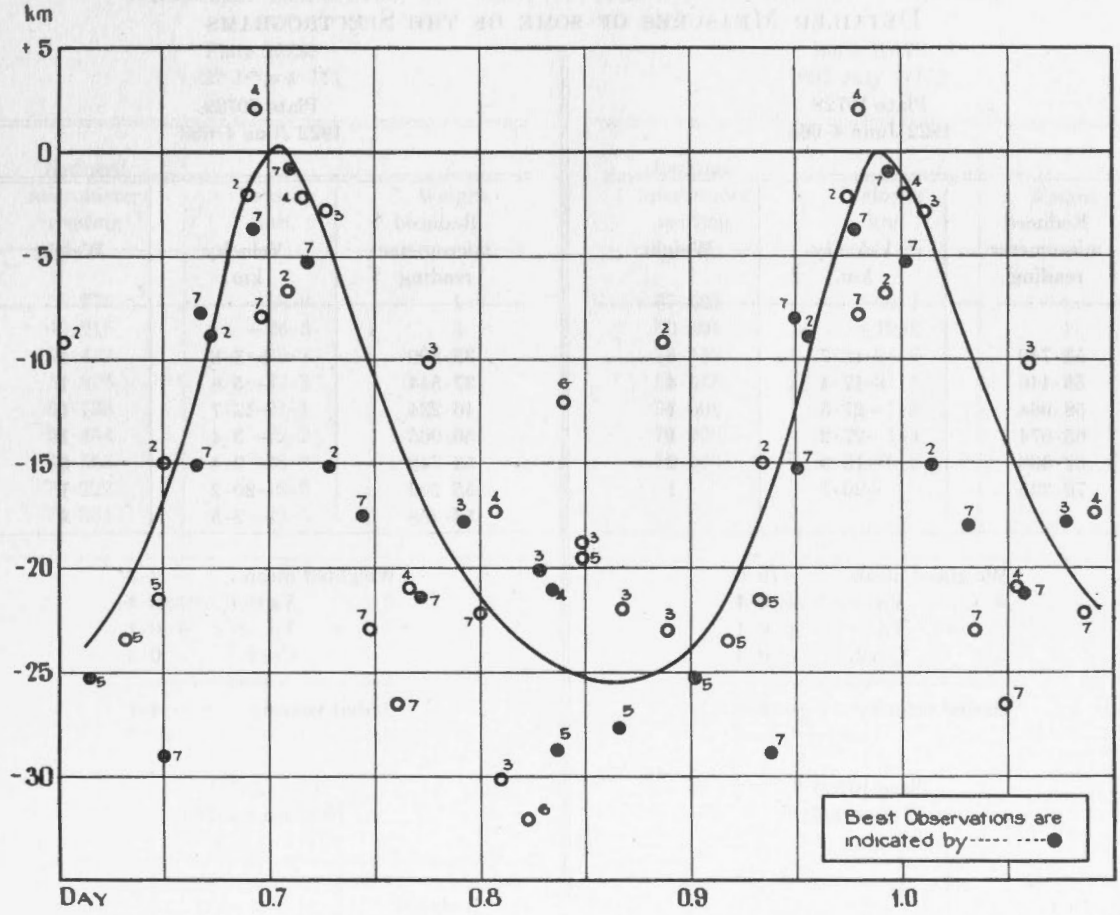
---

[1]The Planetary Nebulae, Pub. Lick Obs., Vol. 13, part III.

Radial Velocities of θ Ophiuchi

Date	Julian Day	Velocity km.
1920, June 13	2422489·683	− 6·2
	·707	−16·4
	·732	− 4·1
	·806	+17·5
1922, June 4	2423210·665	−15·8
	·693	− 4·1
	·718	− 5·9
	·743	−17·9
	·771	−21·8
June 12	218·615	− 9·3
	·663	−14·9
	·685	− 8·9
	·703	− 2·0
	·722	− 6·7
	·742	−15·2
June 19	225·608	− 2·8
	·658	−10·3
	·676	−17·8
	·694	−30·2
	·712	−20·2
	·731	−18·9
	·751	−22·7
	·773	−23·0
June 23	229·581	+ 2·0
	·601	− 2·1
	·654	−20·9
	·695	−17·3
	·721	−20·9
June 26	232·583	−28·8
	·599	−19·5
	·614	−27·7
	·652	−25·3
	·667	−23·6
	·683	−21·5
	·722	+ 4·8
July 2	238·581	−32·1
	·601	−12·0
July 5	241·562	−29·0
	·577	− 7·7
	·605	− 7·7
	·619	− 0·9
	·656	−23·1
	·671	−26·5
	·688	−37·0
	·708	−22·2

The above observations of 1922 apparently determine a velocity variation whose period is $0^d.28620$. Taking the epoch J.D.2423210.705 as maximum and plotting the observations according to the period we obtain the accompanying curve. The black circles indicate the best observations. The numbers 1 to 7 indicate, respectively, the observations from June 4 to July 5. the same number being used for the same day.



The observations of 1920 together with the accompanying velocity curve seem to indicate that a large variation of mean velocity and perhaps other complications have to be expected.

If the above velocity variation indicated by the curve was due to the motion of one of the components of a short-period binary system, the orbit would apparently have a fairly large eccentricity.

In the following detailed measures of some of the spectrograms, the principal lines corresponding to the micrometer readings can be identified by using the table given in the article on δ Ceti.[1]

[1]Pub. Dom. Obs., Vol. V, p. 419.

Detailed Measures of some of the Spectrograms

Plate 10728
1922 June 4·665

Reduced micrometer reading	Velocity km.	Weight
53·740	−18·7	5
58·446	−17·4	4
58·964	−27·5	1
65·674	−27·2	1
67·338	−13·9	2
76·335	−20·7	1

Weighted mean	−19·0
Va	+ 3·4
Vd	+ 0·1
Curv.	− 0·3
Radial velocity	−15·8

Plate 10729
1922 June 4·693

Reduced micrometer reading	Velocity km.	Weight
35·800	+ 3·8	1
37·544	− 5·8	1
46·234	−12·7	1
50·905	− 3·4	1
53·748	− 9·4	6
55·296	−20·2	1
58·458	− 2·5	3

Weighted mean	− 7·3
Va	+ 3·4
Vd	+ 0·1
Curv.	− 0·3
Radial velocity	− 4·1

Plate 10730
1922 June 4·718

Reduced micrometer reading	Velocity km.	Weight
37·529	−20·2	3
39·389	−28·4	1
46·231	−15·9	1
50·904	− 4·5	3
53·751	− 5·8	5
58·458	− 2·5	3
63·455	+ 1·3	1

Weighted mean	− 9·0
Va	+ 3·4
Vd	0·0
Curv.	− 0·3
Radial velocity	− 5·9

Plate 10731
1922 June 4·743

Reduced micrometer reading	Velocity km.	Weight
28·082	−11·3	1
34·302	− 5·6	1
35·773	−21·6	1
37·532	−17·3	1
46·226	−20·1	1
50·892	−18·1	3
53·730	−30·4	4
58·444	−19·8	2
76·363	−23·8	1

Weighted mean	−21·0
Va	+ 3·4
Vd	0·0
Curv.	− 0·3
Radial velocity	−17·9

Detailed Measures of some of the Spectrograms—*Continued.*

Plate 10732
1922 June 4·771

Reduced micrometer reading	Velocity km.	Weight
35·776	−18·8	1
46·215	−26·5	3
49·432	−29·1	2
50·875	−37·3	1
53·738	−21·1	5
58·434	−32·2	3
64·568	−26·8	1
70·222	−13·0	2
76·334	−22·3	1

Weighted mean	−24·8
Va	+ 3·4
Vd	− 0·1
Curv.	− 0·3
Radial velocity	−21·8

Plate 10778
1922 July 5·562

Reduced micrometer reading	Velocity km.	Weight
37·521	−22·1	1
50·891	−19·2	1
53·743	−24·6	2
58·445	−21·1	2
58·992	+ 7·5	1
70·229	− 1·4	1
76·329	−30·2	1

Weighted mean	−17·4
Va	−11·5
Vd	+ 0·2
Curv.	− 0·3
Radial velocity	−29·0

Plate 10779
1922 July 5·577

Reduced micrometer reading	Velocity km.	Weight
35·796	− 2·8	1
46·220	−21·2	1
50·911	+ 3·4	2
53·756	+ 2·3	1
58·471	+12·4	4
59·013	+33·8	1
63·798	+ 9·4	1
70·211	−29·0	1

Weighted mean	+ 4·1
Va	−11·6
Vd	+ 0·1
Curv.	− 0·3
Radial velocity	− 7·7

Plate 10781
1922 July 5·605

Reduced micrometer reading	Velocity km.	Weight
28·080	−13·0	1
34·283	−23·2	1
37·555	+10·6	1
46·258	+19·1	1
50·910	+ 2·3	4
53·757	+ 3·5	2
58·456	− 6·2	2
70·255	+36·2	1
76·363	+23·8	1

Weighted mean	+ 4·1
Va	−11·6
Vd	+ 0·1
Curv.	− 0·3
Radial velocity	− 7·7

Detailed Measures of some of the Spectrograms—*Concluded.*

Plate 10782
1922 July 5·619

Reduced micrometer reading	Velocity km.	Weight
31·754	+25·2	1
35·785	−13·2	2
37·574	+28·8	1
46·262	+23·3	2
50·916	+ 9·0	3
53·763	+10·5	2
58·470	+ 9·9	4
76·357	+14·3	1

Weighted mean	+11·0
Va	−11·6
Vd	0·0
Curv.	− 0·3
Radial velocity	− 0·9

Plate 10783
1922 July 5·656

Reduced micrometer reading	Velocity km.	Weight
46·232	− 8·5	1
50·915	+ 7·9	2
53·716	−44·5	2
58·455	− 8·7	4
76·351	+ 4·8	1

Weighted mean	−11·2
Va	−11·6
Vd	0·0
Curv.	− 0·3
Radial velocity	−23·1

Plate 10784
1922 July 5·671

Reduced micrometer reading	Velocity km.	Weight
52·473	−38·0	2
53·760	+ 7·0	2
58·460	− 2·5	2
58·957	−35·0	1

Weighted mean	−14·6
Va	−11·6
Vd	0·0
Curv.	− 0·3
Radial velocity	−26·5

Plate 10785
1922 July 5·688

Reduced micrometer reading	Velocity km.	Weight
46·227	−13·8	1
53·739	−17·6	1
58·437	−31·0	3
76·332	−25·4	1

Weighted mean	−25·0
Va	−11·6
Vd	− 0·1
Curv.	− 0·3
Radial velocity	−37·0

All qualities of spectrograms obtained here for θ Ophiuchi are represented in the above measures.

Dominion Observatory,
Ottawa,
August 28, 1922.

DEPARTMENT OF THE INTERIOR

CANADA

HON. CHAS. STEWART, *Minister* W. W. CORY, C.M.G., *Deputy Minister*

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The Location of Epicentres, 1920

BY

W. W. DOXSEE, M.A.

OTTAWA
GOVERNMENT PRINTING BUREAU
1922

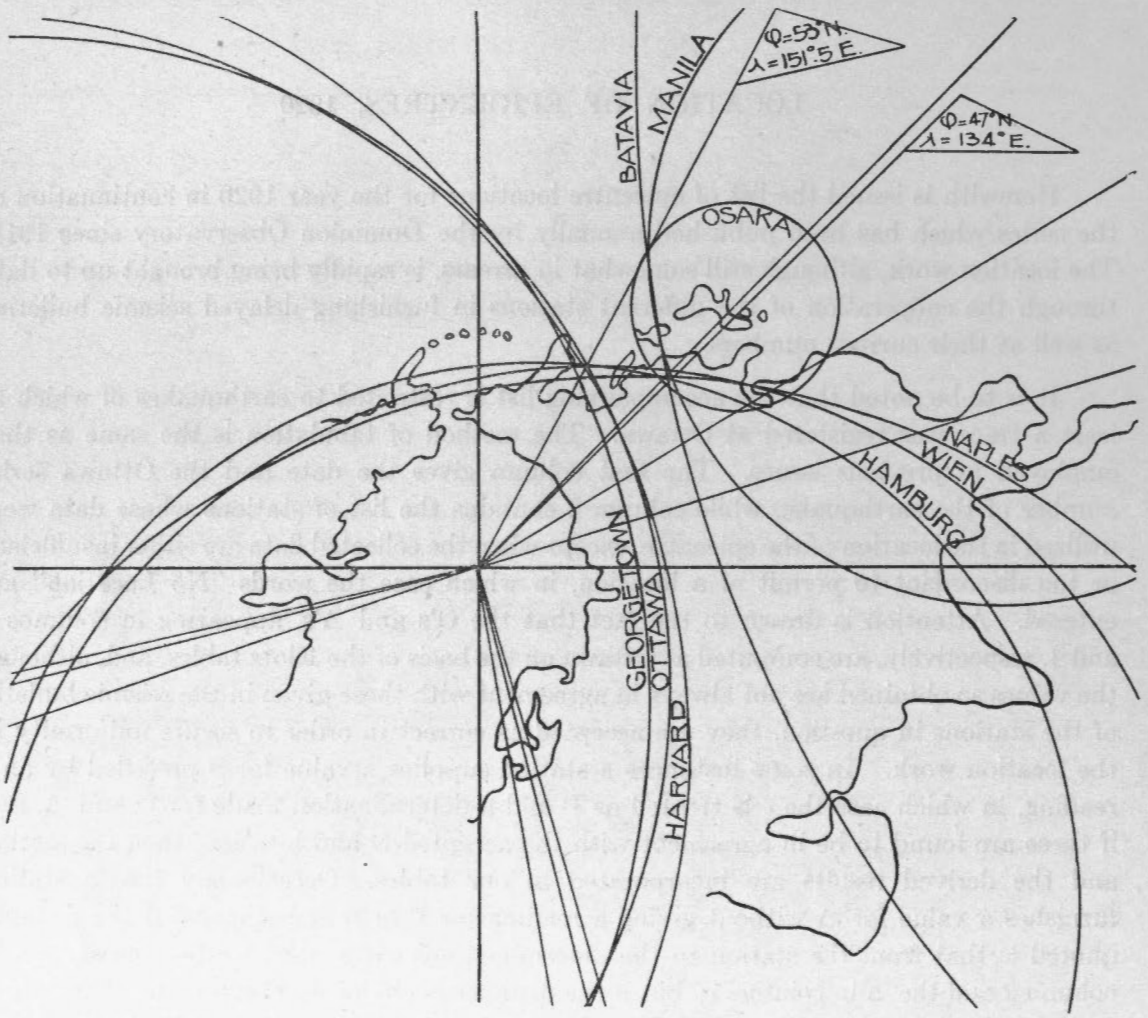
LOCATION OF EPICENTRES, 1920

Herewith is issued the list of epicentre locations for the year 1920 in continuation of the series which has been published annually by the Dominion Observatory since 1911. The location work, although still somewhat in arrears, is rapidly being brought up to date through the coöperation of the different stations in furnishing delayed seismic bulletins as well as their current numbers.

It is to be noted that the accompanying list is restricted to earthquakes of which at least a trace was registered at Ottawa. The method of tabulation is the same as that employed in previous issues. The first column gives the date and the Ottawa serial number of the earthquake, while column 2 contains the list of stations whose data were utilized in the location of the epicentre, except when the collected data are either insufficient or too discordant to permit of a location, in which case the words "No Location" are entered. Attention is drawn to the fact that the O's and Δ's, appearing in columns 3 and 4, respectively, are computed at Ottawa on the basis of the Klotz tables, and, although the values so obtained are not always in agreement with those given in the seismic bulletin of the stations in question, they are accepted as correct in order to secure uniformity in the location work. In some instances a station supplies a value for S preceded by an *e* reading, in which case the *e* is treated as P and a determination made for O and Δ, and if these are found to be in agreement with the accepted O and location, then the station and the derived results are incorporated in our tables. Occasionally too, a station furnishes a value for Δ without giving a reading for P or S or both, and if the distance quoted is that from the station to the determined epicentre, then we list the station in column 2 and the Δ in column 4; but if the distance is obviously in error, then the entries are made in the last column, which contains data available but of no utility in the determination of an epicentre. The geographical coördinates of the epicentre are given in the fifth column along with the accepted value of O, which, generally speaking, is the average of the O's given by the stations. In those cases where an epicentre is located either by press report or by any one or number of stations, the same is noted in column 6.

One earthquake, viz. No. 1112, appears to be double, and as separate locations are given, this brings the total for the year up to 90. Of these 41 were located with considerable accuracy, while 11 others afforded approximate locations and 4 of those remaining were assigned doubtful locations.

In preceding issues mention has been made of what appears to be a new seismic region in the Atlantic Ocean just off the northeast coast of South America. Nos. 1131 and 1136 of this series are further instances of continued seismic activity in this area. In connection with this appearance of new earthquake regions, special mention is made of No. 1132 which definitely yields an epicentre in the Arctic zone a locality which heretofore has not been considered as seismic.



LOCATION BY KLOTZ STEREOGRAPHIC METHOD
No. 1064
1920

Special attention is called to quake No. 1064 of Feb. 22. In the accompanying sketch it is readily seen that the three eastern stations, Manila, Batavia and Osaka, give an epicentre whose coördinates are 47° N and 134° E., while the western stations, Georgetown, Harvard and Ottawa, indicate an approximate location at 53° N. and 151°.5 E. The European or central stations, Hamburg, Wien and Naples, are in agreement with both of these determinations so that it would appear possible that a fault line extends between these two sets of coördinates, or that two simultaneous quakes occurred at the determined epicentres.

DOMINION OBSERVATORY, OTTAWA, September, 1922.

LOCATION OF EPICENTRES, 1920

Date	Station	O	Δ	Epicentre	Other Locations	Other Data
Jan. 4 1055	Ottawa.....	4–22–03	3440	φ = 19° N	Harvard gives Vera Cruz, Mexico.	Victoria 3170
	Georgetown...	4–21–43	3140	λ = 96°·5 W		
	Ithaca.....	4–22–06	3140	O = 4–21–49		
	Denver.....	4–20–59	2440			
	Spring Hill....	(4–23–48)	(1390)			
	Cheltenham...	4–21–37	3040			
	Tucson.....	4–21–11	2080			
	Harvard.....	4–21–54	3530			
	La Paz.....	4–22–01	5040			
	Toronto.....	4–20–48	3600			
Jan. 30 1056	No Location				La Paz gives Minas Geraes, Brazil.	Ottawa 3820 Stonyhurst 3700 Harvard (4790) Toronto 4560 La Paz 2650 Georgetown 4100
Jan. 30 1057	No Location					Sydney 3580 Honolulu 1620
Feb. 2 1058	Batavia.....	(11–21–48)	(5340)	φ = 6° S		Wien 11000 Lemberg 10180 Coimbra 10540 Algiers (8060) Hamburg 7320 Osaka 7840 Strasbourg 4800 Harvard (13400) Tokio 440 Toronto (11030) Georgetown 7320 Budapest 11980 Naples 10980 Cartuja 10780
	Melbourne....	11–23–02	3420	λ = 153°·5 E		
	Zi-ka-wei	11–22–09	5140	O = 11–22–12		
	Sydney.....	11–22–27	2970			
	Victoria.....	11–22–19	9790			
	Manila.....	11–21–26	4220			
Feb. 7 1059	Algiers.....	11–50–27	3450	φ = 64° N		Coimbra (2250) Cartuja 2500
	Hamburg.....	11–50–41	2670	λ = 30° W		
	Strasbourg....	11–50–14	3000	O = 11–50–25		
	Harvard.....		3720			
	DeBilt.....	11–50–29	2570			
	Besançon.....	11–50–14	2930			
Feb. 8 1060	No Location					Perth 1600 Sydney 3600 La Paz 10390
Feb. 10 1061	No Location					Melbourne 2980 Perth 6000 Honolulu 5000 Sydney 2770 Victoria 4180

LOCATION OF EPICENTRES, 1920

Date	Station	O	Δ	Epicentre	Other Locations	Other Data
Feb. 10 1062	Ottawa.....	22–07–22	2900	φ = 19° N		Marseilles 6640
	Halifax.....	22–07–12	2740	λ = 59° W		Honolulu 7850
	Coimbra.....	22–07–19	5930	O = 22–07–22		Barcelona (2260)
	Ithaca.....	22–07–25	2720			
	Algiers.....	22–07–12	7150			
	Hamburg.....	22–07–40	7370			
	Spring Hill....	22–07–24	2570			
	Cheltenham...	22–07–50	2490			
	Tucson.....	22–07–03	4400			
	Harvard.....	22–07–32	2430			
	Toronto.....	22–07–22	2990			
	La Paz.....	22–07–00	3810			
	Georgetown...	22–07–03	2500			
	Dyce.....	(22–08–01)	(6400)			
	Victoria.....	22–06–26	5850			
	DeBilt.....	22–07–52	6920			
	Naples.....	22–07–39	7800			
	Cartuja.....	22–07–14	6550			
Feb. 12 1063	No Location					Harvard 2760
						La Paz 6540
						Georgetown 2440
Feb. 22 1064	Ottawa.....	(17–35–58)	(8120)	φ = 51° N	Osaka gives,	Algiers.... (1840)
	Wien.....	(17–35–39)	(7920)	λ = 143°·5 E	"Off east coast	Honolulu (1120)
	Batavia.....	17–35–44	6520	O = 17–35–35	of Yezo"	Strasbourg 2470
	Hamburg.....	17–35–42	7600	Location		La Paz 13400
	Osaka	(17–35–56)	(1490)	doubtful		Victoria 1690
	Harvard.....	17–35–40	8580			Barcelona 10820
	Sydney.....	17–34–04	9300			Cartuja 8850
	Georgetown...	17–36–01	8580			Besançon 7050
	Manila	17–35–39	3780			
	Naples.....	17–35–31	8600			
Feb. 28 1065	Coimbra.....	18–40–52	9050	φ = 16° S		Harvard (6150)
	La Paz.....	18–41–08	470	λ = 72°·5 W		Ottawa (5000)
	Georgetown	18–40–29	6150	O = 18–40–50		
Mar. 9 1066	No Location					No data.
Mar. 10 1067	No Location					No data
Mar. 15 1068	No Location					Ottawa 9860
						Honolulu 2010
						Harvard (11955)
						La Paz (8810)
						Sydney 2680
						Toronto (8330)
						Victoria 7420
Mar. 19 1069	No Location					No data

LOCATION OF EPICENTRES, 1920

Date	Station	O	Δ	Epicentre	Other Locations	Other Data
Mar. 20 1070	No Location					Ottawa (4920) Tucson 1120
Mar. 20 1071	No Location Data discordant					Ottawa 9560 Coimbra 10220 Georgetown 9060 Ithaca 9090 Algiers (6920) Melbourne 6440 Porto Rico 7300 Cheltenham 8660 Harvard 10600 La Paz 4630 Sydney 8220 Toronto 11460 Victoria 8000 Barcelona 11990 Cartuja (12600)
Mar. 22 1072	Perth Sydney.....	 1–38–43	3500 2940	φ = 9°·5 S λ = 139°·5 E O = 1–38ca. Rough approximation only		Honolulu 2660
Mar. 22 1073	No Location Data discordant					Coimbra (8600) Perth 5600 Honolulu 1800 Harvard (11370) Sydney 3410 Cartuja 10200
Mar. 23 1074	Ottawa..... Georgetown Algiers..... Hamburg..... Cheltenham... Honolulu..... La Paz.....	(15–21–53) 15–21–44 (15–22–20) 15–22–02 15–21–16 15–22–07 15–22–06	(3400) 3270 (9000) 9210 3410 7250 4130	φ = 14° N λ = 89°·5 W O = 15–21–55		Coimbra 6710 Harvard (5760) Toronto (5440)
Mar. 29 1075	Ottawa..... Georgetown... Ithaca..... Algiers..... Hamburg..... Denver..... Tucson..... La Paz..... Victoria.....	5–07–50 5–07–53 5–07–43 (5–07–43) 5–07–43 5–06–59 5–07–46 5–07–50	3780 4050 4010 (9480) 7920 2440 2770 9610 630	φ = 51° N λ = 130°·5 W O = 5–07–41		Coimbra (5200) Cheltenham 7480
April 6 1076	Ottawa..... Georgetown... La Paz.....	(16–43–22) 16–42–38 (16–42–13)	(3800) 3750 (5990)	φ = 29° N λ = 38° W O = 16–42–44		

LOCATION OF EPICENTRES, 1920

Date	Station	O	Δ	Epicentre	Other Locations	Other Data
April 11 1077	Georgetown... Hamburg..... Tokio..... Besançon.....	(23–03–41) 23–03–45 23–03–45	(9120) 8120 1780 8940	φ = 48° N λ = 154° E O = 23–03–43		Stonyhurst 2660 Honolulu 2290 Zi-ka-wei 2290 Sydney 8200 Batavia 6660 Manila 2410
April 16 1078	No Location					Harvard (8300)
April 18 1079	No Location					Cheltenham 1290
April 19 1080	Ottawa..... Coimbra Georgetown... Ithaca..... Algiers..... Cheltenham Tucson..... Porto Rico.... Honolulu..... Hamburg..... La Paz..... DeBilt..... Naples..... Cartuja.....	21–06–26 21–06–26 21–06–18 21–06–11 21–06–43 21–06–22 21–06–19 21–06–47 21–07–05 21–06–24 21–06–30 21–06–43 21–06–55 21–06–35	3420 8640 2980 3190 9300 2930 2170 3200 6000 9510 4820 9060 10050 9120	φ = 19° N λ = 97° W O = 21–06–33	DeBilt reports, "Felt in Mexico"	Stonyhurst 3240 Spring Hill (1280) Harvard 2520 Toronto 2590 Victoria 2030
May 7 1081	Wien..... Hamburg..... Zi-ka-wei..... Budapest.....	(5–41–45) (5–42–05) 5–40–47 5–41–57	(9600) (9350) 2650 9400	φ = 35°·5 N λ = 150° E O = 5–41–38	Batavia and Sydney record a shock at approximately one minute earlier, possibly in the southern Philippines. Manila reports epicentre at E. Mindanao	Coimbra (7520) Stonyhurst 5320 Honolulu 9020 Tokio 2440 Victoria 7440 La Paz (15750) Perth 2300 Algiers (5530) Sydney 5080 Batavia 2600 DeBilt (7980) Cartuja (9500) Naples 4220
May 7 1082	Honolulu..... Osaka..... Tokio..... Perth..... Zi-ka-wei..... Sydney..... La Paz..... Batavia..... Melbourne.... Berkeley.....	21–32–15 21–31–21 21–32–05 21–30–24 21–31–06 21–30–42 (21–30–59) 21–31·0 21–31–00	5540 5680 4740 5280 5860 2920 14800 (5550) 3420 10020	φ = 8°·5 S λ = 158° E O = 21–31–12	Sydney gives, φ = 8°·5 S λ = 144° E	Wien (13000) Strasbourg 2160 Harvard (12300) Victoria 5230 Naples (1480)

LOCATION OF EPICENTRES, 1920

Date	Station	O	Δ	Epicentre	Other Locations	Other Data
May 8 1083	No Location					No data
May 8 1084	No Location					No data
May 26 1085	La Paz..... Sydney..... Batavia.....	12–22–15 12–21–41 12–24–09	10680 4050 7580	These three stations indicate an epicentre in a vicinity just east of the Fiji Is. O = 12–22ca.		Coimbra (11550) Honolulu 1120 Strasbourg (1070) Harvard (8900)
June 2 1086	Denver..... Georgetown Victoria..... Harvard..... Berkeley.....	22–06–51 (22–13–58) 22–06–48 (22–12–35)	270 (2320) 1710 (2733) (1900)	φ = 41°·5 N λ = 104° W O = 22–07ca.		
June 5 1087	Athens..... Berkeley..... Lick..... Cartuja..... Naples..... Besançon..... Honolulu..... Osaka..... Zi-ka-wei.....	4–21–05 4–22–08 4–22–15 4–22–34 4–20–48 4–22–07 4–22–13 4–21–27	9250 9540 9520 10120 9340 9380 8850 2040 860	φ = 32° N λ = 117°·5 E O = 4–22ca. Location approximate		Ottawa (8800)
June 9 1088	Honolulu..... Zi-ka-wei..... Sydney..... Batavia..... Melbourne.... Manila.....	11–30–40 11–30–35 11–30–15 11–30–32 11–29–58 11–31–17	8440 2880 3940 2510 4020 1890	φ = 4° S λ = 129° E O = 11–30–33	Sydney and Batavia report quake felt on I. of Amboyna	Coimbra 10850 Wien (10400) Strasbourg 7780 Victoria (3980) Tokio 1060 Perth 4820 Harvard 13000 La Paz 16040 Hamburg 10000 Lemberg 6450
June 18 1089	Victoria..... Berkeley.....	 10–08–06	1740 545	φ = 33° N λ = 120° W O = 10–08 ca.	Victoria reports quake felt at Los Angeles	Georgetown (1810) Harvard 1560
June 22 1090	Georgetown... Harvard..... Berkeley.....	 2–48–03	(3940) (3866) 560	φ = 41°·5 N λ = 124°·5 W Location approximate O = 2–48–03		

LOCATION OF EPICENTRES, 1920

Date	Station	O	Δ	Epicentre	Other Locations	Other Data
July 2 1091	Honolulu..... Perth..... Batavia..... Berkeley.....	18–40–46 18–41–01 (18–40–10) 18–40–09	6220 4520 (5160) 9750	φ = 2°·5 S λ = 151° E O = 18–40·5 Location approximate		Ottawa (7000) Strasbourg 1980 Victoria 4120 Algiers 2650 La Paz 13130 Sydney 4380
July 2 1092	Honolulu..... La Paz..... Sydney..... Melbourne.... Batavia.....	21–36–45 21–35–36 21–36–36 21–37–40 21–37–13	9280 17800 4170 4020 2230	φ = 9° S λ = 125° E O = 21–36–45 Location and O approximate		Strasbourg 2000 Georgetown (7600) Coimbra (6820) Naples 8740 Perth 2380
July 7 1093	Ottawa..... Strasbourg.... Victoria..... Hamburg..... Georgetown... DeBilt.....	(18–41–34) 18–41–28 18–41–23 (18–41–15) 18–41–28	(4160) 7580 1320 7130 (4960) 7130	φ = 58°·5 N λ = 135° 15′ W O = 18–41–25		Wien (6650) Coimbra 4960
July 7 1094	No Location					No data
July 8 1095	No Location					No data
July 11 1096	No Location..					No data
July 16 1097	Ottawa..... La Paz..... Stonyhurst....	(17–15·9) 17–14–03	(3800) 3590 6220	φ = 14°·5 N λ = 58° W O = 17–14ca. Location approximate		
July 26 1098	La Paz..... Georgetown	5–12–53 (5–12–38)	1800 (7980)	φ = 33° S λ = 70° 15′ W O = 5–12–45	Press reports quake at Santiago, Chile	Coimbra 5040
Aug. 3 1099	Manila..... Batavia..... Zi-ka-wei.....	3–02–35 3–02–36 3–02–05	910 2280 2660	φ = 7° N λ = 123°·5 E O = 3–02–25 Location doubtful	Manila reports quake in Central Mindanao	Strasbourg 4780 Hamburg 9400 Victoria (6300) La Paz 10300 Sydney 4850 Wien 9280 Coimbra (5550) Naples 5320

LOCATION OF EPICENTRES, 1920

Date	Station	O	Δ	Epicentre	Other Locations	Other Data
Aug. 3	Ottawa.....	19–57–20	8140	φ = 27°·5 S		Strasbourg (5000)
1100	La Paz.....	19–57–12	1240	λ = 65° W		Tucson 6840
	Rio de Janeiro	19–56–57	2400	O = 19–57–13		Toronto (12400)
	Cheltenham...	19–57–21	7300			Victoria (3620)
	Algiers.....	19–57–46	9650			Marseilles 10050
	Dyce.....	(19–56–10)	(11220)			Sydney 7860
	Coimbra.....	19–57–34	9440			Wien (4850)
	Harvard.....	19–57–15	7770			Berkeley (4020)
	Cartuja.....	19–57–25	9700			
Aug. 13	Algiers.....	2–03–22	9150	φ = 12°·5 S		Strasbourg 2330
1101	La Paz.....	2–03–01	430	λ = 69°·5 W		Hamburg (5380)
	Uccle.....	2–02–53	9850	O = 2–03–14		Cartuja 3400
	Coimbra.....	2–03–42	8520			
Aug. 15	Osaka.....	8–16–17	6040	φ = 11° S	Sydney gives,	Ottawa 10000
1102	Honolulu.....	8–16–44	5100	λ = 167° E	φ = 1° S	Dyce 6520
	Tucson.....	8–16–38	9740	O = 8–16–23	λ = 163°·5 E	La Paz 10020
	Sydney.....	8–15–39	2990			Marseilles 120
	Melbourne....	8–16·6	3520			Tokio 2080
						Manila 2820
						Wien 7000
						Coimbra 7660
						Zi-ka-wei 7760
						Cartuja 10650
						Naples 5520
						Besançon 1840
Aug. 20	Ottawa.....	(16–15–43)	(9140)	φ = 37°·5 S	La Paz gives,	Strasbourg 9540
1103	Cheltenham...	16–15–40	8540	λ = 76°·5 W	φ = 38° S	Hamburg 8820
	Ithaca.....	16–15–06	8840	O = 16–15–29	λ = 73° ·5 W	Victoria 6860
	La Paz.....	16–15–27	2520		Sentido, Chile	Algiers 8020
	Berkeley.....		9600			Uccle (9380)
						Sydney 5880
						Coimbra 12950
						Stonyhurst 7960
						Harvard.... (9315)
						Melbourne 6450
						Cartuja (10500)
						Naples 8800
Aug. 21 1104	No Location					No data

LOCATION OF EPICENTRES, 1920

Date	Station	O	Δ	Epicentre	Other Locations	Other Data
Aug. 26 1105	Ottawa.....	23–00–04	6200	φ = 52° N	DeBilt gives,	Honolulu 2590
	Strasbourg....	23–00–01	8840	λ = 167°·5 W	"Near Fox	Toronto 6780
	Cheltenham...	22–59–54	6880	O = 23–00–00	Islands"	Victoria 3170
	Hamburg.....	23–00–04	8250			Algiers (11500)
	Georgetown...	22–59–57	6780			Tokio 820
	Uccle.....	23–00–02	8540			
	DeBilt.....	23–00–10	8340			
	Barcelona.....	23–00–18	9320			
	Manila.....	(22–59–41)	(7960)			
	Wien.....	23–00–01	8850			
	Coimbra.....	22–59–58	9550			
	Harvard.....	(22–59–37)	(7240)			
	Zi-ka-wei.....	22–59–50	5960			
	Berkeley.....		3700			
	Cartuja.....	23–00–11	9780			
	Naples.....	23–00–01	9400			
Aug. 29 1106	No Location					Sydney 2600
Sept. 4 1107	No Location					Ottawa (8780)
						Toronto 5100
						La Paz 7250
						Harvard 10600
						Stonyhurst 5100
						Coimbra 9200
						Cartuja 9820
						Athens 10560
Sept. 7 1108	Ottawa.....	5–55–44	6450	φ = 44° N	Uccle gives,	Stonyhurst 1120
	Cartuja.....	5–55–32	1540	λ = 10°·5 E	φ = 43°·9 N	
	Hamburg.....	5–55–33	1170	O = 5–55–46	λ = 10°·5 E	
	Strasbourg....	5–55–52	480			
	Algiers.....	5–55–36	1100			
	Dyce.....	5–55–33	1770			
	La Paz.....	(5–55–34)	(10620)			
	Marseilles.....	5–55–49	460			
	Uccle.....	5–55–40	900			
	Lemberg.....	5–55–43	1330			
	DeBilt.....	5–55–50	970			
	Jugenheim....		620			
	Göttingen.....	5–55–55	730			
	Heidelberg....	5–55–45	580			
	Hohenheim...	5–55–42	500			
	Jena.....		752			
	Karlsruhe.....	5–55–57	490			
	München.....	5–55–45	450			
	Taunus.....	5–55–49	640			
	Wien.....		670			
	Barcelona.....	5–55–30	840			
	Harvard.....	5–55–44	6215			
	Coimbra.....	5–55–46	1560			
	Athens.....	5–56–05	1150			
	Besançon.....	5–56–20	230			

LOCATION OF EPICENTRES, 1920

Date	Station	O	Δ	Epicentre	Other Locations	Other Data
Sept. 8 1109	No Location				Osaka gives Tuscany	Ottawa (10000) Hamburg (11380) Osaka 8750 Algiers 3400 La Paz 9000 Tucson 9120 Honolulu 4450 Tokio 2140 Wien (11700) Harvard 10540 Zi-ka-wei 9780 Coimbra (11220) Lick 3900 Berkeley (3900)
Sept. 9 1110	No Location					Toronto (8680) Victoria 8600 Honolulu 5880 Sydney 3150 Harvard 13750 Zi-ka-wei 6980 Coimbra 7530 Berkeley (10400) Melbourne 3700
Sept. 18 1111	No Location					No data
Sept. 20 1112	Ottawa.....	14–45–12	9660	φ = 38° N		Denver 8800
	Strasbourg....	14–46–08	9440	λ = 146°·5 E		Ithaca (11380)
	Toronto.....	14–44–51	9780	O = 14–45–20		Dyce 11880
	Georgetown...	14–44–27	10550			Victoria 2620
	Besançon.....	14–45–57	9750			Marseilles 2440 La Paz 9550 Stonyhurst 12580
	Osaka.....	14–38–52	7100	φ = 26° S	Osaka gives,	
	Honolulu.....	14–39·0	6110	λ = 173°·5 E	"Near Tongatabu	Tucson 9350
	Tokio.....	14–38–15	7680	O = 14–38–43	Island"	
	Sydney.....	14–38–54	2320			
	Harvard.....	(14–38–36)	(13780)		Sydney gives,	
	Zi-ka-wei.....	14–37–36	8380		φ = 18°·5 S	
	Manila.....	14–38–28	7020		λ = 167° E	
	Berkeley.....	14–39–20	9280			
	Lick.....	14–39–20	9300			
	Athens.....	14–39–05	18000			
	Melbourne....	14–38·5	2980			
Sept. 21 1113	Sydney.....	2–33–26	2700	φ = 18° S	Sydney gives,	La Paz (13560)
	Batavia.....	(2–33–49)	(7120)	λ = 172° E	φ = 17° S	
				O = 2–33–38	λ = 169° E	
				Location and O approximate only		

LOCATION OF EPICENTRES, 1920

Date	Station	O	Δ	Epicentre	Other Locations	Other Data
Sept. 21 1114	Hamburg.....	17–42–16	8550	φ = 45° N		Honolulu 2510
	Strasbourg....	17–42–16	9060	λ = 153°·5 E		
	Uccle.....	17–42–15	8950	O = 17–42–17		
	DeBilt.....	17–42–23	8750			
	Tokio.....	17–42–46	1220			
	Wien.....	17–42–11	8920			
	Batavia.....	(17–42–10)	(7380)			
	Zi-ka-wei.....	17–42–05	3050			
	Coimbra.....	17–42–16	9350			
	Besançon.....	17–42–08	9400			
Sept. 24 1115	Ottawa.....	21–54–54	4340	φ = 6°·5 N		Coimbra 8750
	Ithaca.....	21–54–56	3950	λ = 82° 30′ W		
	Hamburg.....	(21–55–27)	(9280)	O = 21–55–03		
	Strasbourg....	(21–55–13)	(9450)			
	Georgetown...	21–54–58	3560			
	Uccle.....	21–55–02	9320			
	Porto Rico....	21–54–45	2420			
	Tucson.....	21–54–46	4150			
	La Paz.....	21–54–51	2980			
	Harvard.....	21–55–21	3880			
	Cartuja.....	21–55–17	8580			
Sept. 27 1116	No Location					Ottawa (4220) Victoria 1400
Sept. 28 1117	No Location					No data
Oct. 1 1118	No Location					La Paz 7020
Oc . 5 1119	No Location				Berkeley and Lick report quake felt at San Jose, Cal.	Lick 90
Oct. 7 1120	Ottawa.....	20 55–18	5700	φ = 10° S		
	Ithaca.....	20–54–51	5650	λ = 72°·5 W		
	Uccle.....	20–53–45	10140	Location is		
	Victoria.....	(20–54–41)	(8300)	rough approx-		
	Georgetown...	20–53–33	6300	imation only.		
	La Paz.....	20–54–05	530	O = 20–54·3		
	Wien.....	20–54–43	9800			
	Coimbra.....	20–54–41	8250			
	Cartuja.....	20–53–44	9380			
Oct. 8 1121	Ottawa.....	(16–50–28)	(3600)	φ = 15° N		
	Strasbourg....	16–51–01	9120	λ = 90° 30′ W		
	Uccle.....	16–50–51	9010	O = 16–50–56		
	DeBilt.....	16–50–53	9020			
	Cheltenham...	16–51–26	2640			
	Tucson.....	16–51–36	2230			
	Georgetown...	16–50–36	3150			
	Spring Hill....	16–50–23	1550			
	La Paz.....	16–50–50	4300			
	Wien.....	16–51–17	9340			
	Hamburg.....	16–50–56	9160			

LOCATION OF EPICENTRES, 1920

Date	Station	O	Δ	Epicentre	Other Locations	Other Data
Oct. 18 1122	Ottawa.....	8–11–49	8780	φ = 47° N	Kurile Is.	Victoria 329C
	Halifax.....	8–11–52	9100	λ = 150° E		Toronto (678C
	Ithaca.....	8–11–52	9000	O = 8–11–52	Uccle gives,	
	Strasbourg....	8–11–48	8720		φ = 46°·3 N	
	Uccle.....	8–11–45	8680		λ = 148°·5 E	
	DeBilt.....	8–11–46	8540			
	Marseilles.....	8–12–07	9100		Sydney gives,	
	Algiers.....	8–12–21	9250		φ = 46° N	
	Honolulu.....	8–11·5	5320		λ = 151° E	
	Tucson.....	8–11–47	8050			
	Cheltenham...	8–11–54	9280		Tokio gives,	
	Georgetown...	8–10–56	9100		φ = 41°·4 N	
	Wien.....	8–11–47	8500		λ = 148° E	
	Dyce.....	8–11–57	8120		near Etrofu	
	Batavia.....	8–11–50	6950		Island	
	Manila.....	8–11–33	4150			
	Zi-ka-wei.....	8–12–00	2480			
	Göttingen.....	8–11–46	8420			
	Hamburg.....	8–11–46	8250			
	Hohenheim...	8–11–48	8720			
	Durlach.....		8680			
	München.....	8–11–44	8720			
	Coimbra.....	8–12–15	9300			
	Athens.....	8–11–51	9000			
	Sydney.....	8–11–42	8650			
	Tokio.....	8–13–25	510			
	Barcelona.....	8–12–08	9160			
	Besançon.....	8–11–47	8940			
	Berkeley.....	(8–11–35)	(6960)			
Oct. 20 1123	Uccle.....	(10–02–29)	(9400)	φ = 23° N		Manila 2070
	DeBilt.....	(10–02–28)	(9470)	λ = 117° E		Coimbra (8850)
	Honolulu.....	10–01·5	8680	O = 10–02–06		Cartuja 10600
	Zi-ka-wei.....	10–01–57	930			Sydney 6200
						Tokio 660
Oct. 22 1124	Ottawa.....	12–09–51	7390	φ = 21°·5 S		Algiers 8950
	Ithaca.....	12–10–03	7050	λ = 70°·5 W		Honolulu 10180
	Strasbourg....	(12–08 48)	(10740)	O = 12–09–47		Georgetown 7780
	Tucson.....	12–09–58	7390			Wien 8250
	Cheltenham...	12–09–48	6750			Hamburg 9500
	La Paz.....	12–10–03	610			Uccle 9420
	Coimbra.....	12–09–58	9100			Sydney (7600)
						Berkeley 3860
Oct. 24 1125	Honolulu.....	1–39·8	4780	φ = 13° S		
	Batavia.....	(1–38–28)	(6460)	λ = 168° E		
	Sydney.....	1–38–30	2420	Location is only rough approximation O = 1–38·5		

LOCATION OF EPICENTRES, 1920

Date	Station	O	Δ	Epicentre	Other Locations	Other Data
Oct. 28 1126	Strasbourg.... DeBilt. ..... Zi-ka-wei..... Hamburg..... Uccle.....	7–23–49 (7–23–45) 7–23–44 7–23–51 (7–23–44)	8940 (8620) 5150 8380 (8750)	φ = 50°·5 N λ = 178° 45′ E O = 7–23–46		La Paz (15200)
Oct. 28 1127	Ottawa..... Ithaca..... Cheltenham... Tucson..... La Paz..... Coimbra..... Besançon.....	12–50–11 12–50–22 12–49–47 12–50–08 12–50–13 12–50–33 (12–49–53)	8080 7600 7760 7860 1320 9230 (11180)	φ = 28° S λ = 72° W O = 12–50–10	La Paz reports destructive quake at Vallenar, Chile φ = 28°·2 S λ = 70°·5 W	Georgetown 9100 Strasbourg 9150 Toronto 8560 Victoria (6300) Algiers 8900 Honolulu 9650 Wien (7380) Uccle 9550 Cartuja 8940 Athens (11980)
Nov. 4 1128	No Location				Location probably in West Indies	Ithaca 2440 La Paz 4220 Georgetown (2500)
Nov. 6 1129	No Location					La Paz 4750
Nov. 8 1130	No Location				Quake reported from Joliette, Quebec	
Nov. 12 1131	Strasbourg.... Algiers..... La Paz..... Wien..... DeBilt..... Hamburg..... Coimbra..... Cartuja..... Uccle..... Barcelona..... Besançon.....	5–41–53 5–41–43 5–41–53 5–41–52 5–41–55 5–42–11 5–41–46 5–42–04 5–41–53 5–4 –45 5–41–48	6370 5200 4740 6900 6550 6750 4830 4780 6380 5480 6220	φ = 4° N λ = 35° W O = 5–41–53		Victoria (5200) Stonyhurst 2590
Nov. 16 1132	Ottawa..... Saskatoon .... Ithaca..... Victoria..... Sitka..... Coimbra..... Uccle..... Cartuja..... Barcelona.....	8–30–54 8–30–00 (8–31–10) 8–30–53 (8–30–39) 8–31–03 8–30–47 8–31–03	3960 2510 (3960) 2690 (1830) 6640 5920 7200 (7400)	φ = 72° N λ = 126°·5 W O = 8–30–55	An unusual epicentre: First location of an epicentre in Arctic Region which apparently is not seismic	La Paz (9000)

LOCATION OF EPICENTRES, 1920

Date	Station	O	Δ	Epicentre	Other Locations	Other Data
Nov. 26 1133	Algiers.....	8–51–05	1520	φ = 39° N	DeBilt gives	Strasbourg 2360
	Wien.....	8–50–52	1030	λ = 19°·4 E	Albania	Besançon 2410
	Dyce.....	8–50–49	2590	O = 8–50–58		
	Stonyhurst....	8–50–50	2360		Uccle gives,	
	DeBilt.....	8–51–10	1750		φ = 39°·5 N	
	Hamburg.....	8–50–59	1680		λ = 19°·4 E	
	Coimbra.....	8–51–01	2420			
	Cartuja.....	8–50–50	2220			
	Uccle.....	8–50–57	1720			
	Athens.....	8–51–04	420			
Nov. 28 1134	No Location				Quake felt in State of Washington	Victoria 260 Georgetown (4630)
Nov. 29 1135	Victoria.....	8–02–42	2320	φ = 60°·5 N		Ottawa 3740
	Algiers.....	(8–03–10)	(8720)	λ = 152°·5 W		Ithaca (3920)
	Georgetown...	8–02–53	5350	O = 8–02–54		Toronto 3450
	Hamburg.....	(8–02–51)	(7320)			La Paz (9400)
	Uccle.....	8–02–56	7480			
Dec. 5 1136	Wien.....	10–01–01	6400	φ = 3°·5 N		Coimbra 2980
	Algiers.....	10–01–15	4480	λ = 25°·5W		
	Strasbourg....	10–00–58	6050	O = 10–01–12		
	La Paz.....	10–02–22	4910			
	Athens.....	(10–00–30)	(6350)			
	Uccle.....	(10–01·1)	(6050)			
	Cartuja.....	10–01–14	4340			
Dec. 7 1137	No Location					Sydney 2750
Dec. 10 1138	Ottawa.....	4–26–19	9020	φ = 38° S		Victoria 3620
	Georgetown...	(4–26–14)	(8480)	λ = 60°·5 W		Stonyhurst 5000
	La Paz.....	4–25–42	2560	O = 4–26–02		Porto Rico 4740
	Coimbra.....	4–25–55	10200	Location approximate		Sydney (5880) Melbourne 7720
Dec. 11 1139	Honolulu.....	21–23·7	7020	φ = 13° N		Ottawa (2470)
	La Paz.....	21–22–22	4200	λ = 91°·5 W		Georgetown (4830)
				O = 21–23ca. Location doubtful		Tucson (3750)
Dec. 13 1140	Honolulu.....	3–42·3	6110	φ = 6°·5 S		Victoria 4700
	Sydney.....	3–42–27	3030	λ = 153° E		La Paz 10620
	Wellington....	3–42–38	4220	O = 3–42–28 Location approximate		Melbourne 2220

LOCATION OF EPICENTRES, 1920

Date	Station	O	Δ	Epicentre	Other Locations	Other Data
Dec. 16 1141	Saskatoon.....	12–05–56	9600	φ = 38° N	Uccle gives,	Ottawa 9590
	Spring Hill....		(12000)	λ = 108° E	φ = 38° N	Toronto (9625)
	Dyce.....	12–06–03	7500	O = 12–05–55	λ = 110° E	Victoria (9940)
	Wien.....	12–05–36	7220			Georgetown 4620
	Marseilles.....	12–06–07	8050		Zi-ka-wei gives	Berkeley 9500
	Honolulu.....	12–06·1	9150		Pinglang, centre	La Paz 15900
	Sitka.....	(12–05–59)	(8200)		of Provinces of	Balboa 6550
	DeBilt.....	12–05–56	7550		Kansu and Shensi	Tokio 1100
	Algiers.....	12–05–52	8650			Melbourne 3330
	Strasbourg....	12–05–52	7550			Wellington 9400
	Hamburg.....	12–05–50	7200			
	Zi-ka-wei.....	12–06–12	1420			
	Coimbra.....	12–05–53	9120			
	Cartuja.....	12–06–06	9020			
	Uccle.....	12–05–44	7780			
	Lemberg.....	12–05·7	6450			
	Manila.....	12–06–13	2580			
	Batavia.....	12–05–33	4820			
	Athens.....	12–05–38	7120			
	Sydney.....	12–06–00	9050			
	Barcelona.....	12–05–59	8360			
	Göttingen.....	12–06–02	7050			
	Hohenheim...	12–05–44	7580			
	München.....	12–05–57	7350			
	Besançon.....	12–05–49	7880			
	Apia.....	12–06–13	10050			
Dec. 17 1142	Georgetown...	18–59–56	8060	φ = 33° S	Press dispatch	Uccle (8200)
	La Paz.....	18–59–54	1850	λ = 68°·5 W	gives LaValle,	
				O = 18–59–55	Province of	
					Mendoza,	
					Argentine	
					φ = 33° S	
					λ = 68°·6 W	
Dec. 25 1143	Wien.....	(11–33–09)	(7120)	φ = 36° N	Sydney gives	Stonyhurst 2150
	Osaka.....	11–33–16	2650	λ = 106° E	Kansu, China	La Paz 14680
	Algiers.....	11–33–19	8610	O = 11–33–15		Barcelona (10100)
	Hamburg.....	11–33–13	7220			Besançon (4820)
	Zi-ka-wei.....	11–33–05	1760			
	Coimbra.....	11–33–20	9120			
	DeBilt.....	11–33–21	7530			
	Cartuja.....	11–33–13	9020			
	Uccle.....	11–33–21	7620			
	Manila.....	(11–33–57)	(2460)			
	Batavia.....	11–33–13	4700			
	Sydney.....	11–33–19	9160			
	Tokio.....	11–32–28	3150			

DEPARTMENT OF THE INTERIOR
CANADA

HON. CHAS. STEWART, MINISTER

W. W. CORY, C.M.G., DEPUTY MINISTER

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The Spectroscopic System Beta Canis Majoris

BY

F. HENROTEAU, Ph.D.

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THE SPECTROSCOPIC SYSTEM BETA CANIS MAJORIS

BY F. HENROTEAU, PH.D.

The present study is a continuation of the work done by the writer on β Canis Majoris at the Lick Observatory in 1917-18.* The principal results of this former study were:—

(1) *A radial velocity oscillation of very short duration* (about six hours) *a result that was already arrived at by Dr. Albrecht in 1908.*

(2) *A considerable variation of the amplitude of the velocity curve.*

(3) *The fact that the maxima of the different velocity curves could not be connected by a period.*

(4) *A short periodic variation of the widths of the spectral lines* $0^d \cdot 25130$.

It was thought at the time, the star having been observed on only a few nights, that the variation of amplitude was rather erratic, not simple-periodic. It was thought also that a period of radial velocity variation existed in such a way that it sometimes furnished a maximum, sometimes a minimum, of the velocity curve.

The present research, in which the coöperation of Messrs. J. F. Frédette, mainly in observing, and W. A. Thorn, in measuring, is acknowledged, shows that the variation of amplitude is probably periodical, while the radial velocity variation must follow a more complicated law than was at first imagined. For a long time it was thought by the writer that the study of β Canis Majoris with the 15-inch telescope and one prism spectrograph would be almost impossible. Since the star is bright, however, it was decided to use very fine grained plates, and it was found that Seed Process 0 plates furnished splendid spectrograms with an exposure of about thirty minutes. Most of the spectrograms were taken on these plates and β Canis Majoris was observed from the end of December, 1921, continuously through January and February, 1922. Weather conditions were favourable, providing whole weeks of clear and exceedingly transparent skies. While a few of the spectrograms are poor and the measures they furnish unreliable the majority give very accurate velocities. All the spectrograms were measured directly on an ordinary micrometric measuring engine and some have been remeasured on a Hartmann spectro-comparator.

The list of radial velocities obtained in 1921 and 1922 follows:—

*L.O.B., Vol. IX, No. 311, p. 155.

RADIAL VELOCITIES OF β CANIS MAJORIS

Date	Julian Day G.M.T.	Velocity km.	Probable error km.	Measure on Spectro-comparator, km.	Quality of spectrogram
1921					
December 21.....	2423045·783	+35·8	±1·5	.....	coarse grain
	·792	+36·1	±2·8	.....	coarse grain
	·803	+31·5	±2·0	.....	coarse grain
	·824	+27·6	±4·6	.....	coarse grain
	·837	+36·2	±3·9	.....	coarse grain
	·853	+20·5	±7·3	.....	coarse grain
December 27.....	051·627	+40·8	±3·6	.....	poor
	·662	+35·2	±2·2	.....	good
	·694	+34·2	±1·6	.....	good
	·756	+24·6	±0·8	.....	good
	·787	+27·3	±2·6	.....	good
	·812	+21·9	±2·8	.....	fair
	·839	+20·7	±3·4	.....	poor
December 29.....	053·712	+23·4	±4·4	.....	very poor
	·739	+30·5	±1·7	.....	good
	·774	+29·5	±1·2	.....	good
	·805	+21·6	±1·1	.....	fair
1922					
January 1.....	056·615	+30·3	±2·0	.....	fair
	·647	+39·8	±2·1	.....	good
	·683	+28·4	±1·5	.....	fair
	·715	+21·6	±3·8	.....	poor
	·750	+22·7	±3·6	.....	coarse grain
January 2.....	057·581	+24·4	±2·5	.....	fair
	·603	+29·0	±2·4	.....	fair
	·626	+31·2	±2·7	.....	good
	·648	+35·7	±2·2	.....	good
	·670	+38·0	±1·7	.....	good
	·693	+39·2	±1·9	.....	good
	·717	+29·3	±1·6	.....	fair
	·747	+29·4	±2·4	.....	fair
	·773	+23·3	±3·1	.....	poor
January 6.....	061·651	+37·2	±1·4	.....	fair
	·677	+42·4	±3·0	.....	good
	·700	+36·2	±2·5	.....	fair
	·726	+45·3	±2·5	.....	fair
	·751	+18·8	±2·1	.....	fair
	·779	+28·2	±2·8	+22·1	poor
January 12.....	067·560	+20·8	±3·5	.....	very poor
	·584	+23·5	±3·0	.....	poor
	·606	+36·1	±2·2	.....	poor
	·628	+38·7	±2·2	.....	fair
	·651	+36·4	±2·2	.....	fair
	·675	+39·8	±2·4	.....	good
	·699	+41·9	±2·2	.....	good
	·728	+29·0	±2·9	.....	fair
January 15.....	070·607	+23·4	+3·0	.....	very poor
	·631	+35·0	±3·0	.....	poor
	·653	+30·0	±2·1	.....	fair
	·676	+24·4	±2·6	.....	fair

RADIAL VELOCITIES OF β CANIS MAJORIS—*Continued*

Date	Julian Day G.M.T.	Velocity km.	Probable error km.	Measure of Spectro-comparator, km.	Quality of Spectrogram
1922					
January 15	2423070·699	+27·1	±4·2	.....	poor
	·722	+32·3	±2·0	.....	good
	·745	+17·2	±4·4	.....	poor
	·772	+ 8·2	±3·9	.....	poor
January 17	072·566	+ 9·8	±2·4	.....	poor
	·612	+25·1	±3·2	.....	poor
	·658	+ 5·3	±4·2	.....	poor
January 22	077·535	+20·6	±2·1	.....	poor
	·559	+21·4	±1·8	.....	weak
	·582	+16·4	±2·6	.....	poor
	·608	+24·1	±2·8	.....	poor
	·637	+24·1	±2·1	.....	fair
	·665	+34·6	±2·6	.....	fair
	·694	+30·1	±2·0	.....	fair
January 23	078·569	+13·2	±3·2	.....	good
	·594	+21·0	±2·1	.....	good
	·618	+25·0	±2·6	.....	good
	·642	+18·9	±2·6	.....	fair
	·669	+29·1	±2·3	.....	good
	·699	+30·9	±2·6	.....	good
	·733	+30·9	±4·2	.....	fair
January 24	079·542	+24·9	±2·6	.....	fair
	·568	+13·1	±1·8	.....	good
	·591	+20·8	±2·8	.....	good
	·614	+19·9	±1·3	.....	poor
	·637	+24·1	±2·6	.....	good
	·661	+31·6	±2·2	.....	good
	·686	+25·9	±2·6	.....	good
	·715	+23·4	±2·6	.....	good
	·747	+26·0	±3·0	.....	poor
January 25	080·535	+32·8	±1·7	+28·1	good
	·567	+15·5	±2·6	+19·4	fair
	·590	+11·8	±1·6	+11·9	good
	·614	+18·1	±1·9	+18·0	good
	·637	+24·3	±1·5	+19·4	good
	·660	+34·2	+1·3	+27·9	good
	·684	+32·8	±1·7	+31·9	good
	·708	+16·8	±4·0	+ 7·4	poor, very weak
January 26	081·525	+36·9	±3·2	+31·3	poor
	·549	+30·9	±2·1	+30·2	fair
	·573	+20·6	±1·5	+20·6	good
	·597	+25·2	±1·8	+21·2	good
	·620	+20·0	±1·4	.....	fair
	·644	+21·6	±2·0	+19·4	fair
	·723	+28·3	±2·2	+28·0	poor
January 27	082·531	+26·0	±1·8	.....	poor
	·560	+19·1	±1·5	.....	fair
	·585	+24·0	±1·6	.....	good
	·608	+29·1	±2·0	.....	good
	·632	+20·3	+1·1	.....	good
	·676	+15·2	±3·2	.....	poor
	·699	+22·2	±3·5	.....	poor

RADIAL VELOCITIES OF β CANIS MAJORIS—*Continued*

Date	Julian Day G.M.T.	Velocity km.	Probable error km.	Measure on Spectro-comparator, km.	Quality of Spectrogram
1922					
January 29	2423084·531	+31·3	±1·3	.....	good
	·556	+32·2	±1·6	.....	good
	·579	+28·1	±2·0	.....	good
	·602	+22·6	±1·8	.....	good
	·625	+21·7	±1·1	.....	good
	·649	+25·5	±1·7	.....	good
	·704	+23·8	±2·8	.....	poor
January 30	085·521	+27·8	±1·7	.....	good
	·546	+31·6	±1·5	.....	good
	·569	+27·4	±1·7	.....	good
	·592	+26·7	±1·2	.....	good
	·615	+27·0	±1·8	.....	fair
January 31	086·538	+57·2	±2·6	+58·4	good
	·562	+19·6	+1·3	.....	good
	·585	+19·6	±1·3	.....	good
	·609	+ 0·3	±2·2	.....	poor
	·632	+26·7	±3·3	.....	poor
February 7	093·501	+28·2	±2·1	.....	fair
	·529	+35·3	±2·3	.....	good
	·555	+36·2	±2·2	.....	good
	·578	+30·5	±1·9	.....	good
	·601	+23·1	±1·8	.....	good
	·625	+22·6	±2·2	.....	good
	·648	±24·4	±2·4	.....	good
	·674	+42·8	±3·1	.....	very poor
February 13	099·488	+32·2	±1·8	+32·4	poor
	·513	+29·9	±2·9	+23·8	very poor
	·536	+25·5	±2·3	+29·3	fair
	·559	+28·0	±2·1	+30·9	fair
	·583	+32·8	±2·0	+26·8	good
	·606	+25·4	±2·2	+30·2	poor
	·628	+28·1	±2·9	+26·6	poor
	·654	+17·5	+3·2	+30·3	very poor
February 16	102·476	+30·9	±1·3	.....	fair
	·500	+30·4	±1·3	.....	good
	·523	+29·7	±1·5	.....	good
	·546	+27·7	±1·5	.....	good
	·569	+24·4	±1·3	.....	good
	·591	+33·0	±2·1	.....	fair
	·613	+31·0	±1·7	.....	good
	·636	+38·4	±1·8	.....	good
February 20	106·487	+24·2	±1·6	.....	good
	·510	+23·0	±2·0	.....	good
	·556	+19·8	±2·7	.....	good
	·579	+15·0	±1·3	.....	good
	·602	+ 7·1	±2·0	.....	poor
	·627	+23·7	±2·0	.....	poor
February 28	114·487	+37·1	±4·2	.....	poor
	·510	+19·7	±1·8	.....	good
	·533	+20·7	±2·6	.....	fair
	·557	+ 9·7	±1·7	.....	good

Among the different velocity curves that the above results furnish, those shown in Figs. 1 and 2 are among the most interesting; in tracing these curves account was taken of the probable errors of the different observations.

Fig. 1.

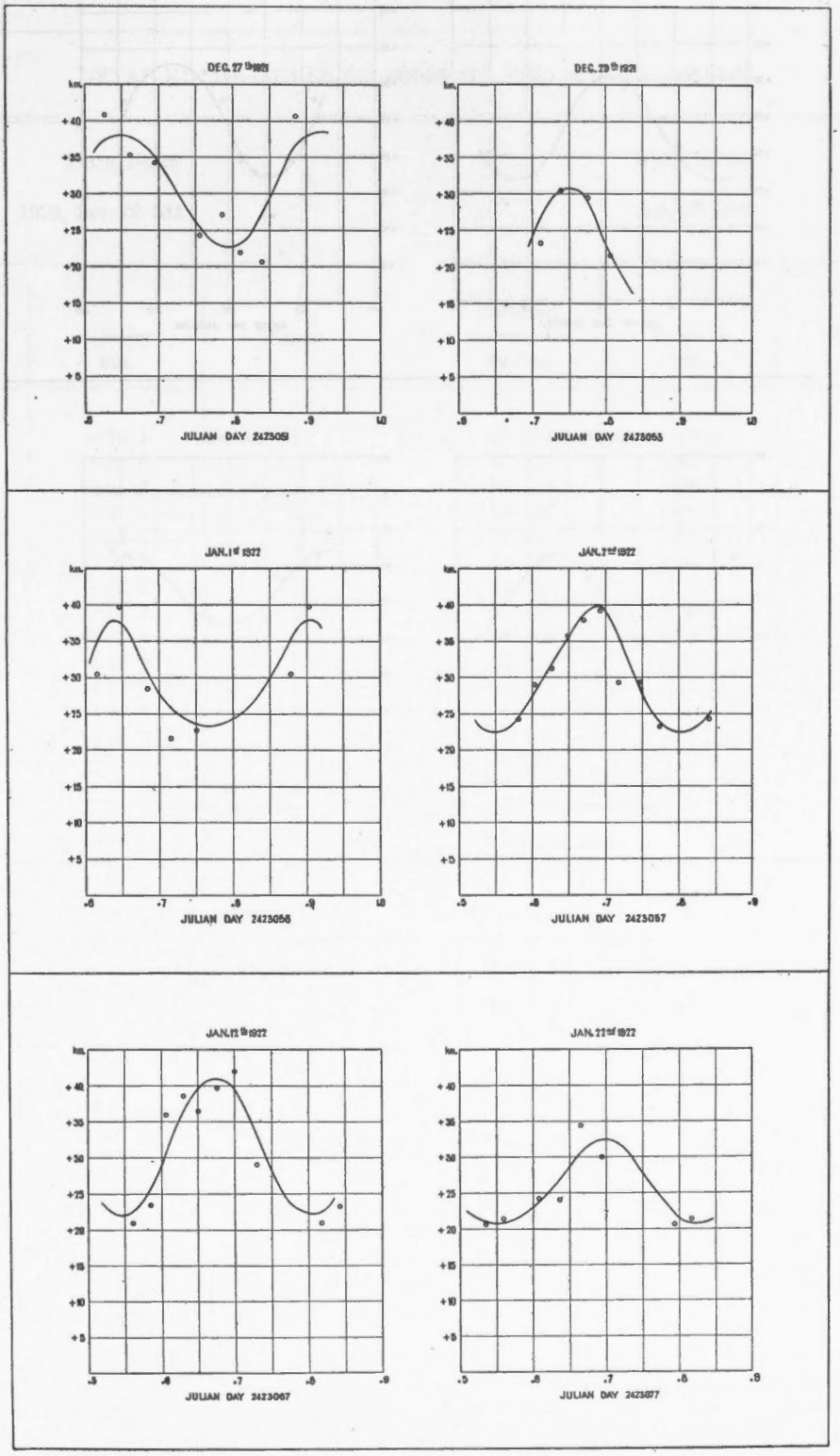
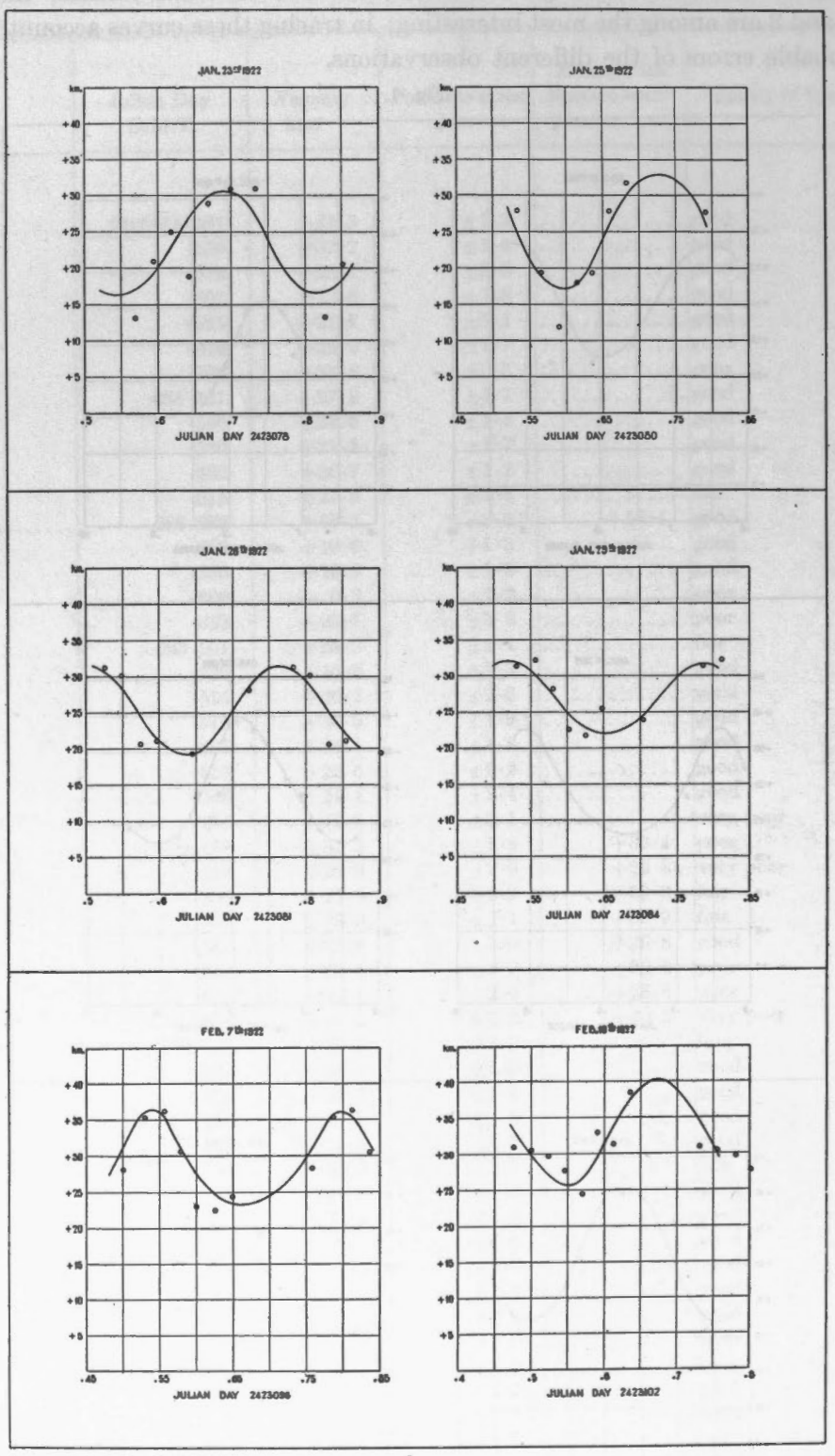


Fig. 2.


JAN. 23rd 1922
JULIAN DAY 2423078
JAN. 25th 1922
JULIAN DAY 2423080
JAN. 28th 1922
JULIAN DAY 2423081
JAN. 29th 1922
JULIAN DAY 2423084
FEB. 7th 1922
JULIAN DAY 2423086
FEB. 10th 1922
JULIAN DAY 2423102

In order to give an idea of the value of the radial velocities obtained, the detailed measures of a series of spectrograms are given here. Most of the lines in these measures can be identified by consulting the table of lines, elements, wave-lengths and micrometer readings published in "The Spectroscopic System Delta Ceti."*

DETAILED MEASURES OF SOME OF THE SPECTROGRAMS

Plate 10225

1922, Jan. 29·531

Reduced micrometer reading	Velocity km.	Weight
28·238	+39·1	1
31·863	+52·8	2
32·091	+61·0	1
32·352	+27·3	2
33·423	+54·3	2
34·429	+51·2	1
35·893	+33·2	2
37·637	+40·7	3
45·399	+46·6	1
46·292	+43·9	2
49·489	+37·7	1
49·647	+41·1	2
50·940	+46·3	3
52·536	+52·9	1
53·771	+43·3	5
55·313	+30·9	2
58·461	+47·1	3
62·672	+51·1	2

Weighted mean	+43·8
Va	−12·4
Vd	+ 0·2
Curv	− 0·3
Radial velocity	+31·3

Plate 10226

Jan. 29·556

Reduced micrometer reading	Velocity km.	Weight
28·263	+60·9	1
31·868	+57·3	2
32·365	+39·1	1
33·407	+39·6	1
37·642	+45·6	3
45·397	+44·5	3
46·285	+36·4	3
49·502	+52·2	2
49·664	+59·9	2
50·939	+45·2	3
52·517	+31·0	1
53·765	+36·3	4
58·453	+37·2	4
62·677	+57·6	2

Weighted mean	+44·8
Va	−12·4
Vd	+ 0·1
Curv	− 0·3
Radial velocity	+32·2

*Pub. Dom. Obs. Vol. V, No. 11.

DETAILED MEASURES OF SOME OF THE SPECTROGRAMS—*Continued.*

Plate 10227
1922, Jan. 29·579

Reduced micrometer reading	Velocity km.	Weight
28·241	+41·8	1
31·873	+61·9	2
32·050	+23·7	1
32·367	+40·9	1
33·432	+62·6	2
34·404	+27·9	1
37·635	+38·8	3
45·395	+42·4	3
46·296	+48·1	3
49·496	+45·5	1
50·926	+30·5	3
52·528	+43·7	1
53·754	+23·4	5
55·328	+40·5	2
58·460	+45·9	5
62·666	+43·2	2

Weighted mean	+40·7
Va	−12·4
Vd	+ 0·1
Curv	− 0·3
Radial velocity	+28·1

Plate 10228
1922, Jan. 29·602

Reduced micrometer reading	Velocity km.	Weight
28·233	+34·8	1
31·868	+57·3	2
32·055	+28·2	1
32·360	+34·6	1
33·419	+50·6	2
37·641	+44·6	3
45·391	+38·2	3
46·282	+33·2	3
49·637	+30·0	2
50·926	+30·5	2
52·522	+36·8	2
53·754	+23·4	5
55·308	+25·0	1
58·447	+29·8	4
58·964	+23·7	2
62·674	+53·7	2

Weighted mean	+35·3
Va	−12·4
Vd	0·0
Curv	− 0·3
Radial velocity	+22·6

Plate 10229
1922, Jan. 29·625

Reduced micrometer reading	Velocity km.	Weight
28·244	+44·4	1
31·859	+49·1	2
32·353	+28·2	2
33·407	+39·6	2
34·413	+36·3	1
35·911	+50·3	1
37·624	+28·1	3
45·388	+35·0	3
46·279	+30·0	3
49·473	+20·0	2
49·646	+40·0	2
50·930	+35·0	4
52·531	+47·1	1
53·758	+28·1	6
55·316	+34·5	2
58·450	+33·5	5
58·974	+36·2	3
62·664	+40·6	2

Weighted mean	+34·4
Va	−12·4
Vd	0·0
Curv	− 0·3
Radial velocity	+21·7

Plate 10230
1922, Jan. 29·649

Reduced micrometer reading	Velocity km.	Weight
28·240	+40·9	1
31·860	+50·0	1
32·052	+25·5	1
32·363	+37·3	2
33·388	+22·1	1
35·894	+34·2	2
37·641	+44·6	3
45·409	+57·2	3
46·280	+31·0	3
49·479	+26·6	2
49·649	+43·3	2
50·933	+38·4	3
53·759	+29·2	5
58·457	+42·2	4
62·672	+51·1	1

Weighted mean	+38·3
Va	−12·4
Vd	− 0·1
Curv	− 0·3
Radial velocity	+25·5

DETAILED MEASURES OF SOME OF THE SPECTROGRAMS—*Concluded*

Plate 10231
1922, Jan. 29·704

Reduced micrometer reading	Velocity km.	Weight
31·859	+49·1	1
32·355	+30·0	1
34·430	+52·1	1
37·656	+59·2	2
45·388	+35·0	3
46·287	+38·5	3
49·463	+ 8·9	1
49·645	+38·9	2
50·924	+28·2	2
52·505	+17·3	2
53·763	+33·9	4
55·297	+11·9	1
58·472	+60·8	2

Weighted mean	+36·7
Va	−12·5
Vd	− 0·1
Curv	− 0·3
Radial velocity	+23·8

The last plate is very weak and difficult to measure, typical of some of the poor measures.

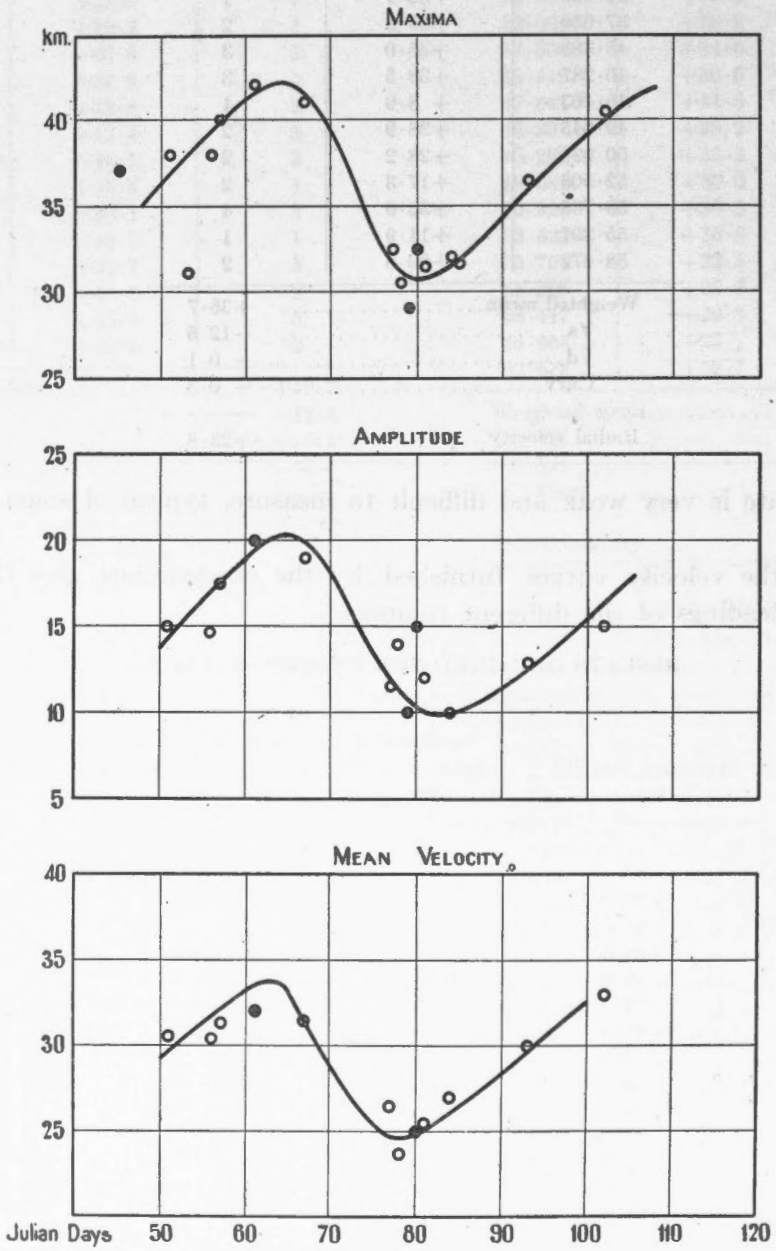
Altogether the velocity curves furnished by the observations give the following results for the headings of the different columns.

RESULTS OBTAINED FOR β CANIS MAJORIS

Julian Day	Maximum velocity km.	Amplitude of velocity curve km.	Estimated mean velocity km.	Time of maximum (decimal fraction of a day)
243045	+37 *	.....	.....	·770*
051	+38·0	15·0	+30·5	·655
053	+31·0	.....	.....	·752
056	+38·0	14·7	+30·4	·640
057	+40·0	17·5	+31·2	·687
061	+42·0	20·0*	+32·0*	·700*
067	+41·0	19·0	+31·5	·675
077	+32·5	11·5	+26·5	·699
078	+30·5	14·0	+23·7	·690
079	+29·0*	10·0*	.....	.....
080	+32·5*	15·0*	+25·0*	.....
081	+31·5	12·0	+25·5	·766
084	+32·0	10·0	+27·0	·788
085	+31·6	.....	.....	·560
093	+36·5	13·0	+30·0	·540
102	+40·4	15·0	+33·0	·672

Some curves are too poorly determined to furnish results and give doubtful values, which are found in the table followed by an asterisk. The other results, especially in the third and fourth columns, are affected by a rather large degree of uncertainty. Columns 2, 3 and 4, combined with column 1, yield the curves shown in Fig. 3, where the doubtful

Fig. 3.



points are indicated by darkened circles. The three curves show unmistakably the same tendencies—probably passing from one maximum to the next in about 42 days—as if the center of mass of the short period system, if such it is, moved in a rather eccentric orbit, (the actual observations, however, do not justify calling this a period). If such an orbit exists it appears to be certain that the amplitude of the short period velocity variation is a function of the position of the center of mass of the system in this orbit.

It is possible that the amplitude of the mean velocity curve varies, as was found in the case of σ Scorpii, for, in 1917-18, hardly any variation of the mean velocity was found.

As to the times at which maxima occur it seems impossible to connect them by any period. Even the law proposed in 1918 connecting a series of maxima with a series of minima by a period, allowing for a reversal of the curve or interchange of maximum and minimum, does not seem to hold. No doubt two or several simple waves by their combination would produce a curve for which the several maxima could not be connected by a simple period—but the succession of maxima would, however, be brought about according to a definite law. Our spectra are too poor to measure the line widths; it seems probable, however, from the observations of 1918 that the variation of line-width is simple-periodic.

Granting the curve of variation of mean velocity to represent also the variation of the center-of-mass velocity of the short-period system, the following very approximate elements for a possible orbit of that center of mass are derived:—

$$
\begin{aligned}
k &= 4\cdot75 \text{ km.} \\
e &= 0\cdot27 \\
P &= 42^{\mathrm{d}} \\
\omega &= 90^\circ \\
T &= 2423070 \text{ J.D.} \\
\gamma &= +29\cdot3 \text{ km.} \\
a \sin i &= 2{,}633{,}000 \text{ km.} \\
\frac{m_1^3 \sin^3 i}{(m+m_1)^2} &= 0\cdot00041
\end{aligned}
$$

The eccentricity is not small. This suggests at once that the short-period velocity curve is possibly due to tidal action, showing variation of amplitude with the variation of position in the 42-day orbit. The variation of amplitude would be greatest for large eccentricity and small orbit, tidal action being approximately a function of the inverse cube of the distance.

Dominion Observatory,
Ottawa,
September, 1922.

DEPARTMENT OF THE INTERIOR
CANADA

HON. CHARLES STEWART, *Minister* W. W. CORY, C.M.G., *Deputy Minister*

PUBLICATIONS

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Dominion Observatory

OTTAWA

OTTO KLOTZ, LL.D., D.Sc., *Director*

Vol. VIII, No. 4

The Spectroscopic System Sigma Scorpii

Second Paper

BY

F. HENROTEAU, PH.D.

OTTAWA
GOVERNMENT PRINTING BUREAU
1923

THE SPECTROSCOPIC SYSTEM SIGMA SCORPII

SECOND PAPER

BY F. HENROTEAU, PH.D.

The present paper gives the results of the observations of σ Scorpii in 1922. In a former paper* an extensive study of this star has already been made; it was found that the variation of the radial velocity followed two periods, a very short one of $0^d \cdot 246834$ and a much longer one of about 34 days. It was also found that the variation of long period had a variable amplitude. In order, however, to arrive at an understanding of the system, observations will have to be secured for a number of years; it is therefore the intention to follow the star for several years and to publish the results obtained each year. The assistance of Mr. J. F. Frédette in the present research is acknowledged.

The radial velocities obtained for σ Scorpii in 1922 are as follows:—

RADIAL VELOCITIES OF σ SCORPII

Date	Julian Day	Velocity km.	Remarks
1922 April 2	2423147·759	−27·3	
	·786	−25·7	
	·808	−35·8	
	·831	−16·3	
	·853	− 8·5	
	·876	− 3·0	
April 4	149·789	−30·9	
	·812	−33·1	
	·837	− 6·5	
	·865	+ 3·6	
	·890	+ 2·7	
April 5	150·752	−38·9	
	·775	−50·0	
	·800	−21·1	
	·826	−13·8	
	·853	−14·0	
April 7	152·769	−37·7	
	·805	−14·4	
	·835	+ 1·3	
	·864	+11·7	
April 16	161·741	− 8·2	
	·770	+13·5	
	·802	−10·0	
	·833	−52·2	
	·858	−29·9	

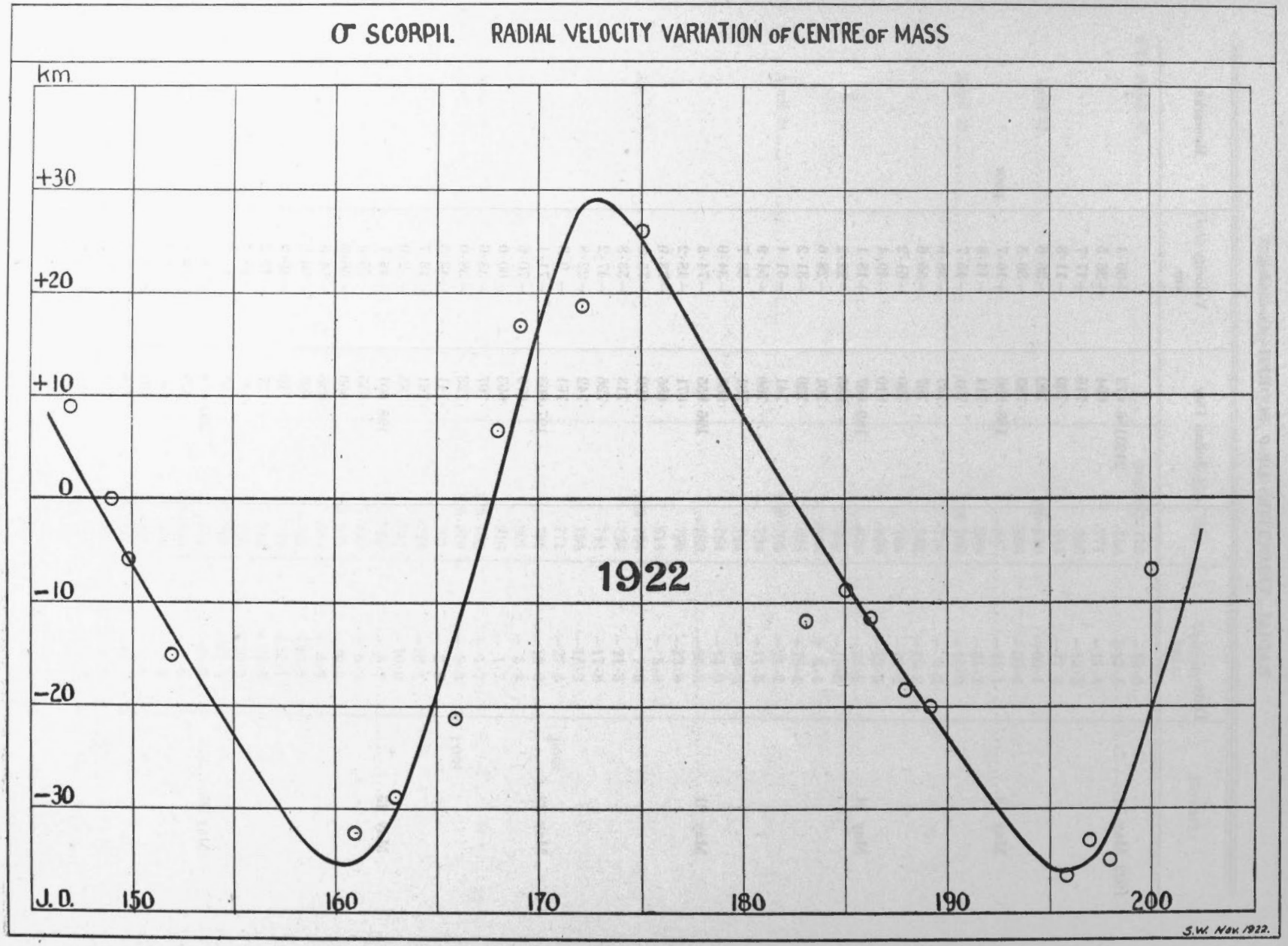
* Pub. Dom. Obs. Vol. V, p. 303.

RADIAL VELOCITIES OF σ SCORPII—*Continued*

Date	Julian Day	Velocity km.	Remarks
1922 April 18	2423163·716	−19·0	
	·744	+17·4	
	·771	−11·4	
	·796	−42·3	
	·815	−47·5	
April 21	166·810	−60·1	
	·826	−50·4	
	·847	−54·1	
	·869	−31·2	
April 23	168·706	−10·0	
	·724	− 9·2	
	·743	−16·2	
	·766	−26·2	
	·789	−33·5	
	·812	−24·2	
	·835	−15·6	
	·858	+ 6·4	
	·878	+18·4	
April 24	169·703	−21·2	
	·724	−11·6	
	·744	−16·2	
	·764	−14·0	
	·783	−23·3	
	·799	−23·9	
	·814	− 5·3	
April 27	172·704	− 7·6	
	·724	−21·3	
	·741	−17·8	
	·756	−18·2	
	·771	−27·6	poor
	·785	−10·3	
	·801	− 5·8	
	·819	− 1·7	
April 28	173·788	+ 1·7	
April 30	175·679	− 8·3	poor
	·701	− 3·8	
	·724	−10·1	
	·747	−10·9	
	·769	+ 9·7	
	·792	+ 6·9	
May 8	183·665	−26·0	
	·684	+ 4·3	
	·701	+20·4	
	·719	+27·1	
	·740	+24·6	
	·760	+10·0	
	·778	−27·5	
	·794	−18·6	
May 10	185·658	− 7·6	
	·676	− 4·9	
	·694	+26·8	
	·710	+32·9	
	·726	+26·1	
	·744	− 3·3	
	·762	−13·8	
	·804	−44·3	
	·830	−38·5	

RADIAL VELOCITIES OF σ SCORPII—*Concluded*

Date	Julian Day	Velocity km.	Remarks
1922 May 11	2423186·672	+30·4	
	·694	+26·5	
	·716	+17·7	
	·739	−11·8	
	·762	−35·6	
	·783	−36·5	
May 13	188·696	+16·7	poor
	·714	−14·6	
	·731	−45·7	
	·747	−38·6	
	·767	−55·6	
	·790	−61·2	
	·810	−49·4	
May 14	189·667	+18·1	
	·685	−22·2	
	·701	−28·6	
	·720	−31·2	
	·741	−51·4	
	·760	−54·9	
	·781	−58·7	
	·803	−34·0	
May 21	196·655	−74·5	
	·671	−48·2	
	·685	−78·0	
	·699	−75·3	
	·713	−53·8	
	·726	−47·2	
	·742	−22·8	
	·761	− 9·3	
May 22	197·663	−71·1	
	·679	−70·6	
	·693	−60·0	
	·707	−38·0	
	·723	−38·0	
	·741	−43·5	
	·761	−13·7	
	·785	− 2·0	
May 23	198·601	−48·7	
	·653	−75·5	
	·669	−66·0	
	·683	−54·8	
	·697	−56·5	
	·710	−40·9	
	·727	−42·2	
	·747	−18·7	
	·767	−11·7	
May 25	200·658	−24·3	
	·672	−19·8	
	·686	−14·9	
	·701	− 4·8	
	·718	− 3·3	
	·738	+ 8·0	
	·760	+25·0	
	·783	+36·7	
	·807	+21·2	


σ SCORPII. RADIAL VELOCITY VARIATION OF CENTRE OF MASS
km
+30
+20
+10
0
−10
−20
−30
J. D.
150
160
170
180
190
200
1922
S.W. Nov. 1922.

The above velocities furnish a fairly large number of nearly complete velocity curves, which may be considered, within the limits of error, of constant amplitude. Their center-of-mass lines, if they might be called so, give the following radial velocities for the nights indicated.

VALUES OF CENTER-OF-MASS VELOCITY OBTAINED FROM SHORT-PERIOD CURVES

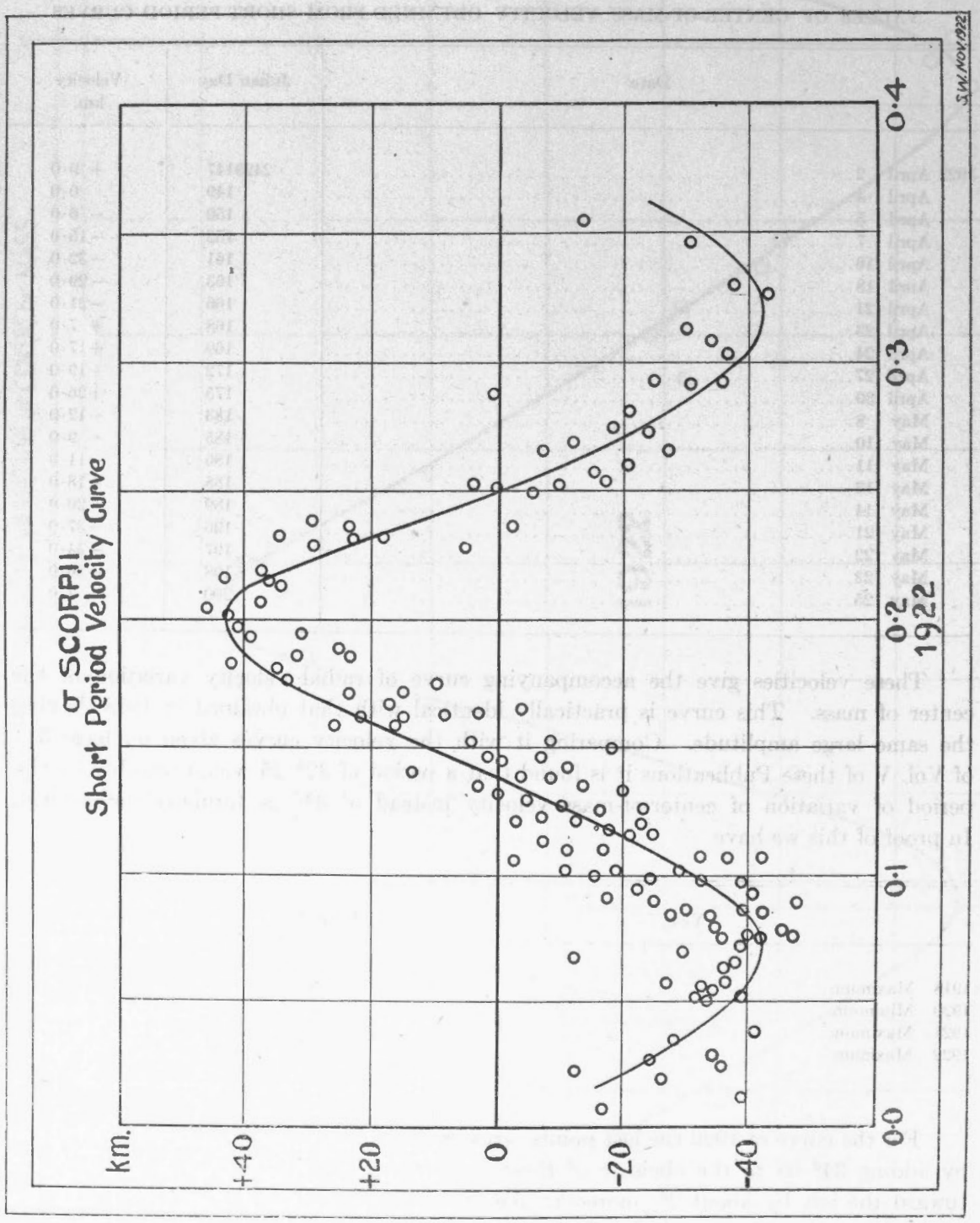
Date	Julian Day	Velocity km.
1922 April 2	2423147	+ 9·0
April 4	149	0·0
April 5	150	− 6·0
April 7	152	−15·0
April 16	161	−32·0
April 18	163	−29·0
April 21	166	−21·0
April 23	168	+ 7·0
April 24	169	+17·0
April 27	172	+19·0
April 30	175	+26·0
May 8	183	−12·0
May 10	185	− 9·0
May 11	186	−11·0
May 13	188	−18·0
May 14	189	−20·0
May 21	196	−37·0
May 22	197	−34·0
May 23	198	−36·0
May 25	200	− 7·0

These velocities give the accompanying curve of radial velocity variation of the center of mass. This curve is practically identical with that obtained in 1918, having the same large amplitude. Comparing it with the velocity curves given on page 311 of Vol. V of these Publications it is found that a period of $32^d \cdot 25$ would possibly be the period of variation of center-of-mass velocity instead of 34^d as formerly determined. In proof of this we have

Year	Julian Day	Equivalent
1918 Maximum	2421687	2421687
1920 Minimum	2461	1687+(24 x 32·25)
1921 Maximum	2816	1687+(35 x 32·25)
1922 Maximum	3171	1687+(46 x 32·25)

For the curve of 1920 the last points (crosses) have been derived from the first points by adding $34^d \cdot 08$ to the abcissae of these points; they will thus have to be displaced toward the left by about 2^d; moreover the first point is probably too high so that the minimum of the curve would be close enough to J.D. 2422461. On the other hand the

values of the center-of-mass velocities derived from Selga's observations in 1915 do not seem to fit the period $32^d \cdot 25$, but do fit a period of $34^d \cdot 08$ much better, as was shown formerly*. To sum up, there seems to be a slight variation in the length of the long-period curve; the determination of such a variation, however, must await further observations.



* See residuals between the observed and computed velocities L.O.B. Vol. IX p. 173.

As to the short period of velocity variation, an examination of the table given on page 312 of Vol. V of these Publications shows that if the residuals of Obs-Pred are assumed to be constant the mean residual will be $-0^d \cdot 028$, so that, if the maximum of 1921 May 10, which happens at J.D. 2422820·646, is taken, it might be considered as a good origin to compute a value of the period by using the observations of 1922. It is found that the period $0^d \cdot 246828$ satisfies these observations. It is a shorter period, 0·246814, which apparently connected the observations of 1920 with those of 1921.

For the observations of 1922 (computing the predicted maxima by adding $0^d \cdot 246828$ a certain number of times to J.D. 2422820·646) the following table is obtained:

Date	Observed Maximum J.D.	Predicted Maximum J.D.	Obs-Pred.
1922 April 2	2423147·932	·941	−0·009
April 4	149·925	·916	+0·009
April 5	150·900	·903	−0·003
April 7	152·872	·878	−0·006
April 16	161·769	·764	+0·005
April 18	163·740	·738	+0·002
April 21	166·940	·947	−0·007
April 23	168·915	·922	−0·007
April 24	169·888	·909	−0·021
April 27	172·882	·871	+0·011
April 30	175·840	·833	+0·007
May 8	183·723	·731	−0·008
May 10	185·713	·706	+0·007
May 11	186·687	·693	−0·006
May 13	188·661	·668	−0·007
May 14	189·650	·655	−0·005
May 21	196·800	·813	−0·013
May 22	197·800	·801	−0·001
May 23	198·779	·788	−0·011
May 25	200·777	·763	+0·014

The observations thus indicate that:

1. *The short period variation has decreased slightly from 1920 to 1921*, this decrease being of the order of $0^d \cdot 000020$.

2. *The short period variation has increased slightly from 1921 to 1922*, this increase being of the order of $0^d \cdot 000014$.

To sum up, there is an interesting small fluctuation of the short period, possibly of an amplitude of the order of $0^d \cdot 00004$.

Taking now the observations of 1922, we may superpose the different short-period velocity curves, so that all of them have the same but undetermined mean velocity. We then obtain the accompanying curve which most likely has a constant amplitude.

Detailed measures of a few spectrograms of σ Scorpii taken in 1920, 1921 and 1922 will now be given in order to give an idea of the value of these measures. The principal lines corresponding to the micrometer readings can be identified by using the table given in the article on δ Ceti*.

*Pub. Dom. Obs., Vol. V, p. 419.

Detailed Measures of some of the Spectrograms

Plate 9063
1920 April 16·727

Reduced micrometer reading	Velocity km.	Weight
50·838	−79·1	2
58·415	−58·3	4
62·654	−43·2	6
63·390	−79·2	4

Weighted mean	−60·5
Va	+19·2
Vd	+ 0·2
Curv.	− 0·3
Radial velocity	−41·4

Plate 9064
1920 April 16·769

Reduced micrometer reading	Velocity km.	Weight
50·830	− 88·1	3
53·685	− 80·7	6
58·405	− 70·7	9
62·623	− 83·8	9
63·203	− 66·0	8
66·821	− 66·2	5
66·971	− 48·6	5
67·350	−105·0	7
68·568	− 25·6	4
76·311	− 58·8	2

Weighted mean	−72·3
Va	+19·1
Vd	+ 0·1
Curv.	− 0·3
Radial velocity	−53·4

Plate 9065
1920 April 16·785

Reduced micrometer reading	Velocity km.	Weight
46·802	−24·6	2
50·846	−70·1	5
53·675	−92·4	3
58·392	−86·8	8
62·656	−40·6	7
63·394	−73·9	8
66·990	−22·2	6
67·325	−32·0	4
76·327	−33·4	2

Weighted mean	−57·2
Va	+19·1
Vd	+ 0·1
Curv.	− 0·3
Radial velocity	−38·3

Plate 9066
1920 April 16·804

Reduced micrometer reading	Velocity km.	Weight
49·545	−76·6	2
50·839	−78·0	5
51·391	−68·9	4
53·704	−58·5	6
54·156	−77·2	6
58·403	−73·2	7
62·617	−91·7	2
63·392	−76·6	2
67·380	−63·0	2
76·309	−62·0	2

Weighted mean	−71·9
Va	+19·1
Vd	0·0
Curv.	− 0·3
Radial velocity	−53·1

Detailed Measures of some of the Spectrograms—*Continued.*

Plate 9067
1920 April 16·826

Reduced micrometer reading	Velocity km.	Weight
50·885	−26·0	1
58·394	−84·3	3
62·645	−55·0	2
63·415	−46·2	2
67·390	−49·0	2
76·344	− 6·4	1

Weighted mean	−53·2
Va	+19·1
Vd	0·0
Curv.	− 0·3
Radial velocity	−34·4

Plate 9637
1921 May 16·669

Reduced micrometer reading	Velocity km.	Weight
50·869	−44·1	3
53·699	−64·4	4
54·126	−56·2	4
58·278	−24·8	6
58·428	−42·2	4
58·938	−60·0	1
62·637	−65·5	1
63·405	−59·4	1
64·533	−73·7	2
67·913	−12·7	2
76·326	−35·0	1

Weighted mean	−45·7
Va	+ 5·8
Vd	+ 0·2
Curv.	− 0·3
Radial velocity	−40·0

Plate 9638
1921 May 16·700

Reduced micrometer reading	Velocity km.	Weight
34·237	−66·0	1
46·767	−62·1	2
49·566	−53·3	2
50·848	−67·8	2
51·500	−80·9	2
53·208	−63·8	2
53·697	−66·7	1
58·424	−47·1	6
62·650	−48·5	3
66·958	−66·7	1
70·201	−43·5	2
76·306	−66·8	1

Weighted mean	−57·5
Va	+ 5·8
Vd	+ 0·1
Curv.	− 0·3
Radial velocity	−51·9

Plate 9639
1921 May 16·727

Reduced micrometer reading	Velocity km.	Weight
37·480	−62·4	1½
47·393	−15·1	1
50·862	−52·0	1
51·415	−41·8	2
51·528	−49·0	2
53·726	−32·8	2
58·428	−42·2	5
62·667	−26·2	2
64·809	−44·6	2
65·691	− 4·1	2
76·317	−49·3	1

Weighted mean	−36·8
Va	+ 5·8
Vd	0·0
Curv.	− 0·3
Radial velocity	−31·3

Detailed Measures of some of the Spectrograms—*Continued.*

Plate 9640
1921 May 16·757

Reduced micrometer reading	Velocity km.	Weight
50·904	− 4·5	3
52·494	−13·8	3
53·746	− 9·4	3
55·281	−39·3	1
58·462	0·0	4
64·565	−30·8	4
64·825	−23·0	4
70·228	− 4·4	2
76·319	−46·1	1

Weighted mean	−15·7
Va	+ 5·8
Vd	0·0
Curv.	− 0·3
Radial velocity	−10·2

Plate 9641
1921 May 16·785

Reduced micrometer reading	Velocity km.	Weight
46·262	+23·3	1
50·917	+10·2	1
58·453	−11·2	2
62·709	+28·8	2
63·812	+27·9	3
64·615	+36·2	2
67·379	+43·1	1
70·230	− 1·4	1
76·333	−23·8	1

Weighted mean	+17·3
Va	+ 5·7
Vd	− 0·1
Curv.	− 0·3
Radial velocity	+22·6

Plate 10560
1922 April 23·706

Reduced micrometer reading	Velocity km.	Weight
45·299	−43·0	1
46·198	−44·5	1
46·847	−23·5	2
50·861	−53·1	3
53·729	−29·3	6
55·312	− 2·4	1
58·438	−29·8	5
58·986	0·0	1
62·690	+ 3·9	2
63·459	+11·9	3
63·724	−89·1	1
67·388	−51·8	2
70·220	−15·9	3

Weighted mean	−26·4
Va	+16·5
Vd	+ 0·2
Curv.	− 0·3
Radial velocity	−10·0

Plate 10561
1922 April 23·724

Reduced micrometer reading	Velocity km.	Weight
37·531	−13·4	1
45·323	−17·8	1
49·411	−52·2	1
50·848	−67·8	2
53·740	−16·4	4
58·431	−38·4	5
58·957	−36·3	3
62·685	− 2·6	2
63·434	−21·1	1
70·240	+13·1	3
76·329	−30·2	3

Weighted mean	−25·5
Va	+16·5
Vd	+ 0·1
Curv.	− 0·3
Radial velocity	− 9·2

Detailed Measures of some of the Spectrograms—*Continued.*

Plate 10562
1922 April 23·743

Reduced micrometer reading	Velocity km.	Weight
34·250	−53·9	1
35·768	−29·1	3
37·509	−34·6	3
45·298	−44·1	1
48·593	−42·9	3
49·590	−26·6	1
50·889	−21·5	7
52·465	−47·1	2
53·724	−35·1	6
55·283	−36·9	3
58·431	−38·4	7
58·953	−41·3	3
62·665	−28·8	4
63·439	−14·5	3
66·848	−29·0	1
67·011	+ 6·9	1
67·368	−27·8	2
70·204	−39·2	3
76·329	−30·2	2

Weighted mean	−32·5
Va	+16·5
Vd	+ 0·1
Curv.	− 0·3
Radial velocity	−16·2

Plate 10563
1922 April 23·766

Reduced micrometer reading	Velocity km.	Weight
31·700	−23·4	1
32·207	−34·6	1
33·250	−39·6	1
35·759	−37·6	2
37·482	−60·5	3
46·202	−40·3	2
48·565	−73·7	1
49·566	−53·3	3
50·866	−47·5	6
51·415	−41·8	1
52·462	−50·6	2
53·713	−48·0	5
58·429	−40·9	9
62·676	−14·4	3
63·432	−23·8	3
66·976	−41·7	2
76·315	−52·5	1

Weighted mean	−42·5
Va	+16·5
Vd	+ 0·1
Curv.	− 0·3
Radial velocity	−26·2

Detailed Measures of some of the Spectrograms—*Continued.*

Plate 10564
1922 April 23·789

Reduced micrometer reading	Velocity km.	Weight
35·722	−72·4	2
40·874	−56·0	2
45·307	−34·6	1
46·211	−30·7	3
48·581	−56·1	2
49·423	−38·8	2
49·581	−36·6	3
50·864	−49·7	6
52·455	−58·6	2
53·703	−59·7	8
55·267	−55·9	1
58·417	−55·8	10
58·958	−35·0	4
62·658	−38·0	5
63·421	−38·3	3
70·181	−72·5	2
76·316	−50·9	2

Weighted mean	−49·7
Va	+16·5
Vd	0·0
Curv.	− 0·3
Radial velocity	−33·5

Plate 10565
1922 April 23·812

Reduced micrometer reading	Velocity km.	Weight
28·040	−39·2	1
31·684	−37·8	2
32·186	−53·7	2
33·262	−28·5	3
34·247	−56·7	1
35·720	−74·3	1
40·558	−60·0	2
40·868	−62·0	1
45·304	−37·8	2
46·171	−73·1	1
49·410	−53·3	2
50·857	−57·6	5
51·421	−35·0	2
52·475	−35·6	3
53·716	−44·5	8
55·280	−40·5	2
58·423	−48·4	5
58·944	−52·5	4
62·675	−15·7	4
63·437	−17·2	3
63·759	−42·6	2
64·576	−16·1	1
65·080	−27·0	1
67·350	+ 2·8	1
67·894	−38·1	1
68·570	−22·7	2
70·211	−29·0	1
76·334	−22·3	2

Weighted mean	−40·4
Va	+16·5
Vd	0·0
Curv.	− 0·3
Radial Velocity	−24·2

Detailed Measures of some of the Spectrograms—*Continued.*

Plate 10566
1922 April 23·835

Reduced micrometer reading	Velocity km.	Weight
37·516	−27·8	1
45·307	−34·6	1
46·789	−38·5	2
49·604	−11·1	3
50·876	−36·2	4
52·477	−33·3	3
53·722	−37·4	6
56·579	−18·2	2
58·127	− 1·2	2
58·430	−39·7	5
58·946	−50·0	2
62·674	−17·0	4
63·405	−59·4	3
64·809	−44·5	1
70·220	−16·0	3
76·320	−44·5	1

Weighted mean	−31·7
Va	+16·4
Vd	0·0
Curv.	− 0·3
Radial velocity	−15·6

Plate 10567
1922 April 23·858

Reduced micrometer reading	Velocity km.	Weight
41·690	+17·2	1
46·852	+28·9	2
50·874	−38·4	1
53·733	−24·6	4
55·288	−30·9	1
58·448	−17·4	6
58·785	+11·2	1
58·968	−22·5	2
62·675	−15·7	4
63·463	+17·2	3
67·004	− 2·8	2
67·348	0·0	2
70·230	− 1·4	2
76·313	−55·6	1

Weighted mean	− 9·6
Va	+16·4
Vd	− 0·1
Curv.	− 0·3
Radial velocity	+ 6·4

DETAILED MEASURES OF SOME OF THE SPECTROGRAMS—*Concluded.*

Plate 10568
1922 April 23·878

Reduced micrometer reading	Velocity km.	Weight
45·348	+ 8·4	2
46·220	−21·2	2
50·914	+ 6·8	3
53·702	−60·8	1
55·303	−13·1	2
58·470	+ 9·9	6
58·773	− 3·7	2
62·674	−17·0	3
63·467	+22·4	3
67·034	+38·9	2
70·245	+20·3	1
76·347	− 1·6	2

Weighted mean	+ 2·4
Va	+16·4
Vd	− 0·1
Curv.	− 0·3
Radial velocity	+18·4

All qualities of spectrograms obtained are represented in the measures given.

DOMINION OBSERVATORY,
OTTAWA,
November 29, 1922.

DEPARTMENT OF THE INTERIOR
CANADA

HON. CHARLES STEWART, *Minister* W. W. CORY, C.M.G., *Deputy Minister*

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A Spectrographic Study of Stars of Classes A and F

BY

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A SPECTROGRAPHIC STUDY OF STARS OF CLASSES A AND F

BY F. HENROTEAU, PH.D.

The purpose of the present study was to see whether any stars of the β Canis Majoris type could be found among the later spectral classes. The discovery at the Yerkes Observatory that τ Cygni (class F) is of this type shows that very short-period radial velocity oscillations are not limited to stars of class B. Since stars of class B, however, are to be classified among the giants or semi-giants, and also since the absolute magnitude of τ Cygni is 1·9 (semi-giant), it seemed advisable to search among the stars of neighbouring absolute magnitudes (stars probably of low density and large volume where pulsations or tidal effects would happen on a large scale) to find whether among them there might be others of the β Canis Majoris type.

The stars given in the following table were observed: the absolute magnitudes given are those determined by Dr. W. S. Adams at the Mount Wilson Observatory.[1]

It must be mentioned that the spectrograms of these stars secured here were made with a wide slit. With such a slit a great gain was obtained in the time of exposure, though perhaps to some extent at the expense of accuracy.

Most of the spectrograms were measured on a Hartmann spectro-comparator, using a spectrogram of α Cygni as standard. This standard spectrogram was divided into thirteen sections numbered from 1 to 13, corresponding to micrometer readings (half millimeter unit scale) $35+(n-1)\times 2\cdot 5$, where n is the number of the section. In the detailed measures of the plates f is the constant by which to multiply the sum of all the differences, V the velocity indicated by the standard spectrogram, Vs the velocity obtained, not corrected for the motions of the earth, while Va and Vd are as usual the corrections due, respectively, to the earth's revolution around the Sun and the earth's rotation.

The assistance of Mr. J. F. Frédette and of Mr. W. A. Thorn is acknowledged.

TABLE OF STARS INVESTIGATED

H.R.	Star	R.A. (1900)		Decl. (1900)		Visual Magnitude	Absolute Magnitude	Spectrum
		h	m	°	′			
2484	ξ Geminorum	6	39·7	+13	0	3·40	2·0	F5
3569	ι Ursae Majoris	8	52·4	+48	26	3·12	1·9	A5
3888	υ Ursae Majoris	9	43·9	+59	31	3·89	1·5	F
4031	ζ Leonis	10	11·1	+23	55	3·65	−0·1	F
4662	γ Corvi	12	10·7	−16	59	2·78	—	B8
5055	ζ_2 Ursae Majoris	13	19·9	+55	26	3·96	1·9	A2
5435	γ Bootis	14	28·1	+38	45	3·00	1·8	F
5487	μ Virginis	14	37·8	− 5	13	3·95	2·4	F5
5733	μ Bootis	15	20·7	+37	44	4·47	2·2	F
6095	γ Herculis	16	17·5	+19	23	3·79	1·4	F
7377	δ Aquilae	19	20·5	+ 2	55	3·44	1·8	F

The individual studies of these stars follow.

[1]Contributions from the Mount Wilson Obs., No. 199.

ξ GEMINORUM

The spectrograms of ξ Geminorum are none too good for measurement. They give the following results:

OTTAWA RADIAL VELOCITIES OF ξ GEMINORUM

Plate	Date	Velocity	Remarks
		km.	
9499	1921 Feb. 18·548	+14·5	
9500	·570	+14·4	
9504	Feb. 20·540	+17·0	poor.
9506	·584	+ 9·6	weak.
9509	·654	+12·4	

The spectrum of ξ Geminorum is rather complex. Professor Küstner [2] in Bonn suspected that two spectra are superposed; he considered the star as being possibly a close visual double. Our velocities are too poor to indicate a short-period radial velocity variation; the velocity in February, 1921, is, however, very different from velocities obtained formerly, which are given in the following table. This gives weight to the supposition that the star is a close double, which would probably be an interesting object for measuring by the interferometer method.

RADIAL VELOCITIES OF ξ GEMINORUM

(Other Observatories)

Place	Author	Date	Velocity	Remarks
			km.	
Bonn	Küstner	1910 Mar. 6·33	+29·7	Küstner considers the velocity as constant.
		1911 Jan. 15·43	+31·6	
		April 4·32	+24·6	
		7·31	+30·2	
		8·32	+29·0	
		13·30	+20·5	
		14·30	+23·6	
		15·30	+25·0	
Vienna	Hnatek	1913 Mar. 7·300	+29·5	
		11·392	+20·4	
		12·287	+25·8	

[2] A.N. No. 4750.

ι URSAE MAJORIS

The spectrum of ι Ursae Majoris is very poor. The lines are very wide and diffuse and the radial velocities are far from reliable.

The velocities obtained here are:

RADIAL VELOCITIES OF ι URSAE MAJORIS

Plate	Date	Velocity
		km.
10260	1922 Feb. 7 ·739	+14·4
10261	·765	− 9·0
10262	·787	− 5·5
10263	·810	+11·6
10265	·853	+ 4·5
10266	·876	+14·3
10268	·919	+ 1·2
10269	·942	+ 4·0

This gives a mean velocity of + 4·4 km.

The velocities obtained formerly by Hnatek are:—

Date	Velocity
	km.
1913 Mar. 7 ·447	+10·2
12 ·449	+11·9
14 ·422	+12·8

υ URSAE MAJORIS

The spectrum of υ Ursae Majoris is among the poorest encountered. The velocities obtained here for this star have therefore to be given a very small weight. They are:—

RADIAL VELOCITIES OF υ URSAE MAJORIS

Plate	Date	Velocity
		km.
10278	1922 Feb. 13 ·722	−11·1
10279	·751	−23·5
10280	·781	+ 7·4
10281	·810	− 0·7

This gives a mean velocity of −7·0 km.

The following velocities have been given by Hnatek:[3]

Date	Velocity
	km.
1913 May 25 ·402	+26·5
26 ·382	+27·4

υ Ursae Majoris is a visual double star suspected to be a physical system.

ζ LEONIS

ζ Leonis was discovered to be a spectroscopic binary by Mr. Wilson at the Lick Observatory.[4] The following velocities were obtained there.

LICK OBSERVATORY VELOCITIES OF ζ LEONIS

Date	Velocity
	km.
1899 Feb. 21 ·933	− 8·0
1905 Feb. 28 ·738	−26·7
1906 Jan. 26 ·965	−20·2
1910 Nov. 30 ·083	− 5·5
Dec. 5 ·105	− 7·6
1911 Jan. 3 ·019	−10·7

To this has to be added a velocity of −17·3 km. obtained by J. B. Cannon[5] on 1917, March 26·731.

[3] A. N. Vol. 196, p. 384.
[4] L. O. B., Vol. VI, p. 145.
[5] Pub. Dom. Obs., Vol. IV, p. 255.

The velocities obtained here in 1922 are the following:—

OTTAWA VELOCITIES OF ζ LEONIS

Plate	Date	Velocity
		km.
10542	1922 April 21 ·551	−54·2
10543	·574	−57·5
10546	·637	−50·5
10547	·656	−55·5
10553	23 ·529	−48·8
10554	·549	−55·2
10555	·569	−49·4
10556	·590	−59·0
10557	·610	−55·3
10558	·630	−55·0
10559	·650	−53·1

ζ Leonis is evidently not a short-period binary. The large negative velocity obtained here is remarkable and indicates that the amplitude of the velocity variation is at least 50 kilometers.

Following are the detailed measures of two of the plates:—

Plate 10553
1922 April 23·529
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	0	+ 3
4	− 2	+ 8
5	0	0
6	+17	+ 8
7	+17	0
8	0	+10
9	+12	+27
10	+ 5	+19
11	+ 8	+14
12	+14	+22
13	− 5	0
Sum	+66	+111

Vs −22·43
Va −26·45
Vd + 0·04

Radial Velocity −48·84

Plate 10556
1922 April 23·590
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	+ 1	−13
4	0	+ 7
5	−12	−14
6	− 6	+12
7	− 3	+ 3
8	−14	+ 1
9	− 5	− 3
10	+ 6	+ 3
11	0	− 7
12	+ 3	+18
13	+ 1	+ 7
Sum	−29	+14

Vs −32·42
Va −26·46
Vd − 0·07

Radial velocity −58·95

γ CORVI

γ Corvi was found to be a spectroscopic binary by Dr. W. W. Campbell and Dr. H. D. Curtis.

The radial velocities obtained here for this star are:—

RADIAL VELOCITIES OF γ CORVI

Plate	Date	Velocity
		km.
10509	1922 April 10·581	0·0
10510	·603	− 7·4
10511	16·535	−16·4
10512	·550	−10·2
10513	·565	−21·6
10514	·581	−15·1
10515	·594	−18·2
10516	·605	−12·3
10517	·618	−15·6
10518	·628	−13·6
10519	·638	−20·4
10520	·649	−20·1

The star is probably not of period shorter than one day. The period must, however, be fairly short. The radial velocities published formerly are:—

Place	Authors	Date	Velocity
			km.
Yerkes.....	Frost and Adams....	1902 April 2·688	− 7·4
		3·688	− 7·0
		19·710	− 6·1
Lick.....	Campbell and Curtis	1902 Dec. 30	+ 2
		1903 Feb. 23	0
		May 6	−20
		May 11	− 6
		May 17	+ 4

The detailed velocities of two of our plates are given here:—

Plate 10510 1922 April 10·603 f = 0·06172 V = −31·64			Plate 10519 1922 April 16·638 f = 0·06172 V = −31·64		
Section	Difference Star-Comparison		Section	Difference Star-Comparison	
	Direct	Reversed		Direct	Reversed
3	+42	+37	3	+ 5	+16
4	+23	+28	4	+ 5	+ 9
5	+30	+26	5	+16	+15
6	+18	+20	6	+20	+18
7	+17	+ 9	7	+27	+20
8	+18	+28	8	+30	+21
9	+35	+32	9	+26	+13
10	+23	+34	10	+14	+11
11	+28	+25	11	+19	+25
Sum.....	+234	+239	Sum.....	+162	+148
Vs	− 2·44		Vs	−12·51	
Va	− 5·06		Va	− 7·95	
Vd	+ 0·12		Vd	+ 0·02	
Radial velocity	− 7·38		Radial velocity	−20·44	

ζ_2 URSAE MAJORIS

The lines in our spectrograms of ζ_2 Ursae Majoris are rather diffuse, although fairly good for spectra of class A. The velocities obtained are:—

RADIAL VELOCITIES OF ζ_2 URSAE MAJORIS

Plate	Date	Velocity
		km.
10477	1922 April 2·561	−21·2
10478	·590	−21·8
10479	·618	−17·7
10480	·647	−23·5
10481	·675	−21·0
10482	·703	−31·0
10489	April 3·540	−27·4
10490	·569	−25·6

Considering the large velocity of plate 10482 as accidental it seems likely that the star is a spectroscopic binary of fairly short period, but not shorter than one day.

The velocities obtained formerly by Ludendorff at Potsdam[6] are:—

Date	Velocity
	km.
1905 April 20·396	−13·0
May 16·375	−12·0
1906 April 10·400	−14·0
May 4·379	− 9·6
5·375	− 7·3
6·366	−13·0
7·377	−14·0
14·362	− 7·9
1907 April 20·341	−10·0
25·370	−16·4
26·341	−11·7
28·341	−15·1
May 12·362	−17·7
14·345	−13·4

Frost and Lee also give a range of velocity of −17 to +10 km.[7]

The detailed measures of two of our plates are:—

Plate 10477
1922 April 2·561
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	+19	+20
4	+ 8	+12
5	+ 7	+10
6	− 1	+11
7	+ 7	+ 7
8	+ 7	+12
9	+20	+28
10	+15	+26
11	+18	+27
12	+15	+26
13	+15	+34
Sum	+130	+213

Vs	−13·78
Va	− 7·55
Vd	+ 0·17
Radial velocity	−21·16

Plate 10478
1922 April 2·590
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	+19	+23
4	+14	+ 9
5	+ 3	+23
6	+17	+18
7	+ 2	+ 9
8	+ 9	+ 7
9	0	+28
10	+20	+35
11	+20	+27
12	+13	+18
13	+ 1	+16
Sum	+118	+213

Vs	−14·41
Va	− 7·56
Vd	+ 0·15
Radial velocity	−21·82

[6] A.N. Vol. 177, p. 9.
[7] A. N. Vol. 177, p. 171.

γ BOOTIS

Professor P. Guthnick,[8] Director of the Babelsberg Observatory, has investigated γ Bootis with the photo-electric cell. He found it to be a variable of a very small amplitude, $0^m \cdot 05$, and very short period, $0^d \cdot 290313$. The probabilities are then that γ Bootis is of the β Canis Majoris type. Unfortunately its spectrum is very poor, the lines being wide and diffuse. Only one radial velocity, −35 km., was given before for this star by Dr. Campbell.[9]

The velocities we have obtained are the following:—

RADIAL VELOCITIES OF γ BOOTIS

Plate	Date	Velocity	Phase, taking 1922 Mar. 25·762 as origin
		km.	
10472	1922 Mar. 25·809	−48·8	$0^d \cdot 047$
10648	May 14·590	−48·3	0 ·184
10658	·833	−46·5	0 ·137
10659	May 15·573	−63·6	0 ·006
10660	·581	−60·8	0 ·014
10662	·610	−49·1	0 ·043

A variation of radial velocity is possible. The phases are given for the period $0^d \cdot 290313$; a curve could pass through the plotted observations; there are, however, too few observations to say with certainty whether the radial velocity variation admits of the above period; the spectrum is also too poor.

Following are the detailed measures of two of the plates:—

Plate 10472
1922 Mar. 25·809
f = 0·11457
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
6	−40	−38
7	−44	−16
8	−42	− 9
9	−38	+17
10	+ 3	+20
Sum	−161	−26

Vs	−53·07
Va	+ 4·25
Vd	0·00
Radial velocity	−48·82

Plate 10660
1922 May 15·581
f = 0·05818
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
4	−20	+22
5	−26	+40
6	−14	− 2
7	−34	−11
8	−32	− 4
9	−30	−10
10	−59	−24
11	−23	− 9
12	−47	− 4
13	−15	− 1
Sum	−300	− 3

Vs	−49·27
Va	−11·61
Vd	+ 0·13
Radial velocity	−60·75

These measures are average ones; they show that the spectrograms are in the main very poor.

[8] Veröff. der U. Sternwarte zu Berlin-Babelsberg Bd. II Heft 3/p. 128.

[9] L. O. B. Vol. 7, p. 116.

μ VIRGINIS

Only three spectrograms have been secured of this star; they give the following velocities:—

RADIAL VELOCITIES OF μ VIRGINIS

Plate	Date	Velocity
		km.
10595	1922 April 30·549	−21·6
10596	·577	− 5·5
10597	·603	−11·1

A short-period radial velocity variation might be suspected but more plates will be needed to ascertain this, especially since the lines are wide and diffuse.

The star was announced to be a spectroscopic binary by Dr. Campbell[10] (discovered by Mr. Burns). The Lick Observatory velocities are the following:—

Date	Velocity
	km.
1898 April 15·861	+ 6
1899 Feb. 15·013	0
May 2·802	+ 1
1904 May 23·786	− 2
1905 April 10·840	+17
1906 April 2·974	+ 5
1907 April 8·921	+11
1910 Feb. 11·097	+ 2
1911 April 20·815	+ 1
30·852	+ 6

μ BOOTIS

The spectrum of μ Bootis is very poor and difficult to measure. The lines are wide and diffuse.

Five spectrograms were secured on one night, but only three were measurable. They give the following velocities:—

[10] L. O. B. Vol. VI, p. 146

RADIAL VELOCITIES OF μ BOOTIS

Plate	Date	Velocity
		km.
10289	1922 Feb. 15·812	−29·2
10290	·853	−17·2
10291	·895	−18·8

Velocities obtained formerly are:—

Place	Author	Date	Velocity
			km.
Allegheny	F. C. Jordan[11]	1909 Mar. 26·790	−13·3
		April 15·771	−19·4
		May 11·751	−10·6
		June 6·693	−15·1

A real change in radial velocity is doubtful.

γ HERCULIS

Dr. W. W. Campbell gave one radial velocity, −39 km., for this star.

The velocities obtained here are:—

RADIAL VELOCITIES OF γ HERCULIS

Plate	Date	Velocity	Remarks
		km.	
10590	1922 April 28·549	−40·2	weak
10591	·578	−49·3	poor
10592	·604	−62·0	very poor
10593	·627	−46·2	

The spectrum of γ Herculis having very wide and diffuse lines a variation of radial velocity is doubtful.

[11] Pub. Allegheny Obs. Vol. II, p. 124.

The detailed measures are:—

Plate 10590
1922 April 28·549
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	−12	+ 2
4	−36	−19
5	−11	−50
6	−38	−31
7	−15	−15
8	−20	− 5
9	− 6	+ 3
10	−10	−13
11	−22	−19
12	+21	−19
13	− 7	− 2
Sum.....	−156	−168

Vs −48·5
Va + 8·0
Vd + 0·3

Radial velocity −40·2

Plate 10591
1922 April 28·578
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	−50	−39
4	−28	−23
5	−33	−47
6	− 3	−44
7	−24	−17
8	−47	−27
9	−12	−34
10	−14	−31
11	+ 8	−12
12	+13	− 7
13	−15	−13
Sum.....	−205	−294

Vs −57·6
Va + 8·0
Vd + 0·3

Radial velocity −49·3

Plate 10592
1922 April 28·604
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	−66	−36
4	−41	−42
5	−33	−32
6	−13	−38
7	−22	−42
8	−24	−52
9	−29	−20
10	−27	−35
11	−24	−56
12	−33	−33
13	−41	− 5
Sum.....	−353	−391

Vs −70·3
Va + 8·0
Vd + 0·3

Radial velocity −62·0

Plate 10593
1922 April 28·627
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	−68	−26
4	−49	−28
5	−58	−17
6	−30	−18
7	−19	−14
8	−26	− 9
9	− 8	− 6
10	+ 4	+ 2
11	0	−24
12	+16	− 9
13	−30	−23
Sum.....	−268	−172

Vs −54·5
Va + 8·0
Vd + 0·3

Radial velocity −46·2

δ AQUILAE

The lines in the spectrum of δ Aquilae are rather diffuse and difficult to measure. However, it shows a decided range of velocity variation. The star was discovered to be of variable velocity by Dr. Campbell and Dr. Curtis at the Lick Observatory.[12] It was afterwards investigated by Mr. Parker, who secured and measured thirty-four spectrograms, but failed to find a period for the radial velocity variation. Spectrograms have been secured here on five different nights and their measures indicate a very short period of about $0^h \cdot 1571$; it can thus be classified among the stars of the β Canis Majoris type. At the request of the writer, Mr. Otto Struve at the Yerkes Observatory, after securing and measuring a series of spectrograms, confirmed the fact that its radial velocity variation is of very short period.

The case of δ Aquilae is thus similar to that of τ Cygni. The spectra are almost identical; their absolute magnitudes are 1·8 and 1·9, respectively, and they are both situated in dense regions of the Milky Way.

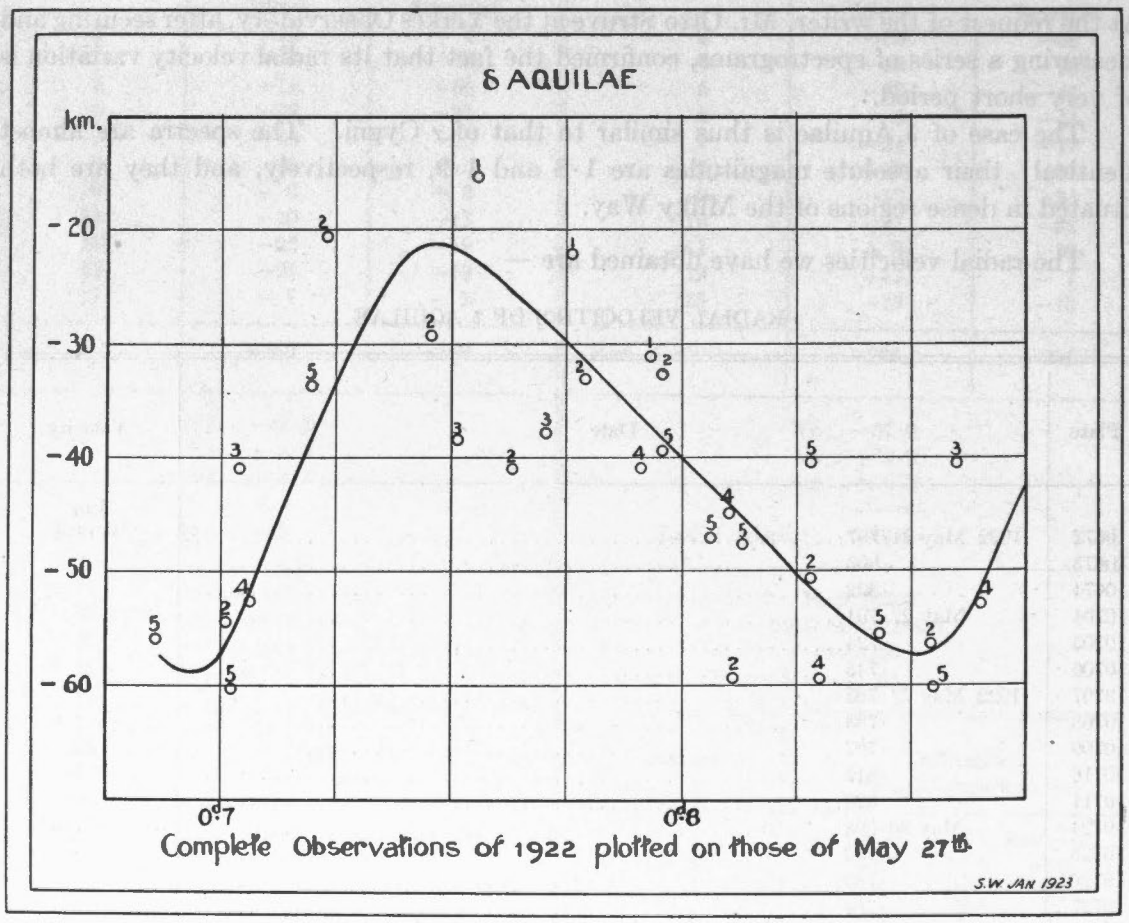
The radial velocities we have obtained are:—

RADIAL VELOCITIES OF δ AQUILAE

Plate	Date	Velocity
		km.
10672	1922 May 21·787	−15·4
10673	·806	−22·7
10674	·822	−31·2
10704	May 27·701	−55·8
10705	·724	−20·8
10706	·745	−29·6
10707	1922 May 27·763	−41·0
10708	·783	−34·0
10709	·797	−32·9
10710	·812	−59·5
10711	·828	−50·5
10724	May 30·688	−41·0
10725	·710	−29·8
10726	·733	−38·8
10727	·754	−37·5
10739	June 14·699	−41·1
10740	·720	−45·4
10741	·741	−59·4
10742	·773	−53·3
10743	·794	−53·3
10744	June 16·661	−47·4
10745	·681	−40·5
10746	·697	−55·5
10747	·712	−60·1
10748	·729	−33·9
10752	·806	−39·5
10753	·824	−48·0

[12] Ap. J. Vol. XVIII, p. 308.

If the above velocities are plotted, taking the time as abscissa and using the period $0^d \cdot 1571$, one can see, account being taken of the errors of observation, that they have a tendency to follow a curve of rather steep ascending branch (see figure). In the figure the five different nights are represented by the numbers 1 to 5.



The detailed measures of the plates of May 27th are given in the following tables:—

Plate 10704
1922 May 27·701
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	−61	−57
4	−54	−60
5	−65	−27
6	−52	−31
7	−67	−17
8	−61	−41
9	−29	−21
10	−39	−20
11	−35	−12
12	−15	− 7
13	−43	−27
Sum.....	−521	−320

Vs −75·42
Va +19·39
Vd + 0·25

Radial velocity −55·78

Plate 10705
1922 May 27·724
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	−26	+ 4
4	−26	− 8
5	−21	− 4
6	−22	−11
7	−17	− 3
8	−19	−15
9	− 9	− 1
10	− 8	+ 1
11	−10	+14
12	0	+16
13	0	− 4
Sum.....	−158	−11

Vs −40·44
Va +19·39
Vd + 0·21

Radial velocity −20·84

Plate 10706
1922 May 27·745
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	−19	−14
4	−28	−25
5	−30	−18
6	−41	0
7	−31	− 8
8	−39	− 1
9	− 8	− 1
10	−17	−12
11	−16	− 4
12	−10	− 1
13	−14	− 1
Sum.....	−253	−85

Vs −49·24
Va +19·38
Vd + 0·18

Radial velocity −29·58

Plate 10707
1922 May 27·763
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	−30	−26
4	−57	−21
5	−53	− 4
6	−20	− 5
7	−33	−10
8	−27	− 6
9	−43	−13
10	−40	−26
11	−33	−22
12	−34	−16
13	−36	− 1
Sum.....	−406	−150

Vs −60·58
Va +19·38
Vd + 0·15

Radial velocity −41·05

Plate 10708
1922 May 27·781
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	−36	−21
4	−44	−24
5	−47	−14
6	−41	−14
7	−28	−19
8	−26	−18
9	−28	− 6
10	−19	− 7
11	+ 1	+ 2
12	− 8	− 1
13	− 9	−12
Sum.....	−285	−134

Vs −53·45
Va +19·37
Vd + 0·11

Radial velocity −33·97

Plate 10709
1922 May 27·797
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	−37	−14
4	−30	− 2
5	−49	− 9
6	−36	− 2
7	−33	− 9
8	−15	−12
9	−13	−24
10	−30	−13
11	−17	− 2
12	−18	−10
13	− 8	−15
Sum.....	−286	−112

Vs −52·36
Va +19·37
Vd + 0·08

Radial velocity −32·91

Plate 10710
1922 May 27·812
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	−41	−37
4	−57	−43
5	−70	−53
6	−56	−49
7	−39	−27
8	−70	−22
9	−33	−54
10	−38	−14
11	−39	−42
12	−47	−34
13	−35	− 8
Sum.....	−525	−383

Vs −78·91
Va +19·36
Vd + 0·05

Radial velocity −59·50

Plate 10711
1922 May 27·828
f = 0·05206
V = −31·64

Section	Difference Star-Comparison	
	Direct	Reversed
3	−39	−33
4	−39	−32
5	−44	−33
6	−29	−46
7	−38	−41
8	−52	−44
9	−30	−29
10	−41	−20
11	−30	−22
12	−31	−25
13	−28	− 8
Sum.....	−401	−333

Vs −69·85
Va +19·36
Vd + 0·02

Radial velocity −50·47

Following are given the velocities obtained previously both here and elsewhere

RADIAL VELOCITIES OF δ AQUILAE (Former Values)

Place	Author	Date	Velocity	Remarks
			km.	
Lick		1900 May 22	−25	
		1902 July 31	−35	
		1903 May 12	− 2	
		May 27	−32	
Potsdam	Ludendorff	1904 Sept. 5·317	−31	
		" 6·321	−60	
		" 16·279	−47	
		" 18·271	−33	
Ottawa	Parker	1906 Aug. 6·73	−41·8	
		" 15·65	−45·2	
		" 24·65	−45·1	
		Sept. 10·64	−25·0	
		" 27·61	−29·0	
		Oct. 23·57	−39·7	
		1907 May 31·79	−29·9	
		June 10·80	−42·8	
		July 2·76	−19·5	
		" 8·75	−28·0	
		" 9·68	−15·6	
		" 10·68	−18·5	
		" 25·68	−16·5	
		Aug. 3·61	−25·7	
		" 5·68	−29·4	
		Sept. 6·65	−25·4	
		" 18·58	−27·0	Mean of two
		1908 May 18·83	−21·9	measures.
		" 22·85	−40·1	
		June 3·83	−29·9	Mean of two
		" 5·95	−35·5	measures.
		" 24·77	−29·5	
		" 26·78	−39·8	
		" 27·75	−40·9	
		July 3·77	−21·9	
		" 8·75	−36·4	
		" 10·77	−26·1	
		" 11·77	−34·6	
		" 13·78	−47·0	
		" 31·69	−30·7	
		" 31·72	−39·1	
		Aug. 5·75	−29·7	
		" 15·73	−31·9	
		" 27·62	−39·5	

The present investigation was not very fruitful in detecting new stars of the β Canis Majoris type that are not of class B. At present only three such stars are known; τ Cygni discovered by Paraskévopoulos, γ Ursae Minoris, discovered by Otto Struve, and δ Aquilae. (Possible additions might be γ Bootis and β Ursae Majoris).[13]

[13] L. O. B. Vol. IX, p. 22.

The remarkable fact about the above three stars is the extreme shortness of their periods, three hours more or less. For γ Ursae Minoris, Struve gives the period as $2^h\ 36^m\ 10^s$; compared with similar stars of class B, where known periods range from about $4^h\ 30^m$ to beyond 6^h, it is much shorter. Also the lines in these three stars are rather wide and diffuse while in early class B stars they attain a higher degree of sharpness, the spectrum of β Canis Majoris, for instance, being among the best.

In a recent investigation on a method of deriving the distances of the A-type stars[14] by W. S. Adams and A. H. Joy, it is said:—

"There seems to be little doubt that great intrinsic luminosity is associated with sharp and narrow lines in all spectral types and that this is due to the *low density* in the atmosphere of such stars. In stars of various spectral types, such as β Orionis, α Cygni, the Cepheid variables and α Orionis, this effect is very marked, and the change in the character of the lines of the variable star o Ceti from maximum when they are well defined, to minimum when they are diffuse and vague, is an excellent illustration of the same phenomenon."

Taking account of this, if we consider the variations in Cepheids as being due to the same cause as the variations in stars of the β Canis Majoris type we must come to the conclusion that the longer the period of radial velocity oscillation, the smaller the density. Along these lines the following table seems to point naturally in that direction.

Type of Variable	Spectral Class	Length of Period (approximate)	Character of Lines
Cepheid	Giant G	35 to 5 days	Sharp.
"	Giant F	16 to 3 days or less	Sharp, perhaps a little more diffuse for some short periods.
β Canis Majoris	B	8^h to 4^h30^m	Fairly sharp, sometimes a little diffuse.
"	A and F	4^h to 2^h30^m	Wide and diffuse.

The period decreases with the advance in the age of the star, (adopting Russell's theory of evolution) while for real spectroscopic binaries it is usually the reverse that occurs.[15] The above table suggests, then, the probability that:—

The period is a function of one variable, the mean density of the star alone; or perhaps a function of two variables, mean density and mass of the star, the variation of the mean density being by far the most important factor in making the period vary.

To explain this theoretically one might consider for instance that a rotating star assumes the form of a Jacobian ellipsoid not very far from the point of bifurcation between McLaurin and Jacobian ellipsoids, such as was assumed in a theoretical study of σ Scorpii.[16] For such a Jacobian ellipsoid we would have, if we call ω the angular velocity of rotation, ρ the density of the ellipsoid and f the universal constant of gravitation.[17]

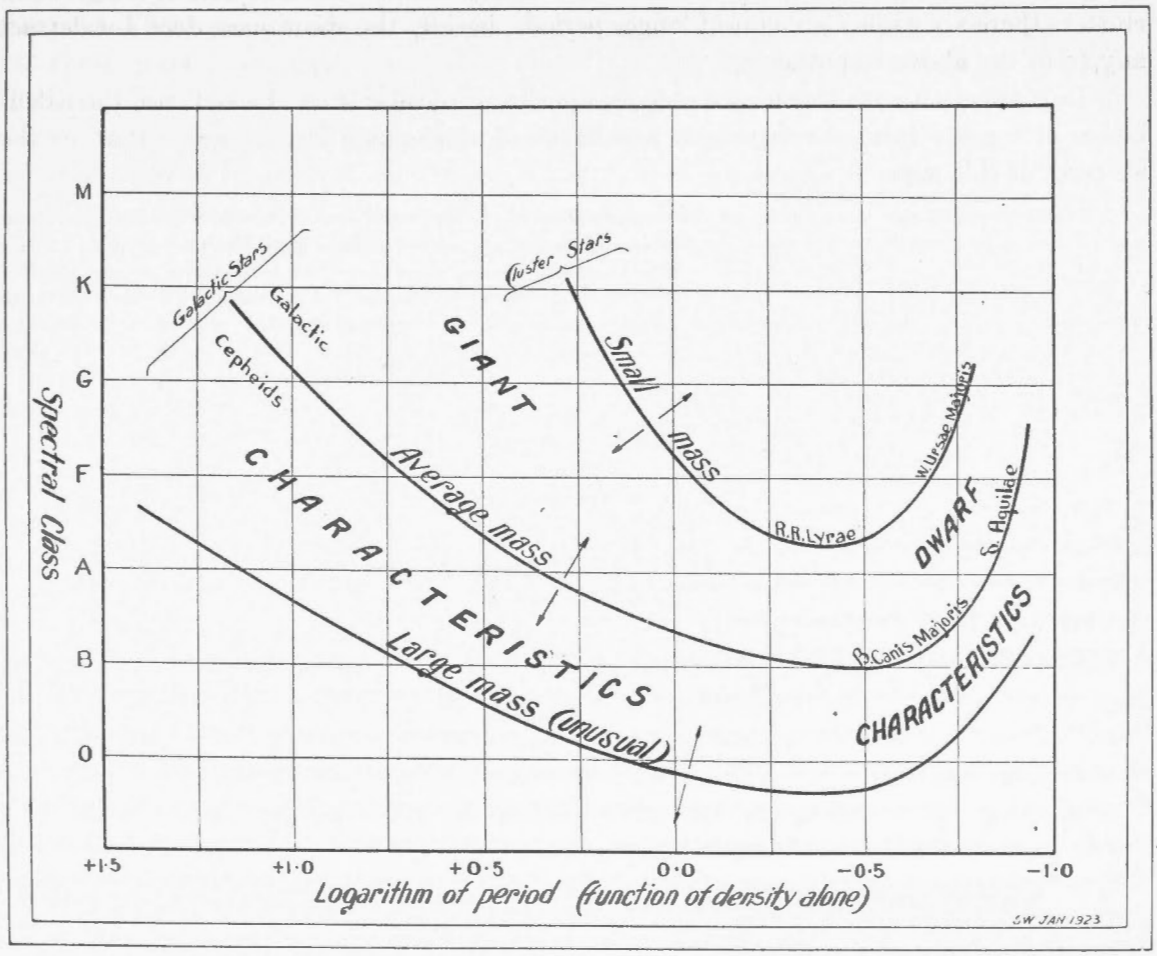
$$\frac{\omega^2}{2\pi f \rho} = 0 \cdot 18709, \text{ very nearly} \qquad (1)$$

If we assume the radial velocity oscillations as being due to some kind of pulsation it is very likely that the period is a function of the density alone. It was shown by Eddington that if we have two similar globes of fluid[18] executing oscillations under their own gravitation, their periods will be inversely proportional to the square roots of their densities, so that a formula similar to formula (1) can be adopted, or:—

[14] Proceedings of the Nat. Ac. of Sc. Vol. 8, p. 176.
[15] L. O. B. Vol. VI, p. 38.
[16] Pub. Dom. Obs. Vol. V, p. 314.
[17] Tisserand Mécanique Céleste, Vol. II, p. 104.
[18] The Observatory, Vol. 41, 1918, p. 379.

$$\frac{1}{P^2} = C\rho \qquad (2)$$

where P is the period of oscillation, C a constant and ρ the density of the body. The period-luminosity law as found by Miss Leavitt for the Cepheids of the smaller magellanic cloud and extended by Shapley to the case of Cepheids in star clusters, adds a large observational weight to the above theories. If we consider the spectral class of a star as a definite measure on a scale, we have to suppose that this spectral class is a function both of the density and of the mass of the star. We know already from Eddington's work on the interior of the stars that only stars of larger mass can attain the B type in their evolution and stars of still larger mass the O type, (according to J. S. Plaskett's discovery,[19] an O star has been found the most massive). The following hypothesis as illustrated by the accompanying graph is then very logical. This graph is self explanatory; the curve representing the life-history of a variable star (as represented in the figure) would have an equation of the form $f(x, y, \alpha)$, where x is the period of variation, y is the spectral class and α a variable parameter or the mass of the star. This leads immediately to the following conclusion:—



[19] M. N. Vol. 82, 1922, p. 447.

Let us assume for the sake of argument that the variability in these stars is due to pulsation. Any other theory where the period is very nearly a function of the density alone would do. A pulsating star of small mass which would have an evolution, let us say M K G F G K M, without ever attaining the stage O or B, or even A, would, however, decrease in period as any other Cepheid would. When it had attained a rather considerable density, for which the formula (2) would give a period of a fraction of a day, it might still exhibit the spectral characteristics of a giant F because near the top of the giant stage of its evolution, but *it would be a star of small mass and most likely of low total brightness.* Indeed, if it had a larger mass, the graph indicates that it would be near class B.

Cepheids in clusters as well as a very few Cepheids of our galactic system (those of the cluster type) have very short periods, periods such that the graph for galactic stars of average mass would place them near early class B. But these Cepheids are nearly class F; hence, according to our hypothesis, they would be of small mass, perhaps much smaller than the average mass of a galactic star. Accordingly, stars in globular clusters would be very small stars; their atmospheres would be highly ionized and their spectra would exhibit strong enhanced lines and weak arc lines, but they would be of low total brightness, because their masses and their volumes would be very small. The fact that in the globular clusters there are some Cepheids of longer periods, besides the short ones, does not detract any from the above hypothesis.

In connection with this idea a recent paper by Professor H. N. Russell[20] on the calculation of masses from spectroscopic parallaxes is of singular importance. Part of the abstract of this paper is as follows:—

"*Calculation of masses of stars from spectroscopic parallaxes.* It appears probable that the line intensities upon which spectroscopic parallaxes are based are *functions of the temperature and density of the star's atmosphere.* If this were exactly true, all stars of the same surface brightness and density would have the same spectroscopic absolute magnitude, and *the masses, computed from the spectroscopic parallaxes would come out the same for all the stars* of such a group (whatever the dispersion among their actual masses) and equal to the geometrical mean of the latter. To obtain a reliable measure of the dispersion in mass among binary stars, parallaxes must be determined in some other way.

Spectroscopic and dynamical parallaxes.—It follows that the spectroscopic parallaxes and the dynamical parallaxes (derived on the assumption that the mass of a binary system is equal to the mean value for stars of its spectral type and absolute magnitude) are *systematically equivalent to one another* and really rest on the same physical relationship and assumptions."

In other words, although it has been shown that the dispersion in mass for the majority of the stars is probably not large, there might be exceptions, such as stars of very small masses in clusters, which by Adams' method or by Shapley's assumption of period-luminosity curve would be classified as giant stars and supposed to be much larger than they really are.

Schouten[21] finds the distance of the globular clusters about seven times smaller than does Shapley.[22] The former bases his results on the assumption that the luminosity curve for stars in the clusters is identical with that found for the stars of the whole sky. The latter bases his distances on his estimations of the absolute luminosities of the Cepheid variables found in the clusters; the values he gives for these luminosities may be entirely too high.

[20] Ap. J. Vol. 55, 1922, p. 238.

[21] Proceedings of the Ac. of Sc. of Amsterdam, Vol. 20, p. 1108 and Vol. 21, p. 36, 1918.

[22] Contributions from the Mt. Wilson Obs., Nos. 151 and 152.

Kapteyn and Van Rhyn[23] from the observed proper motions of the galactic Cepheids of so-called cluster type compute large parallaxes and relatively low luminosities for these stars. They conclude, therefore, that the analogous short—period Cepheids in clusters may also be dwarfs, and consequently that the distances assigned by Shapley to globular clusters may be about eight times too great.

The following mean radial velocities of short-period Cepheids have also to be noted:—

Star	α 1855·0	Period	Radial Velocity	Author
	h m s	d	km.	
SU Draconis	11 29 38	0·6604347	−193	Adams.
SW Draconis	12 10 38	0·56965	− 74	"
RS Bootis	14 27 21	0·377333	− 51	"
RR Lyrae	19 20 17	0·566826	− 69	Kiess[24]

These high radial velocities are more suggestive of stars of small mass and hence of rather small intrinsic luminosity. It may be supposed, however, as was done by Shapley,[25] that these stars have small parallaxes, large intrinsic luminosities and great peculiar velocities; then the fact that they are so widely distributed over the sky, combined with their small parallaxes, would cast some doubt on the possibility of their forming a cluster similar to the Taurus or the Ursae Majoris clusters. An investigation of the space motion of 1,646 stars by Adams and Strömgren has shown that the average velocities of stars of types F, G, K and M vary with absolute magnitude to a marked degree, the fainter stars moving more rapidly than the brighter ones. The giant stars show an especially regular increase of velocity with decreasing brightness. If the kinetic theory of gases be applied to the sidereal universe, assuming an approximate equidistribution of energy, the most massive stars should have the lowest velocities.

It is quite likely that for the average galactic star of mean mass on the descending branch of evolution, the value of the density would soon be too large and hence the period of variation would soon be too small (if pulsation, would soon be stopped); so that in classes G and K of the galactic stars we cannot expect to find stars of the β Canis Majoris type. A certain number of stars of classes G and K have been investigated here in order to find whether any of them were of the β Canis Majoris type, but none have been found.

To sum up, in the light of the comparison between the periods of the Cepheids and those of the stars of the β Canis Majoris type, a relation such as that indicated by the accompanying diagram seems to be logical. A whole family of such curves would of course be required for a complete representation, each one being lower than the preceding one with increase of mass. For the stars of our galactic system these curves would usually be comprised between narrow limits, but for stars of globular clusters, it might not be so.

[23] Bul. of the Ast. Inst. of the Netherlands No. 8, 1922, Mar. 13.

[24] L. O. B. Vol. VII, p. 146.

[25] Contributions from the Mount Wilson Obs., No. 153, p. 10.

It is of great interest to consider here the following extract from an article published recently by Dr. Paul W. Merrill [26] of the Mt. Wilson Observatory.

"Measurements of the velocities of the Md stars by spectroscopic methods have shown them to have the highest speeds of any class of stars. The average residual radial velocity (random motion of an individual star) is 31 km. per second, and the average space motion is twice this. Some of the highest velocities measured are given in the following table:—

	Velocity km.	Period days	Range magnitude
R Arietis	+ 102	186	5·9
X Monocerotis	+ 146	Irreg.	2·0
T Ursae Maj	− 102	257	6·7
S Librae	+ 285	192	5·4
R Draconis	− 144	246	5·7
T Herculis	− 130	165	6·4
W Lyrae	− 182	197	4·9
RT Cygni	− 127	190	5·3
Z Cygni	− 173	263	6·0

The periods of these stars are less than the average for all long-period variables. Why the shorter period stars should have higher velocities than the others is a question we cannot answer."

An extension of our diagram as given above, considering the long-period variables as Cepheids, as many astronomers do, would answer this last question. Indeed if we consider the average period of variation for stars of class Md of average galactic mass it would be in the neighbourhood of 400 days or more, so that if on the diagram we take as abscissa the logarithm of a period in the neighbourhood of 100 days and as ordinate the one that puts the star in class Md, the corresponding point would be on a curve of small mass—the star would then probably have a larger space motion.

My appreciation is due to Mr. R. Meldrum Stewart for his kindness in reading my articles and discussing with me important points.

[26] Some Results of Spectroscopic Observations of Long Period Variable Stars. Published by the Amer. Ass. of Var. Star Observers, May 25, 1922.

DOMINION OBSERVATORY,
OTTAWA,
January 15, 1923.

DEPARTMENT OF THE INTERIOR

CANADA

HON. CHARLES STEWART, *Minister*. W. W. CORY, C.M.G., *Deputy Minister*.

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Gravity in Northwestern Canada

By

A. H. MILLER, M.A.

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1921

CONTENTS

PAGE

Introduction..... 87

Descriptions of stations..... 88

Explanation of Tables..... 88

Free Air, Bouguer, and Isostatic methods of reduction..... 90

Summary of Results—Tables..... 93

Depth of Compensation for the nine field stations..... 108

Sketch map showing stations of 1921 and 1922 (Inside back cover).

GRAVITY IN NORTHWESTERN CANADA

INTRODUCTION

During the season of 1921 five gravity stations were established in the Mackenzie river basin. Four more, two of which are farther north than any of the stations of 1921, were occupied in 1922; one of these, Arctic Red River, is about 60 miles north of the Arctic circle. A preliminary report* on the work of the previous season has already been published. The present publication contains the results of the two seasons' work.

The determinations were made with a half seconds pendulum apparatus of the Mendenhall type. Three bronze pendulums, each of approximately one half-second period, constitute the pendulum set. In some cases only two pendulums were used but at most of the stations observations were taken with all three. Concrete piers were erected on which to set up the apparatus; the flexure was measured with an interferometer. At all the nine stations, with the exception of Peace River, which is on a telegraph line, the rates of the chronometers were obtained from the Annapolis wireless signals. These were determined by Mr. Henderson of this Observatory, who made the time comparisons in the field. The corrections to the signals were determined at Ottawa by comparison with the standard Observatory clocks.

When the results of the work of 1921 were published the computation of the corrections for topography and compensation had not been made for the various stations occupied during that season. This reduction was postponed on account of the uncertainty that then existed in the elevations, and until better maps could be secured for the purpose. Contour maps or sketch maps of the country in the vicinity of stations where the topography is very uneven have now been obtained. Near most of the remaining stations the country is flat and the need for such maps is not so great. For the topography of the country beyond that immediately surrounding the stations and extending out to a distance of approximately 500 miles the relief map of Canada published in the Department's Atlas of 1915 has been used. As this area is responsible for a large proportion of the correction for each station, the reductions are of course to a considerable extent dependent upon the general accuracy of this map. During the summer of 1922 a line of levels was run down to Mackenzie river by the Topographical Surveys Branch. This practically determines the elevations of stations on the upper part of the river and around Great Slave lake, and has made it possible to estimate with greater confidence the elevation of stations farther down the river.

The isostatic reductions for the nine stations in this part of the country have therefore been made and the results are given in the following pages of this publication. These have not, of course, the finality of results that are based on accurate maps of well-surveyed territory. As new information is obtained from the survey of the country it may be necessary to make certain corrections to these computations but it is not likely that these corrections will in any case be very large.

*Publications of the Dominion Observatory Vol. V, No. 10. This publication also contains a summary of all gravity work done in this country up to 1921.

The correction for topography and compensation for Ottawa was recomputed, chiefly owing to the fact that from the previous computation no record of the corrections for separate zones was available. A difference of ·008 dynes exists between the value recently obtained and that which was previously given for Ottawa.* However, the writer is satisfied that the present value represents the true correction to be found from the maps that are now available, which should be sufficiently accurate for the purpose of the reduction.

DESCRIPTIONS OF STATIONS

Descriptions of the gravity stations occupied during the season of 1922 are given below. The astronomical stations to which they are referred were established at the same time as the gravity stations. A cement pier for the reception of the pendulum case was erected at each station.

Corresponding information for the stations of 1921 is given in Vol. V, No. 10 of these Publications.

Liard River, B.C.—The gravity station is located on the right bank of Liard river in latitude 59 ° 59′, approximately. It is about 5 miles below the mouth of La Biche river and opposite a small island shown on the west side of the river on R. G. McConnell's map of 1890. A log cabin 8 by 8 feet in which to set up the apparatus was built when occupying the station. The pier, the top of which is flush with the ground, is in the west end of this building. It is 140 feet north and 10 feet east of the astronomical station and was 18 feet above the level of Liard river at this point on July 3.

Good Hope, N.W.T.—The pier was placed in the north side of the powder magazine of the Hudson's Bay Co., the top of the pier being about 9 inches above the floor level. It is 285 feet north and 25 feet east of the astronomical station and was 52 feet above the water level of Mackenzie river in front of the Company's landing on August 11.

Arctic Red River, N.W.T.—A pier, the top of which was about 18 inches above the floor level, was erected in the north end of a log building 18 by 20 feet, owned by the Hudson's Bay Co., and kept for the accommodation of Indians coming to the post during the winter. The pier is approximately 50 feet west of the astronomical station and was about 100 feet above the water level at the mouth of Arctic Red river on August 17.

Chipewyan, Alta.—At this place the top of the pier was about 18 inches above the ground level and was erected in the west end of the Hudson's Bay Co's. blacksmith shop. The base of the pier rests on solid rock. The gravity pier is 20 feet south and 5 feet west of the astronomical station and is 47 feet above the high-water mark of lake Athabaska.

EXPLANATION OF TABLES

In Table I are given the periods of the pendulums obtained from the five standardizations that have been made at Ottawa since the resumption of gravity work in this country in March, 1921. The mean of the first two was used in making the relative determination of g between Ottawa and Washington (see Vol. V, No. 10, Table III). The mean of the second and third was used for the field work of 1921 and that of the fourth and fifth for the field work of 1922.

*Vol. V, No. 10, Table VI.

The periods of the pendulums at the stations occupied during 1922 and the resulting values of the force of gravity in dynes are given in Table II.

The pendulum observations and the reduction of the times of vibration of the pendulums at Ottawa and the four field stations of 1922 are given in Table III.

Information regarding the work of 1921, corresponding to that given in Tables I to III of this report, is given in the publication for that year. (Vol. V, No. 10).

Table IV gives the corrections for topography and compensation for separate zones (depth of compensation 113·7 km.) for each of the stations occupied during 1921 and 1922. The elevations of the various zones were found from the maps for each station and then the corrections were obtained by using the tables in Special Publications Nos. 10 and 40 of the U. S. Coast and Geodetic Survey.

In Table V will be found the corrections for various depths of compensation. These were computed from the quantities in Table IV by making use of the tables given on pages 98 and 99 of Special Publication No. 40.

Table VI gives for various depths of compensation the gravity anomalies deduced from Helmert's formula of 1901, $\gamma_0 = 978{\cdot}030\ (1 + {\cdot}005302 \sin^2 \phi - {\cdot}000007 \sin^2 2\phi)$. This is one of the earlier gravity formulae of this form. While the results do not in all likelihood represent the most probable anomalies they are of some interest.

They may be compared with the Helmert anomalies obtained in other countries and by simply subtracting ·008 dyne from each of the quantities in the table the anomalies resulting from Hayford's formula of 1912* are obtained. They may also be used in conjunction with similar data to determine corrections to the constants in Helmert's formula. Dr. Wm. Bowie has used the Helmert anomalies in deriving a number of gravity formulae. In deducing a new formula it is as convenient to start with Helmert's formula as any other, and by so doing at least a certain amount of computation may be saved by taking advantage of some of Dr. Bowie's results.

In 1916 Dr. Bowie derived the following gravity formula from 348 stations in different parts of the world: $\gamma_0 = 978{\cdot}039\ (1 + {\cdot}005294 \sin^2 \phi - {\cdot}000007 \sin^2 2\phi)$. Of these stations 216 were in the United States, 73 in India, 42 in Canada and 17 in Europe. As this formula is one of the most recent and probably one of the best gravity formulae we have, it has been thought worth while to compute by this formula the gravity anomalies at the different assumed depths of compensation. These anomalies are given in Table VII.

In Table VIII are given the principal facts for the stations of 1921 and 1922. In accordance with previous custom the gravity anomalies are given for the purposes of comparison by three methods of reduction. These anomalies are given in the last three columns of the tables.

*In Special Publication No. 40 U. S. C. & G. S. the Hayford anomalies are given for 409 stations in different parts of the world.

FREE AIR, BOUGUER AND ISOSTATIC METHODS OF REDUCTION

By a gravity anomaly at any place is meant the difference between the observed value and the computed value of gravity for that place. If the observed value is less than the computed value the anomaly is negative, indicating a deficiency of gravity, while on the other hand if the anomaly is positive the observed value is greater than the computed value, which indicates an excess of gravity. The observed value of gravity is a certain definite quantity for each station and is determined from the pendulum observations. The computed value may be obtained by several different methods of reduction and the quantity obtained for it depends upon the method that is adopted. It will first of all depend upon the formula that is used to represent g at sea-level. In table VIII Bowie's formula, $\gamma_0 = 978 \cdot 039\ (1 + \cdot 005294 \sin^2 \phi - \cdot 000007 \sin^2 2\ \phi)$†, has been used for this purpose. In this formula γ_0 represents the value of g in dynes at sea-level and ϕ the latitude. By substituting for ϕ the latitude of the point where gravity is required the computed value at sea-level is at once obtained.

Most gravity stations are not at sea-level but at a certain height above it. In computing a value of gravity for a station it therefore becomes necessary to make some correction to γ_0 to allow for the height of the station above sea-level.

In the *Free Air* method of reduction only one correction to γ_0 is made. It is simply the correction that must be made in accordance with the universal law of gravitation, in any method of reduction, to take account of the increased distance of the station from the centre of attraction of the earth. As far as the computation of the correction is concerned, the station is considered to be standing out in space at its own elevation and as if all the material in the crust of the earth above sea-level were taken away to an infinite distance. The station would then be left standing in the air, which no doubt accounts for the name that is given the method.

A close approximation to the value of the correction may be easily obtained. Imagine the earth to be a sphere. The attraction of the sphere on one gram of matter at a point on or outside the surface, which would be the value of gravity at the point for a spherical earth, would then be $\frac{MG}{r^2}$, where M is the mass of the earth, G the gravitation constant ($=6 \cdot 66 \times 10^{-8}$ c.g.s. units*) and r the distance of the point from the centre of the earth, which for stations at ordinary elevations is approximately the radius of the earth. The rate of change of g for a point outside the surface will be $\frac{dg}{dr}$. We have then

$$g = \frac{MG}{r^2}$$

$$\frac{dg}{dr} = -\frac{2MG}{r^3} = -\frac{2g}{r}$$

Substituting the value of g at 45° (980·621) and the mean value of r (637×10^4 metres) this becomes

$$\frac{dg}{dr} = -3 \cdot 08 \times 10^{-4} \text{ dynes per metre.}$$

By taking account of the earth's flattening Helmert** obtained the value $3 \cdot 086 \times 10^{-4}$ and this has since been generally used to correct for the elevation of the station. It may be remarked, however, that this is itself an approximation found by Helmert by neglecting very small terms in the complete expression he obtained for the value of the quantity.

†Tables giving the value of γ_0 obtained from this formula for various latitudes from 0 to 90 are published in the Smithsonian Physical Tables and also in the Smithsonian Meteorological Tables.

*Smithsonian Physical Tables.

**Encyklopädie der Mathematischen Wissenschaften, Band $VI_{1,7}$ S 97.

The computed value by the Free Air method is then $\gamma_0 - \cdot 0003086$ x height of station in metres.

In the *Bouguer method* the above correction for elevation is first applied and in addition an attempt is made to take account of the attraction of the material in the earth's crust above sea-level. The effect of this is assumed to be represented by the attraction of a slab or disc of infinite radius and of thickness equal to the elevation of the station. The station is supposed to be located at the centre of the upper surface of the disc. The attraction of the disc at this point can easily be shown to be equal to $2\pi\ \delta GH$, where G is again the gravitation constant, δ is the density of the material forming the disc, which may be taken as the mean continental surface density of the earth ($=2\cdot67$), and H is the thickness of the slab or the elevation of the station.

Approximately the value of gravity at the station is

$$g = \frac{MG}{r^2} = \frac{4}{3}\pi\Delta\, r\, G.$$

where Δ is the mean density of the earth ($5\cdot5247$)*;

from which it follows that

$$G = \frac{3g}{4\pi\Delta r}$$

If this value of G be substituted in the expression $2\ \pi\ \delta$ GH it is seen that the attraction of the disc is equal to $\frac{2gH}{r}$ x $\frac{3}{4}\frac{\delta}{\Delta}$

It has already been shown that,

$$\frac{dg}{dr} = -\frac{2g}{r}$$

This is the elevation correction per unit distance. For an elevation H it will be equal to $-\frac{2gH}{r}$. As the Bouguer correction is the sum of this and the attraction due to the infinite disc, in order to get the computed value of g by the Bouguer method we must add to γ_0 the quantity given by $-\frac{2gH}{r} + \frac{2gH}{r}\frac{3}{4}\frac{\delta}{\Delta} = -\frac{2gH}{r}(1-\frac{3}{4}\frac{\delta}{\Delta})$, in which form the correction is frequently expressed. Substituting for δ and Δ the values $2\cdot67$ and $5\cdot52$, respectively, the correction becomes

$$-\frac{2g}{r} \times \cdot 637\, H$$

It is thus $\cdot 637$ times the simple elevation correction.

The Bouguer reduction takes no account of any uneveness in the topography nor does it make any allowance for the curvature of the earth. However, neither of these omissions probably accounts for the fact that it gives values of g that are more in error than those obtained by either of the other two methods. At first sight one would certainly expect the Bouguer method to be more nearly correct than the Free Air method because the former reduction takes account, to a large extent, of the attraction of material above sea-level. Notwithstanding this it will be seen that the Bouguer method gives, for the stations in the table, values of g that are much too large. In fact if we leave the attraction of the material above sea-level out of consideration altogether, as is done in the Free Air method, we obtain quantities that are nearer the observed values. In spite of this we know that any correct method of reduction must take account of all matter in the earth's crust and that there must be an explanation of the fact that the Bouguer values of g are so much in error.

*Smithsonian Physical Tables.

The failure of the method can be accounted for if we suppose that we have material of less than normal density underneath the continent. If at the same time we suppose the water of the oceans, on account of its lower density, is underlain with material of greater than normal density and still greater than that which lies under the continents, we have a state of affairs known as isostasy. The fact that both the Free Air and Bouguer anomalies have been found to be generally positive for stations near the ocean lends support to this view. Moreover, there is a mass of evidence from the study of deflections of the vertical and of geology and gravity observations in favour of isostasy.

In order to obtain a definite idea of the quantities that are involved in gravity reductions by the isostatic method, imagine two columns to be taken in the earth's crust. One of these may be taken in a land area on the continent and the other in the ocean. We shall suppose further that each column extends for the same depth below sea-level and has for its base a cross-section of unit area. The sides of the column will be formed by vertical lines passing through the perimeter of the base, while the top will be a small portion of the surface of the earth of approximately unit area. If the depth of these columns below sea-level be taken equal to the depth of compensation, then the theory of isostasy requires the pressures at the bases of these and all similar columns to be the same. If we attribute the pressures at the bottom to the weights of the columns then, neglecting small variations in gravity, it follows that the masses of the columns are equal. As the depth of compensation is measured from sea-level, the land columns will be longer than the ocean columns. If we consider a land column to be divided into two parts by the sea-level surface, then compared with the mass of a normal column (i.e. a column taken at the sea coast or under land where the elevation is only slightly above sea-level) there must be a deficiency of matter in the lower part of the column exactly equal to the quantity of matter in the part of the column above sea-level. On the other hand in the solid portion of an ocean column there must be an excess of matter to compensate for the lightness of the water. This deficiency or excess of matter is spoken of as the compensation. The extent of it will depend upon the elevation of the land or the depth of the sea and, for any of the columns, may be computed from the average continental density or from the known density of sea water. The elevations or sea depths which are also required in this connection may be obtained from contour or relief maps. The land above sea-level or the water in the ocean is called the topography. The computed value of g obtained by the application of the theory of isostasy is γ_0 − elevation correction ± the correction for topography and compensation.

Tables for the evaluation of the isostatic corrections have been published by Meissner* in Germany and by Hayford and Bowie** in the United States. The latter have been used for gravity stations in this country. In these tables the whole surface of the earth is divided into 33 zones in all. The station whose correction is required becomes the centre of each of these zones. After finding, from the maps, the average elevations or depths of the zones for any given station, the corrections for topography and compensation may at once be obtained from the tables. The corrections are given for various elevations and depths for each zone.

*Astronomische Nachrichten, Band 206, Nr. 4924-25, Band 214, Nr. 5125.
**Special Publications Nos. 10 & 40, U. S. C. & G. S.

In computing the corrections for the tables the curvature of the earth is taken into account and the compensation is supposed to be uniformly distributed down to the depth of compensation. Each topographic feature, however small, is considered to be completely compensated.

SUMMARY OF RESULTS

TABLE I

Date	Periods of Pendulums in Seconds		
	1	2	3
March 14-17, 1921	[a]·5013476	[a]·5014658	[a]·5014396
April 20-23, 1921	·5013471	·5014646	·5014385
Oct. 27-Nov. 4, 1921	·5013455	·5014628	·5014365
Feb. 25-27, 1922	·5013464	·5014635	·5014373
Nov. 7-18, 1922	·5013442	·5014624	·5014364

TABLE II

Station	Periods of Pendulums in Seconds			Value of g in Dynes			
	1	2	3	1	2	3	Weighted Mean
Ottawa (Feb. 25-27)	[a]·5013464	·5014635	·5014373	.....	.....	.....	980·618
Liard River	·5010460	·5011635	·5011377	981·790	981·790	981·789	981·790
Good Hope	·5009058	·5010234	·5009969	982·340	982·339	982·341	982·340
Arctic Red River	·5008820	·5009990	.....	982·433	982·435	.....	982·434
Chipewyan	·5010627	·5011810	·5011555	981·724	981·722	981·720	981·723
Ottawa (Nov. 7-18)	·5013442	·5014624	·5014364	.....	.....	.....	980·618

TABLE III

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: OTTAWA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Dent No. 56182	Coincidence Interval: Chronometer: Dent No. 48419	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Dent No. 56182	Period Uncorrected: Chronometer: Dent No. 48419	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: D 56182	Corrections: Rate: D 48419	Corrections: Flexure	Period Corrected: Chronometer: Dent No. 56182	Period Corrected: Chronometer: Dent No. 48419	Period Corrected: Mean
1922																					
Feb. 25.....	1	1	D	1	186·42	183·85	7·3	2·0	10·60	60·5	·5013446	·5013631	−17	+ 184	+ 1	− 138	− 331	− 9	·5013467	·5013459	·5013463
" 25.....	2	1	D	1	186·70	184·70	7·5	1·9	10·10	61·5	·5013426	·5013573	−17	+ 205	+ 1	− 143	− 285	− 9	·5013463	·5013468	·5013466
																Mean.....		....	·5013465	·5013464	·5013464
Feb. 25-26.....	3	2	D	1	171·44	167·85	7·7	1·8	10·40	65·0	·5014625	·5014939	−17	+ 193	− 3	− 156	− 469	− 9	·5014633	·5014634	·5014634
" 26.....	4	2	D	1	171·44	168·05	8·0	1·9	10·33	61·8	·5014625	·5014921	−18	+ 196	0	− 155	− 457	− 9	·5014639	·5014633	·5014636
																Mean.....		....	·5014636	·5014634	·5014635
Feb. 26-27.....	5	3	D	1	174·20	172·53	7·7	1·9	10·74	59·8	·5014393	·5014532	−17	+ 178	+ 2	− 171	− 312	− 9	·5014376	·5014374	·5014375
" 27.....	6	3	D	1	174·38	173·39	7·5	1·8	10·74	61·9	·5014378	·5014460	−17	+ 178	0	− 161	− 238	− 9	·5014369	·5014374	·5014372
																Mean.....		....	·5014373	·5014374	·5014373

TABLE III—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: RIGHT BANK OF LIARD RIVER IN VICINITY OF 60TH PARALLEL OF LATITUDE. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer Bond No. 627	Coincidence Interval: Chronometer Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer Bond No. 627	Period Uncorrected: Chronometer Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate B 627	Corrections: Rate D 56182	Corrections: Flexure	Period Corrected: Chronometer Bond No. 627	Period Corrected: Chronometer Dent No. 56182	Mean
June 20	1	1	D	1	251·97	242·32	7·9	1·6	11·17	58·5	·5009941	·5010338	−17	+ 160	+ 4	+ 358	− 23	−11	·5010435	·5010451	
" 20-21	2	1	D	1	249·27	240·55	8·0	1·7	12·62	60·0	·5010049	·5010415	−17	+ 100	+ 3	+ 358	− 23	−11	·5010482	·5010467	
																Mean			·5010459	·5011459	·5010459
June 21	3	1	D	1	248·98	240·56	7·9	1·6	12·71	61·0	·5010061	·5010414	−17	+ 96	+ 2	+ 337	− 16	−11	·5010468	·5010468	
" 21-22	4	1	D	1	249·52	240·98	7·9	1·8	12·53	61·5	·5010039	·5010396	−18	+ 103	+ 1	+ 337	− 16	−11	·5010451	·5010455	
																Mean			·5010460	·5010462	·5010461
June 22	5	1	D	1	249·34	240·22	7·8	1·9	12·62	62·5	·5010046	·5010429	−18	+ 100	+ 1	+ 346	− 38	−11	·5010464	·5010463	·5010464
June 23	6	2	D	1	222·25	215·39	8·1	1·8	13·76	56·2	·5011274	·5011634	−18	+ 52	+ 7	+ 331	− 16	−11	·5011635	·5011648	
" 23-24	7	2	D	1	222·25	215·85	8·4	1·7	13·54	57·0	·5011274	·5011609	−19	+ 61	+ 6	+ 331	− 16	−11	·5011642	·5011630	
																Mean			·5011639	·5011639	·5011639
June 24	8	2	D	1	222·24	216·02	8·1	2·0	13·51	58·0	·5011274	·5011600	−20	+ 62	+ 5	+ 314	− 10	−11	·5011624	·5011626	·5011625
June 26	9	3	D	1	226·38	219·62	8·1	1·5	15·18	57·0	·5011068	·5011409	−17	− 8	+ 6	+ 342	+ 3	−11	·5011380	·5011382	
" 26-27	10	3	D	1	228·59	221·83	8·1	1·8	12·70	57·0	·5010960	·5011295	−19	+ 96	+ 6	+ 342	+ 3	−11	·5011374	·5011370	
																Mean			·5011377	·5011376	·5011377
June 27	11	3	D	1	229·12	222·60	8·1	2·1	10·96	57·0	·5010935	·5011256	−20	+ 169	+ 5	+ 299	− 23	−11	·5011377	·5011376	·5011377

TABLE II—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: OTTAWA. OBSERVER: A. H. MILLER

STATION: GOOD HOPE, N.W.T. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval		Arc		Temperature	Pressure	Period Uncorrected		Corrections (7th Decimal Place)						Period Corrected		
					Chronometer						Chronometer					Rate			Chronometer		
					Bond No. 627	Dent No. 56182	Initial	Final			Bond No. 627	Dent No. 56182	Arc	Temp.	Pressure	B 627	D 56182	Flexure	Bond No. 627	Dent No. 56182	Mean
1922																					
July 24.....	1	1	D	1	289·91	282·30	8·0	1·5	12·23	58·2	·5008639	·5008872	−16	+ 116	+ 5	+ 330	+ 96	−10	·5009064	·5009063	
" 24-25.....	2	1	D	1	293·07	285·15	8·0	1·6	10·16	58·0	·5008545	·5008783	−17	+ 203	+ 4	+ 330	+ 96	−10	·5009055	·5009059	
																Mean.....		....	·5009060	·5009061	·5009060
July 25.....	3	1	D	1	291·61	283·57	8·2	1·6	11·50	59·0	·5008588	·5008832	−18	+ 147	+ 3	+ 329	+ 98	−10	·5009039	·5009052	
" 25-26.....	4	1	D	1	287·20	279·86	8·0	1·7	14·13	60·0	·5008720	·5008949	−17	+ 36	+ 3	+ 329	+ 98	−10	·5009061	·5009059	
																Mean.....		....	·5009050	·5009056	·5009053
July 26.....	5	1	D	1	284·86	277·73	8·0	1·6	15·60	61·5	·5008792	·5009018	−17	− 25	+ 1	+ 305	+ 89	−10	·5009046	·5009056	
" 26-27.....	6	1	D	1	285·00	278·96	7·9	1·6	14·60	62·5	·5008787	·5008978	−17	+ 17	+ 1	+ 305	+ 89	−10	·5009083	·5009058	
																Mean.....		....	·5009065	·5009057	·5009061
July 28.....	7	2	D	1	254·53	249·35	7·8	1·3	12·70	55·5	·5009841	·5010046	−15	+ 96	+ 7	+ 302	+ 106	−10	·5010221	·5010230	
" 28-29.....	8	2	D	1	252·74	248·14	8·4	1·5	13·75	57·8	·5009911	·5010096	−18	+ 52	+ 5	+ 302	+ 106	−10	·5010242	·5010231	
																Mean.....		....	·5010232	·5010231	·5010231
July 29.....	9	2	D	1	252·60	.....	8·1	1·3	14·87	60·8	·5009917	.....	−16	+ 5	+ 2	+ 307	.....	−10	·5010205		
" 29-30.....	10	2	D	1	250·24	.....	7·7	1·4	15·56	63·0	·5010010	.....	−15	− 23	0	+ 307	.....	−10	·5010269	.....	
																Mean.....		....	·5010237	.....	·5010237

						Dent 48419						Dent 48419					Dent 48419			Dent 48419	
July 31.....	11	3	D	1	262·99	252·04	7·8	1·6	11·89	55·0	·5009524	·5009938	−16	+ 130	+ 7	+ 319	− 119	−10	·5009954	·5009930	
" 31-Aug. 1.....	12	3	D	1	262·50	250·51	7·9	1·6	11·75	56·2	·5009542	·5010000	−17	+ 136	+ 6	+ 319	− 119	−10	·5009976	·5009996	
																Mean.....		....	·5009965	·5009963	·5009964
Aug. 1.....	13	3	D	1	263·62	252·23	8·1	1·7	11·44	57·5	·5009501	·5009931	−18	+ 149	+ 4	+ 338	− 110	−10	·5009964	·5009946	
" 1-2.....	14	3	D	1	263·23	250·79	7·9	1·7	11·44	59·0	·5009516	·5009988	−17	+ 149	+ 3	+ 338	− 110	−10	·5009979	·5010003	
																Mean.....		....	·5009972	·5009975	·5009973

TABLE III—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS—*Continued*

STATION: ARCTIC RED RIVER, N.W.T. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval		Arc		Temperature	Pressure	Period Uncorrected		Corrections (7th Decimal Place)						Period Correcte		
					Chronometer						Chronometer					Rate			Chronometer		
					Bond No. 627	Dent No. 56182	Initial	Final			Bond No. 627	Dent No. 56182	Arc	Temp.	Pressure	B 627	D 56182	Flexure	Bond No. 627	Dent No. 56182	Mean
Aug. 21	1	1	D	1	298·60	291·81	7·9	1·5	10·90	54·2	·5008386	·5008582	−16	+ 172	+ 8	+ 258	+ 83	−11	·5008797	·5008818	
" 21-22	2	1	D	1	296·02	290·72	7·8	1·5	11·42	55·0	·5008459	·5008614	−16	+ 150	+ 7	+ 258	+ 83	−11	·5008847	·5008827	
																Mean			·5008822	·5008823	·5008822
Aug. 22	3	1	D	1	297·55	291·64	7·7	1·4	11·71	56·0	·5008417	·5008587	−15	+ 138	+ 6	+ 270	+ 110	−11	·5008805	·5008815	
" 22-23	4	1	D	1	295·94	290·88	7·8	1·4	12·11	57·0	·5008462	·5008610	−15	+ 121	+ 5	+ 270	+ 110	−11	·5008832	·5008820	
																Mean			·5008819	·5008818	·5008818
Aug. 24	5	2	D	1	258·02	253·95	7·8	1·2	14·88	53·0	·5009708	·5009864	−14	+ 5	+10	+ 279	+ 129	−11	·5009977	·5009983	
" 24-25	6	2	D	1	257·17	253·51	8·2	1·3	14·77	55·0	·5009740	·5009881	−16	+ 10	+ 8	+ 279	+ 129	−11	·5010010	·5010001	
																Mean			·5009994	·5009992	·5009993
Aug. 25	7	2	D	1	258·55	254·37	8·1	1·2	14·01	56·0	·5009688	·5009847	−15	+ 41	+ 7	+ 284	+ 118	−11	·5009994	·5009987	
" 25-26	8	2	D	1	260·71	256·03	8·0	1·2	12·44	57·0	·5009608	·5009784	−14	+ 107	+ 6	+ 284	+ 118	−11	·5009980	·5009990	
																Mean			·5009987	·5009989	·5009988

TABLE III—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: CHIPEWYAN, ALBERTA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval		Arc		Temperature	Pressure	Period Uncorrected		Corrections (7th Decimal Place)						Period Corrected		
					Chronometer						Chronometer					Rate			Chronometer		
					Bond No. 627	Dent No. 56182	Initial	Final			Bond No. 627	Dent No. 56182	Arc	Temp.	Pressure	B 627	D 56182	Flexure	Bond No. 627	Dent No. 56182	Mean
Sept. 25-26.....	1	1	D	1	244·48	240·42	7·9	1·4	12·85	49·8	·5010247	·5010420	−15	+ 90	+12	+ 304	+ 132	− 9	·5010629	·5010630	·5010630
Sept. 26.....	2	1	D	1	244·15	240·36	7·9	1·8	12·91	50·2	·5010260	·5010423	−18	+ 88	+12	+ 291	+ 126	− 9	·5010624	·5010622	
" 26-27.....	3	1	D	1	244·56	240·67	7·8	1·8	12·31	51·0	·5010243	·5010409	−17	+ 113	+11	+ 291	+ 126	− 9	·5010632	·5010633	
																Mean.....			·5010628	·5010628	·5010628
Sept. 27.....	4	1	D	1	245·75	241·93	7·7	1·7	11·84	51·0	·5010194	·5010355	−16	+ 132	+11	+ 298	+ 148	− 9	·5010610	·5010621	
" 27-28.....	5	1	D	1	244·41	241·16	8·0	1·7	12·49	51·0	·5010250	·5010388	−17	+ 105	+11	+ 298	+ 148	− 9	·5010638	·5010626	
																Mean.....			·5010624	·5010624	·5010624
Sept. 28.....	6	2	D	1	220·78	217·03	8·0	1·5	10·51	53·5	·5011349	·5011546	−16	+ 188	+ 8	+ 308	+ 98	− 9	·5011828	·5011815	
" 28-29.....	7	2	D	1	225·17	220·53	8·0	2·1	5·95	56·2	·5011128	·5011362	−20	+ 379	+ 5	+ 308	+ 98	− 9	·5011791	·5011815	
																Mean.....			·5011810	·5011815	·5011812
Sept. 29.....	8	2	D	1	225·32	220·65	7·9	1·5	6·67	64·8	·5011120	·5011356	−16	+ 349	− 3	+ 361	+ 129	− 9	·5011802	·5011806	
" 29-30.....	9	2	D	1	226·61	222·08	7·9	1·6	5·10	56·2	·5011056	·5011283	−17	+ 415	+ 5	+ 361	+ 129	− 9	·5011811	·5011806	
																Mean.....			·5011807	·5011806	·5011806
Sept. 30.....	10	2	D	1	228·40	222·79	7·9	2·1	3·47	56·2	·5010970	·5011247	−20	+ 483	+ 5	+ 385	+ 109	− 9	·5011814	·5011815	·5011815
Oct. 1-2.....	11	3	D	1	238·01	230·74	8·0	1·0	−0·02	67·8	·5010526	·5010858	−13	+ 629	− 8	+ 430	+ 98	− 9	·5011555	·5011555	·5011555

TABLE III—*Concluded*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: OTTAWA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval		Arc		Temperature	Pressure	Period Uncorrected		Corrections (7th Decimal Place)						Period Corrected		
					Chronometer						Chronometer					Rate			Chronometer		
					Bond No. 627	Dent No. 56182	Initial	Final			Bond No. 627	Dent No. 56182	Arc	Temp.	Pressure	B 627	D 56182	Flexure	Bond No. 627	Dent No. 56182	Mean
Nov. 7.....	1	1	D	1	189·92	187·50	8·0	1·9	15·90	55·0	·5013198	·5013369	−18	− 38	+ 8	+ 301	+ 134	− 9	·5013442	·5013446	·5013444
" 7-8.....	2	1	D	1	189·98	187·56	7·9	1·7	15·86	55·0	·5013194	·5013365	−17	− 36	+ 8	+ 305	+ 132	− 9	·5013445	·5013443	·5013444
Nov. 8.....	3	1	D	1	190·27	187·59	8·0	1·5	15·85	55·2	·5013174	·5013363	−16	− 36	+ 8	+ 319	+ 130	− 9	·5013440	·5013440	
" 8-9.....	4	1	D	1	190·33	187·56	8·0	1·9	15·76	56·2	·5013170	·5013365	−18	− 32	+ 7	+ 319	+ 130	− 9	·5013437	·5013443	
																Mean.....		....	·5013439	·5013442	·5013440
Nov. 13-14.....	5	2	D	1	174·94	172·66	7·7	1·8	15·02	53·7	·5014332	·5014521	−17	− 1	+ 9	+ 310	+ 123	− 9	·5014624	·5014626	·5014625
Nov. 14.....	6	2	D	1	174·94	172·69	7·7	1·85	14·95	54·5	·5014331	·5014519	−17	+ 2	+ 9	+ 313	+ 122	− 9	·5014629	·5014626	
" 14-15.....	7	2	D	1	174·99	172·65	7·7	1·55	15·15	55·0	·5014328	·5014522	−15	− 6	+ 8	+ 313	+ 122	− 9	·5014619	·5014622	
																Mean.....		....	·5014624	·5014624	·5014624
Nov. 15.....	8	2	D	1	175·07	172·40	7·8	1·6	15·25	55·1	·5014321	·5014544	−16	− 10	+ 8	+ 330	+ 105	− 9	·5014624	·5014622	·5014623
Nov. 16-17.....	9	3	D	1	178·35	175·78	7·6	1·3	14·86	56·0	·5014057	·5014263	−14	+ 6	+ 7	+ 314	+ 108	− 9	·5014361	·5014361	·5014361
" 17.....	10	3	D	1	178·45	176·07	8·0	1·3	14·56	57·0	·5014049	·5014239	−15	+ 18	+ 6	+ 317	+ 126	− 9	·5014366	·5014365	·5014366
" 17-18.....	11	3	D	1	178·82	176·09	8·2	1·8	14·43	57·0	·5014020	·5014238	−19	+ 24	+ 6	+ 343	+ 125	− 9	·5014365	·5014365	·5014365
																Mean.....		....	·5014364	·5014364	·5014364

TABLE IV

AVERAGE ELEVATIONS AND CORRECTIONS FOR TOPOGRAPHY AND COMPENSATION FOR SEPARATE ZONES

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Ottawa, Ont., No. 1				Peace River, Alta., No. 43			
A	270	+ 2	0	+ 2	1,060	+ 2	0	+ 2
B	275	+ 46	0	+ 46	1,070	+ 63	0	+ 63
C	263	+ 28	0	+ 28	1,074	+106	0	+106
D	248	+ 11	0	+ 11	1,113	+ 87	− 1	+ 86
E	236	+ 6	0	+ 6	1,178	+ 45	− 2	+ 43
F	210	+ 1	− 1	0	1,332	+ 16	− 4	+ 12
G	240	0	− 1	− 1	1,417	+ 7	− 5	+ 2
H	275	0	− 1	− 1	1,524	+ 4	− 7	− 3
I	275	0	− 2	− 2	1,683	+ 3	− 13	− 10
J	288	0	− 3	− 3	1,766	+ 1	− 20	− 19
K	340	0	− 5	− 5	1,860	+ 1	− 30	− 29
L	411	0	− 10	− 10	1,940	0	− 46	− 46
M	506	0	− 28	− 28	1,880	0	−110	−110
N	650	0	− 42	− 42	2,240	0	−115	−115
O	883	0	− 49	− 49	2,415	0	−120	−120
18				− 12				− 29
17				− 12				− 27
16				− 10				− 27
15				− 10				− 31
14				− 10				− 37
13				− 18				− 57
12				− 7				− 31
11				− 5				− 28
10				+ 4				− 10
9				+ 7				− 1
8				+ 11				+ 3
7				+ 7				+ 4
6				+ 3				+ 4
5				+ 8				+ 9
4				+ 5				+ 6
3				+ 4				+ 3
2				+ 3				+ 3
1				+ 1				0
Total				− 79				−384

TABLE IV—*Continued*

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet *	Topography	Compensation	Topography and Compensation
	Resolution, N.W.T. No. 44				Providence, N.W.T., No. 45			
A	497	+ 2	0	+ 2	510	+ 2	0	+ 2
B	497	+ 56	0	+ 56	510	+ 56	0	+ 56
C	496	+ 60	0	+ 60	508	+ 61	0	+ 61
D	495	+ 30	− 1	+ 29	498	+ 30	− 1	+ 29
E	497	+ 12	− 1	+ 11	494	+ 12	− 1	+ 11
F	498	+ 4	− 1	+ 3	500	+ 4	− 1	+ 3
G	497	+ 2	− 2	0	500	+ 2	− 2	0
H	499	+ 1	− 2	− 1	500	+ 1	− 2	− 1
I	500	+ 1	− 4	− 3	500	+ 1	− 4	− 3
J	501	0	− 5	− 5	750	0	− 8	− 8
K	499	0	− 8	− 8	750	0	− 12	− 12
L	499	0	− 12	− 12	750	0	− 18	− 18
M	571	0	− 32	− 32	798	0	− 45	− 45
N	626	0	− 32	− 32	1,128	0	− 58	− 58
O	798	0	− 45	− 45	1,267	0	− 66	− 66
18				− 10				− 13
17				− 11				− 13
16				− 11				− 14
15				− 13				− 14
14				− 16				− 16
13				− 27				− 31
12				− 18				− 24
11				− 18				− 21
10				− 13				− 11*
9				− 5				− 3*
8				0				+ 1*
7				+ 2				+ 3*
6				+ 4				+ 4*
5				+ 9				+ 9*
4				+ 6				+ 6*
3				+ 4				+ 4*
2				+ 3				+ 3*
1				0				0*
Total				− 91				−179

*These values have been interpolated from those obtained for neighbouring stations.

TABLE IV—*Continued*

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Simpson, N.W.T. No. 46				Norman, N.W.T., No. 47			
A	430	+ 2	0	+ 2	280	+ 2	0	+ 2
B	430	+ 56	0	+ 56	276	+ 41	0	+ 41
C	418	+ 51	0	+ 51	265	+ 27	0	+ 27
D	417	+ 21	0	+ 21	265	+ 11	0	+ 11
E	409	+ 9	− 1	+ 8	268	+ 6	− 1	+ 5
F	415	+ 3	− 1	+ 2	271	+ 1	− 1	0
G	440	+ 2	− 2	0	325	+ 1	− 1	0
H	465	+ 1	− 2	− 1	479	0	− 2	− 2
I	490	+ 1	− 4	− 3	631	0	− 5	− 5
J	525	0	− 6	− 6	409	0	− 5	− 5
K	550	0	− 9	− 9	514	0	− 8	− 8
L	615	0	− 15	− 15	702	0	− 17	− 17
M	709	0	− 40	− 40	1,150	0	− 64	− 64
N	1,039	0	− 52	− 52	1,844	0	− 93	− 93
O	1,322	0	− 70	− 70	1,930	0	− 95	− 95
18				− 17				− 18
17				− 20				− 18
16				− 22				− 18
15				− 23				− 21
14				− 23				− 19
13				− 39				− 32
12				− 28				− 22
11				− 20				− 18
10				− 10*				− 10
9				− 2*				− 2
8				+ 2*				+ 2
7				+ 3*				+ 2
6				+ 4*				+ 3
5				+ 8*				+ 7
4				+ 6*				+ 6
3				+ 4*				+ 3
2				+ 3*				+ 3
1				0*				0
Total				−230				− 355

*These values have been interpolated from those obtained for neighbouring stations.

TABLE IV—*Continued*

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Liard River, B.C., No. 48				Good Hope, N.W.T., No. 49			
A	525	+ 2	0	+ 2	200	+ 2	0	+ 2
B	518	+ 55	0	+ 55	180	+ 33	0	+ 33
C	513	+ 62	0	+ 62	180	+ 15	0	+ 15
D	513	+ 32	− 1	+ 31	181	+ 5	0	+ 5
E	525	+ 13	− 1	+ 12	188	+ 2	0	+ 2
F	550	+ 5	− 2	+ 3	210	+ 1	− 1	0
G	600	+ 2	− 2	0	230	0	− 1	− 1
H	650	+ 1	− 3	− 2	250	0	− 1	− 1
I	750	+ 1	− 5	− 4	275	0	− 2	− 2
J	1,500	− 1	− 17	− 18	300	0	− 3	− 3
K	1,700	− 1	− 27	− 28	435	0	− 7	− 7
L	2,300	− 3	− 55	− 58	640	0	− 15	− 15
M	2,082	− 2	−121	−123	634	0	− 35	− 35
N	2,336	− 1	−119	−120	1,000	0	− 52	− 52
O	2,899	− 1	−141	−142	1,690	0	− 87	− 87
18				− 36				− 20
17				− 37				− 19
16				− 36				− 18
15				− 37				− 20
14				− 41				− 20
13				− 53				− 32
12				− 30				− 15
11				− 18				− 14
10				− 8				− 9*
9				0				− 1*
8				+ 4				+ 2*
7				+ 4				+ 3*
6				+ 4				+ 4*
5				+ 9				+ 7*
4				+ 6				+ 6*
3				+ 4				+ 3*
2				+ 3				+ 3*
1				0				0*
Total				−592				−286

*These values have been interpolated from those obtained for neighbouring stations.

TABLE IV—*Concluded*

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Arctic Red River, N.W.T., No. 50				Chipewyan, Alta. No. 51			
A	135	+ 2	0	+ 2	748	+ 2	0	+ 2
B	129	+ 28	0	+ 28	741	+ 58	0	+ 58
C	122	+ 9	0	+ 9	716	+ 84	0	+ 84
D	108	+ 2	0	+ 2	715	+ 52	− 1	+ 51
E	99	+ 1	0	+ 1	721	+ 22	− 2	+ 20
F	140	0	0	0	719	+ 9	− 2	+ 7
G	190	0	− 1	− 1	713	+ 4	− 3	+ 1
H	230	0	− 1	− 1	720	+ 2	− 3	− 1
I	275	0	− 2	− 2	717	+ 2	− 6	− 4
J	320	0	− 4	− 4	720	+ 1	− 8	− 7
K	360	0	− 6	− 6	725	+ 1	− 12	− 11
L	420	0	− 10	− 10	740	+ 1	− 18	− 17
M	395	0	− 22	− 22	755	0	− 42	− 42
N	828	0	− 49	− 44	1,088	0	− 56	− 56
O	1,625	0	− 82	− 82	1,287	0	− 70	− 70
18	.....	.....	.....	− 16	.....	.....	.....	− 13
17	.....	.....	.....	− 19	.....	.....	.....	− 14
16	.....	.....	.....	− 19	.....	.....	.....	− 15
15	.....	.....	.....	− 20	.....	.....	.....	− 15
14	.....	.....	.....	− 22	.....	.....	.....	− 15
13	.....	.....	.....	− 24	.....	.....	.....	− 28
12	.....	.....	.....	− 14	.....	.....	.....	− 20
11	.....	.....	.....	− 15	.....	.....	.....	− 18
10	.....	.....	.....	− 7	.....	.....	.....	− 14
9	.....	.....	.....	0	.....	.....	.....	− 7
8	.....	.....	.....	+ 3	.....	.....	.....	− 2
7	.....	.....	.....	+ 4	.....	.....	.....	+ 2*
6	.....	.....	.....	+ 5	.....	.....	.....	+ 4*
5	.....	.....	.....	+ 6	.....	.....	.....	+ 9*
4	.....	.....	.....	+ 6	.....	.....	.....	+ 6*
3	.....	.....	.....	+ 4	.....	.....	.....	+ 3*
2	.....	.....	.....	+ 3	.....	.....	.....	+ 3*
1	.....	.....	.....	0	.....	.....	.....	0*
	Total.....			−255	Total.....			−119

*These values have been interpolated from those obtained for neighbouring stations.

TABLE V

CORRECTIONS IN DYNES FOR TOPOGRAPHY AND ISOSTATIC COMPENSATION FOR GIVEN DEPTHS OF COMPENSATION

Number and Name of station	Depth 42·6 km.	Depth 56·9 km.	Depth 85·3 km.	Depth 113·7 km.	Depth 127·9 km.	Depth 156·25 km.	Depth 184·6 km.
1. Ottawa	−·0061	−·0074	−·0080	−·0079	−·0077	−·0069	−·0060
43. Peace River	−·0324	−·0340	−·0370	−·0384	−·0390	−·0396	−·0392
44. Resolution	−·0047	−·0055	−·0075	−·0091	−·0098	−·0108	−·0113
45. Providence	−·0125	−·0142	−·0161	−·0179	−·0185	−·0191	−·0194
46. Simpson	−·0139	−·0162	−·0201	−·0230	−·0240	−·0259	−·0267
47. Norman	−·0257	−·0290	−·0335	−·0355	−·0363	−·0372	−·0373
48. Liard River	−·0490	−·0522	−·0569	−·0592	−·0599	−·0606	−·0602
49. Good Hope	−·0190	−·0221	−·0262	−·0286	−·0297	−·0306	−·0313
50. Arctic Red River	−·0165	−·0191	−·0229	−·0255	−·0264	−·0277	−·0281
51. Chipewyan	−·0065	−·0080	−·0104	−·0119	−·0124	−·0133	−·0135

TABLE VI

ANOMALIES COMPUTED FROM HELMERT'S FORMULA FOR VARIOUS DEPTHS OF COMPENSATION

Number and Name of station	Depth 42·6 km.	Depth 56·9 km.	Depth 85·3 km.	Depth 113·7 km.	Depth 127·9 km.	Depth 156·25 km.	Depth 184·6 km.
	$g-g_c$	$g-g_c$	$g-g_c$	$g-g_c$	$g-g_c$	$g-g_c$	$g-g_c$
1. Ottawa	−·001	·000	+·001	+·001	+·001	000	−·001
43. Peace River	+·006	+·008	+·011	+·012	+·013	+·014	+·013
44. Resolution	−·011	−·010	−·008	−·007	−·006	−·005	−·005
45. Providence	−·003	−·002	·000	+·002	+·003	+·003	+·003
46. Simpson	+·002	+·004	+·008	+·011	+·012	+·014	+·015
47. Norman	−·011	−·008	−·003	−·001	−·001	·000	·000
48. Liard River	−·024	−·021	−·016	−·014	−·013	−·012	−·013
49. Good Hope	+·006	+·009	+·013	+·016	+·017	+·018	+·018
50. Arctic Red River	+·015	+·017	+·021	+·024	+·024	+·026	+·026
51. Chipewyan	−·010	−·009	−·007	−·005	−·005	−·004	−·003
Mean with regard to sign	−·003	−·001	+·002	+·004	+·005	+·005	+·005
Mean without regard to sign	·009	·009	·009	·009	·010	·010	·010

TABLE VII

ANOMALIES COMPUTED FROM BOWIE'S WORLD FORMULA OF 1916 FOR VARIOUS DEPTHS OF COMPENSATION

Number and name of station	Depth 42·6 km.	Depth 56·9 km.	Depth 85·3 km.	Depth 113·7 km.	Depth 127·9 km.	Depth 156·25 km.	Depth 184·6 km.
	$g-g_c$	$g-g_c$	$g-g_c$	$g-g_c$	$g-g_c$	$g-g_c$	$g-g_c$
1. Ottawa	−·006	−·005	−·004	−·004	−·004	−·005	−·006
43. Peace River	+·002	+·004	+·007	+·008	+·009	+·010	+·009
44. Resolution	−·014	−·013	−·011	−·010	−·009	−·008	−·008
45. Providence	−·006	−·005	−·003	−·001	·000	·000	·000
46. Simpson	−·002	·000	+·004	+·007	+·008	+·010	+·011
47. Norman	−·014	−·011	−·006	−·004	−·004	−·003	−·003
48. Liard River	−·027	−·024	−·019	−·017	−·016	−·015	−·016
49. Good Hope	+·003	+·006	+·010	+·013	+·014	+·015	+·015
50. Arctic Red River	+·012	+·014	+·018	+·021	+·021	+·023	+·023
51. Chipewyan	−·014	−·013	−·011	−·009	−·009	−·008	−·007
Mean with regard to sign	−·007	−·005	−·002	·000	+·001	+·002	+·002
Mean without regard to sign	·010	·010	·009	·009	·009	·010	·010

TABLE VIII

PRINCIPAL FACTS FOR GRAVITY STATIONS ESTABLISHED DURING 1921 AND 1922

Station	Longitude	Latitude	Altitude	Computed g at sea-level	Corrections: Altitude	Corrections: Topography and Isostatic Compensation	Computed Gravity	Observed Gravity	Hayford and Bowie anomaly O-C	Bouguer anomaly O-C	Free Air anomaly O-C
	h m s	° ′ ″	metres	dynes	dynes	dynes	dynes	dynes	dynes	dynes	dynes
1. Ottawa	5 02 52	45 23 38	83	980·656	·026	−·008	980·622	980·618	−·004	−·021	−·012
43. Peace River	7 49 09	56 14 04	324	981·612	−·100	−·038	981·474	981·482	+·008	−·066	−·030
44. Resolution	7 34 42	61 10 05	152	982·008	−·047	−·009	981·952	981·942	−·010	−·036	−·019
45. Providence	7 50 37	61 21 14	156	982·022	−·048	−·018	981·956	981·955	−·001	−·036	−·019
46. Simpson	8 05 23	61 51 39	132	982·061	−·041	−·023	981·997	982·004	+·007	−·031	−·016
47. Norman	8 22 17	64 53 59	87	982·281	−·027	−·036	982·218	982·214	−·004	−·050	−·040
48. Liard River	8 15 10	59 58 43	160	981·915	−·049	−·059	981·807	981·790	−·017	−·094	−·076
49. Good Hope	8 34 33	66 15 18	59	982·374	−·018	−·029	982·327	982·340	+·013	−·023	−·016
50. Arctic Red River	8 54 57	67 26 37	41	982·452	−·013	−·026	982·413	982·434	+·021	−·010	−·005
51. Chipewyan	7 24 35	58 42 44	229	981·815	−·071	−·012	981·732	981·723	−·009	−·047	−·021
Mean anomaly with regard to sign									·000	−·041	−·025
Mean anomaly without regard to sign									·009	·041	·025

DEPTH OF COMPENSATION FOR THE NINE FIELD STATIONS*

From the results of a large number of gravity stations, suitably distributed over the earth's surface, it is possible by the method of least squares to obtain a formula for γ_0 and at the same time the most probable depth of compensation. From the gravity formula a value of the earth's flattening or ellipticity is easily deduced. A number of such solutions have already been made by Bowie* for stations in the United States and in other parts of the world.

With only ten stations in a comparatively limited area it is not possible to obtain a complete solution that is of any value. If, however, we have a formula that is known to represent the variations in gravity sufficiently well the depth of compensation can be determined even though the stations are not distributed over such a wide area. The depth so determined will give some idea of the depth of compensation in the area under consideration.

For the stations included in this report two solutions have been made for the depth of compensation using (1) Helmert's formula of 1901 and (2) Bowie's world formula of 1916.

It should be remarked that these are in principle special cases of the more general solutions that have been made by Bowie. If γ_0 be the value of gravity at sea-level computed from one of the formulae, g the observed value for any particular station, Z the combined correction due to elevation, topography and compensation, then we have for each station $g = \gamma_0 + Z + v$

where v is the residual obtained from the solution for the station,

or $g = \gamma_0 + Z_1 + \frac{dZ}{dt} \Delta t + v$,

where Z_1 is the correction for some definite depth of compensation t, and Δt represents a small change in this depth.

$$\frac{dZ}{dt} \Delta t = g - (\gamma_0 + Z_1) + v$$

$$= (\text{gravity anomaly at depth } t) + v \text{ or}$$

$$\frac{dZ}{dt} \Delta t - \text{gravity anomaly} = v.$$

As the elevation correction is the same for all depths of compensation, $\frac{dZ}{dt}$ represents the rate of change with the depth of the correction for topography and compensation. The value of this for each station may be obtained from Table V.

Taking 28·4 km. as the unit for Δt and ·01 dyne as the unit anomaly, the following observation equations for the nine field stations are obtained from Helmert's formula for a depth of compensation of 65 km.

$$-\cdot31\,\Delta t - 0\cdot9 = v$$
$$-\cdot19\,\Delta t + 0\cdot9 = v$$
$$-\cdot23\,\Delta t + 0\cdot1 = v$$
$$-\cdot41\,\Delta t - 0\cdot5 = v$$
$$-\cdot51\,\Delta t + 0\cdot7 = v$$
$$-\cdot52\,\Delta t + 2\cdot0 = v$$
$$-\cdot47\,\Delta t - 1\cdot0 = v$$
$$-\cdot42\,\Delta t - 1\cdot8 = v$$
$$-\cdot26\,\Delta t + 0\cdot8 = v$$

*Chapter VIII, Special Publication No. 40 U. S. C. & G. S.

The depth of compensation obtained from these equations is approximately 67 km., with a probable error of 20 km.

For a depth of compensation of 85·3 km. the observation equations resulting from Bowie's formula are as follows:—

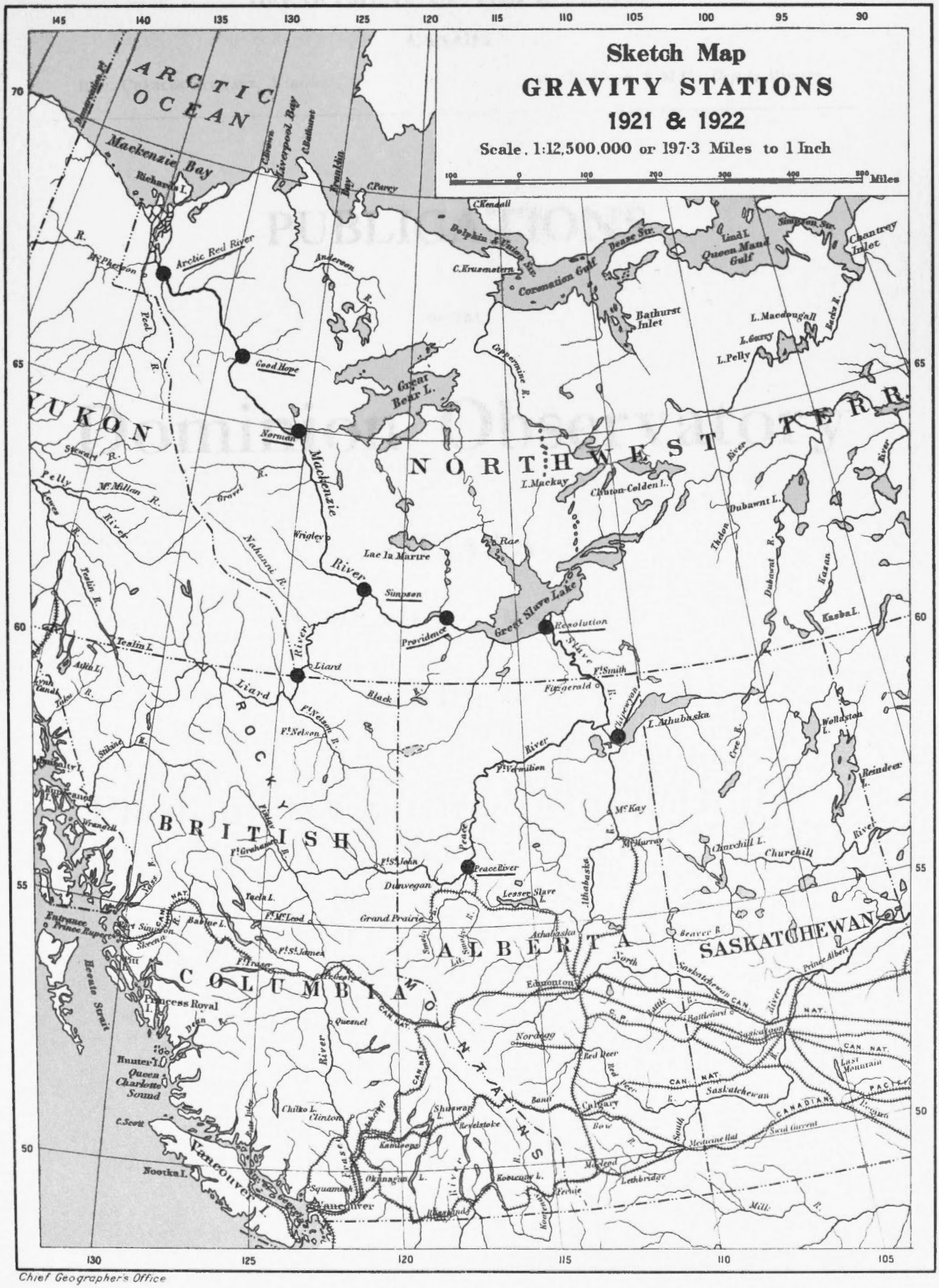
$$
\begin{aligned}
-\cdot 22\ \Delta t - 0\cdot 7 &= v \\
-\cdot 18\ \Delta t + 1\cdot 1 &= v \\
-\cdot 185\ \Delta t + 0\cdot 3 &= v \\
-\cdot 34\ \Delta t - 0\cdot 4 &= v \\
-\cdot 325\ \Delta t + 0\cdot 6 &= v \\
-\cdot 35\ \Delta t + 1\cdot 9 &= v \\
-\cdot 325\ \Delta t - 1\cdot 0 &= v \\
-\cdot 320\ \Delta t - 1\cdot 8 &= v \\
-\cdot 195\ \Delta t + 1\cdot 1 &= v
\end{aligned}
$$

From these the depth of compensation obtained is 91 kilometres with a probable error of 29 kilometres.

On account of the small number of stations no great significance can be attached to these two results. They are, however, a rough confirmation of the order of magnitude that has already been found for the depth of compensation.

In concluding this report the writer wishes to acknowledge his indebtedness and at the same time to express his gratitude for the assistance and many valuable suggestions he has received from Mr. R. Meldrum Stewart, Assistant Director of this Observatory.

DOMINION OBSERVATORY,
OTTAWA,
December, 1923.



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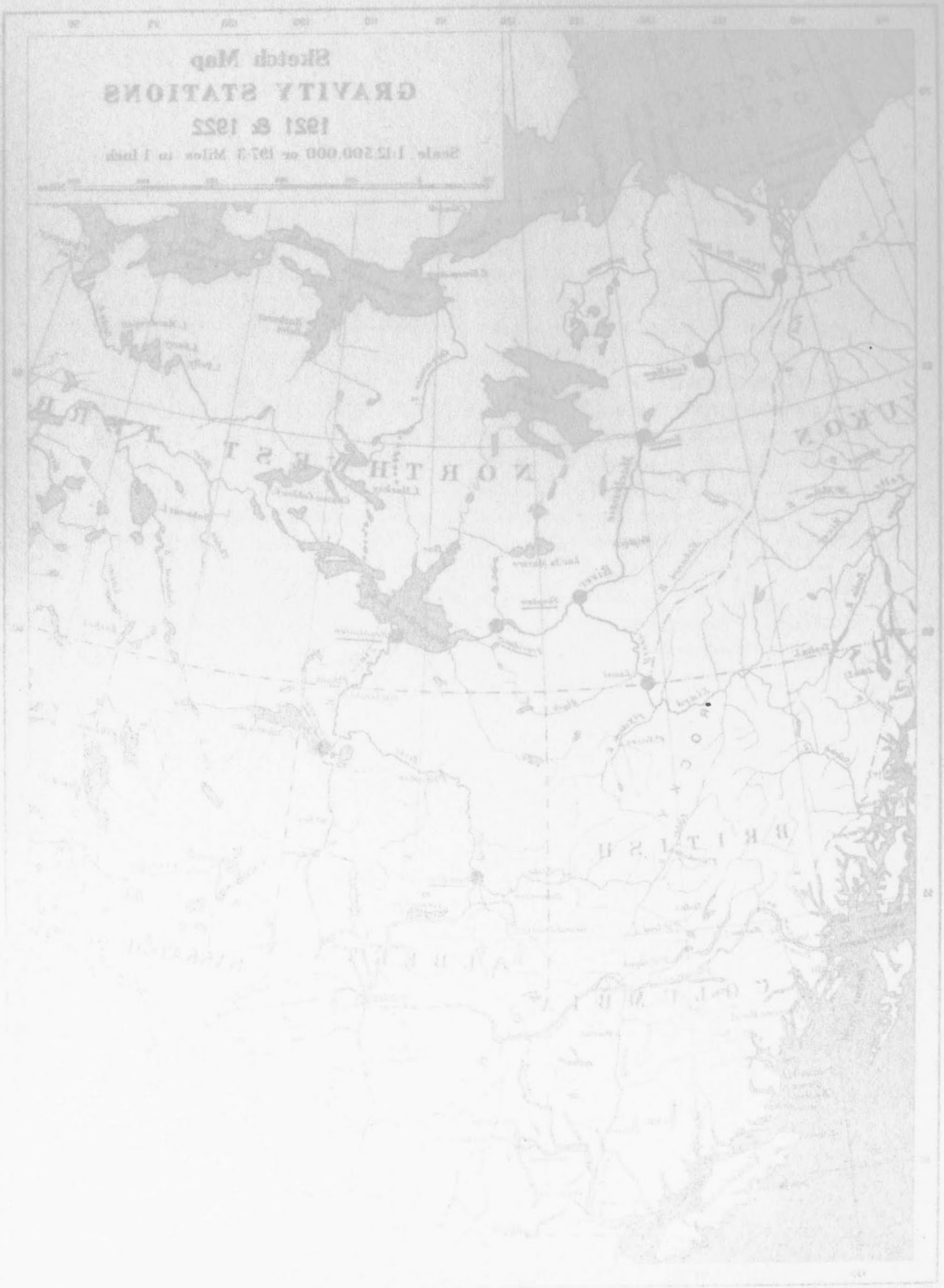

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Photometry with a 6-Inch Doublet

By

R. M. MOTHERWELL, M.A.

OTTAWA
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PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1924

CONTENTS

	PAGE
Photographic Equatorial	117
Photometric Method	118
Sensitometer Box	118
Exposure and Development of Plates	121
Measurement of Plates	122
Reduction of Measurements	123
Correction for Sky Fog on Plates	123
Correction for Curvature of Field of Camera	125
Atmospheric Absorption	125
Table of Exposures	128
Catalogue of Results	129

ILLUSTRATIONS

	PAGE
Figure 1.—Camera Hut	115
Figure 2.—Spherical Aberration Curve of 6-inch Doublet	117
Figure 3.—Colour Curve of 6-inch Doublet	117
Figure 4.—Telescope and Cameras	116
Figure 5.—Sensitometer Box	119
Figure 6.—Mounting for Rotating Sensitometer Box	119
Figure 7.—Microphotometer	120
Figure 8.—Reduction Curve	124
Figure 9.—Correction Curve for Distance from Centre of Plate	126

86602—1½

FIG. 1—Camera Hut

84602—2

FIG. 4—Telescope and Cameras

PHOTOMETRY WITH A 6-INCH DOUBLET

PHOTOGRAPHIC EQUATORIAL

When the photographic telescope [1] of the Dominion Observatory was mounted in a separate building (Fig. 1), the 6-inch doublet then purchased was figured for stellar photometry by the extra-focal method of Parkhurst and Jordan.[2] Both the 6-inch and 8-inch doublets give excellent negatives in stellar photography but the discs formed by the 8-inch, when the plate is within or without the focus, are too uneven to permit of accurate measurements of their densities. The 6-inch being figured with a view to extra-focal work gives fairly even discs when the plate is set at least 5 mm. outside the focus. If the plate is closer to the focus the discs are too uneven to measure, a light centre making it almost impossible to get accurate measurements. This is a very unfortunate condition as it means the out-of-focus images must be at least 1 mm. in diameter and this necessitates, for stars below the seventh magnitude, an exposure so long that the plates will be fogged by the city lights. In other words, the 6-inch is not suitable for extra-focal photometry of the fainter stars. This difficulty was soon realized and the work embraced in this article was carried out, having in mind a focal method by which the fainter stars might be reached.

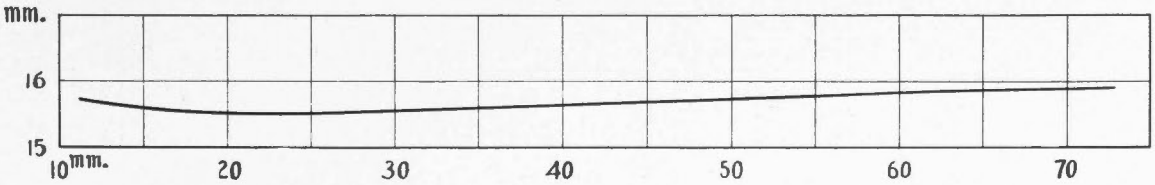

Fig. 2—Spherical Aberration Curve—6-inch Doublet

The 6-inch doublet was thoroughly tested for spherical and chromatic aberration by the Hartmann [3] method. Fig. 2 shows a maximum spherical aberration of slightly over 0·4 mm. and Fig. 3 gives the colour curve. The field of the doublet is reasonably flat,

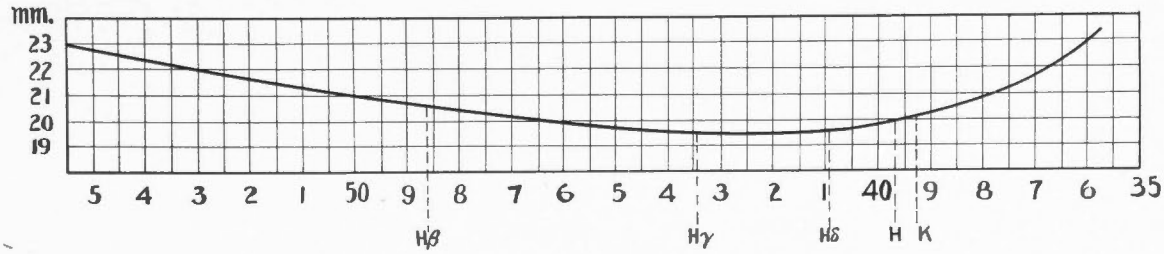

Fig. 3—Colour Curve of 6-inch Doublet

good definition being obtainable on focal plates over a field of about 9° diameter. For extra-focal work, however, the curvature of the field necessitates a correction which will

[1] Jour. R.A.S.C., Sept.-Oct., 1914.
[2] A. J., Vol. 26, p. 244, 1907.
[3] Zeitschrift für Instrumentenkunde, Vol. 24, pp. 1, 33 and 97, 1904.

be dealt with in detail in a subsequent paragraph. This correction limits the available field to a radius of about 3°; adapters are therefore fitted in place of the 8 by 10-inch plate holders and 4 by 5-inch plates used. The 4 by 5-inch plate holders can be moved 25 mm. in declination either way from the central position so that a series of exposures can be made on one plate.

The guiding telescope with a focal length of 52·5 inches and aperture of 4·5 inches is sufficiently powerful to permit of very accurate guiding, even for focal plates. This is, of course, very necessary as the instrument is used for direct photography of star fields and comets. There are also two 8-inch objective prisms of 15° and 25° angles. These can be mounted, separately or together, on the 8-inch doublet and are used for photographing spectra of comets and star fields. The combined prisms give a spectrum slightly over one-half inch between H_β and K. The guiding telescope can be moved in declination, but not far enough to guide directly on the object whose spectrum is being photographed. The eye-piece can also be moved in any direction, linear and circular scales on the eye-end of the tube providing a check on any setting should it be necessary to repeat the observation at another date. This shifting of the eye-piece is especially useful in photographing comets with tails of a length greater than the radius of the plate. The telescope and mounting are shown in Fig. 4.

PHOTOMETRIC METHOD

Sensitometer Box

The sensitometer box (Fig. 5) is similar to those used in other observatories but perhaps a brief description might be given. There are twenty light brass tubes, each 75 mm. long and 10 mm. in diameter, set parallel in a brass box 129 mm. by 101 mm. by 80 mm. Over each end of the box is a thin brass plate pierced with circular holes opposite the centre of each tube. The holes in the back plate are 0·8 mm. diameter. Those in the front plate vary from 0·739 mm. to 4·360 mm. In each tube are two diaphragms to prevent reflection of light from the walls of the tubes, and the front and back plates and interior of each tube are coated with a dull black paint to further reduce reflection.

The sides of the box extend 3 mm. beyond the back plate, thus forming a holder for the photographic plate. A light-tight cover fits over the end of the box and inside this cover are two springs which press the photographic plate tightly against the back plate.

A metal framework (see Fig. 6) which can be rotated by an electric motor holds the sensitometer in such a position that the front end points toward the pole through an opening in a window of the dark room. A fixed frame in front of the box contains several sheets of opal glass which render the illumination of the front plate openings more uniform, and the rotation of the box during exposure eliminates, to a great extent, irregular illumination due to lack of uniformity in the thickness of the opal glass sheets.

The light passes through the openings in the front and back plates and strikes the photographic plate, producing thereon a circular image of the same size as the openings in the back plate. The relative densities of these images depend on the relative diameters of the openings in the front plate. These diameters were measured several times in two coördinates and the mean is given in the second column of Table I. The third column

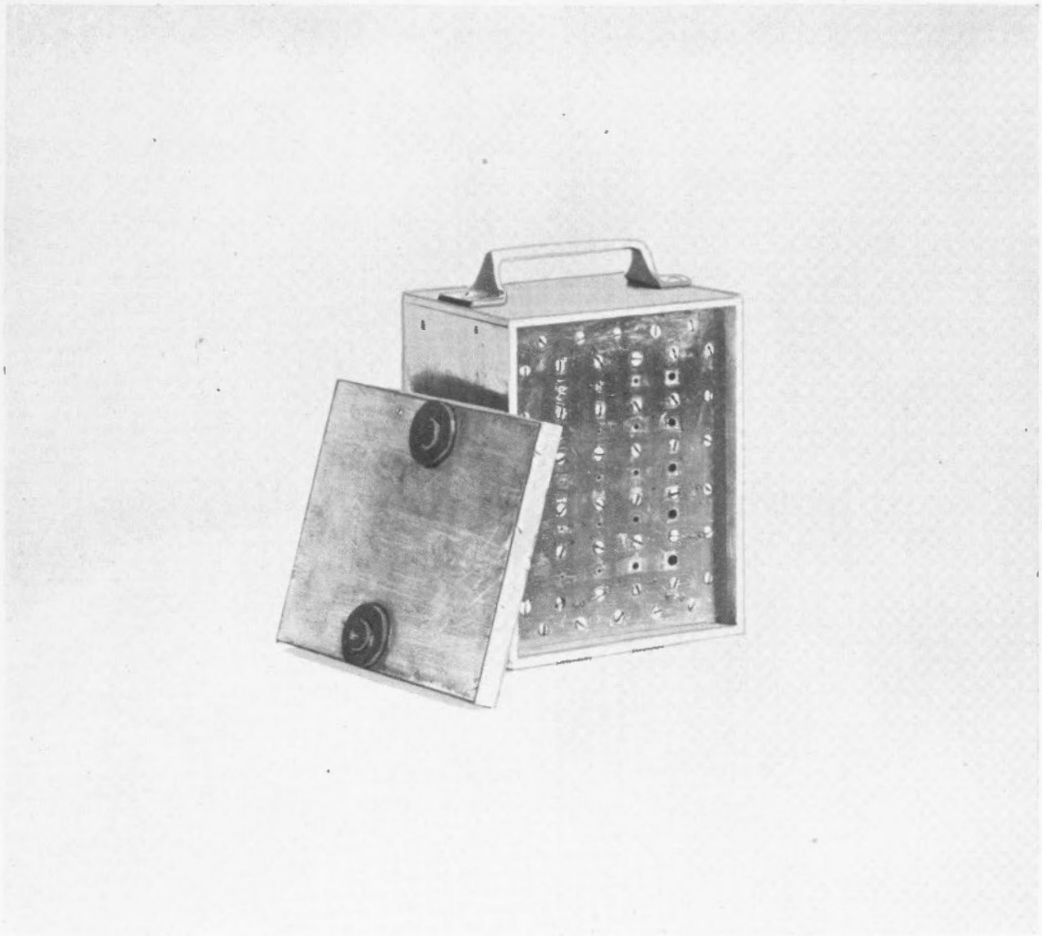

FIG. 5—Sensitometer Box

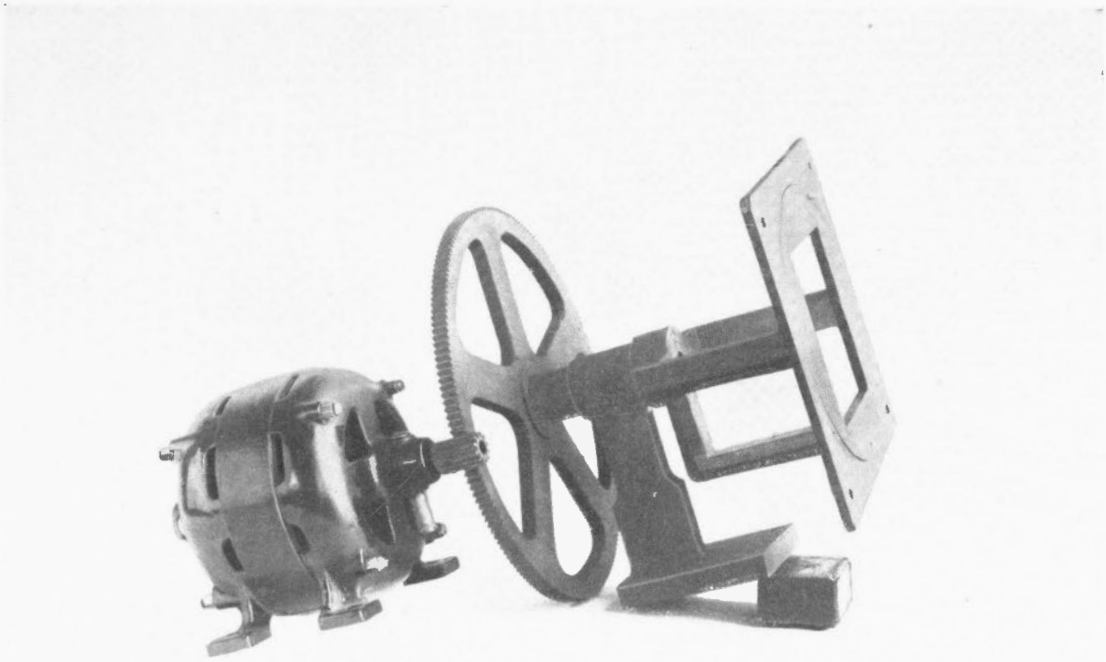

FIG. 6—Mounting for rotating Sensitometer Box

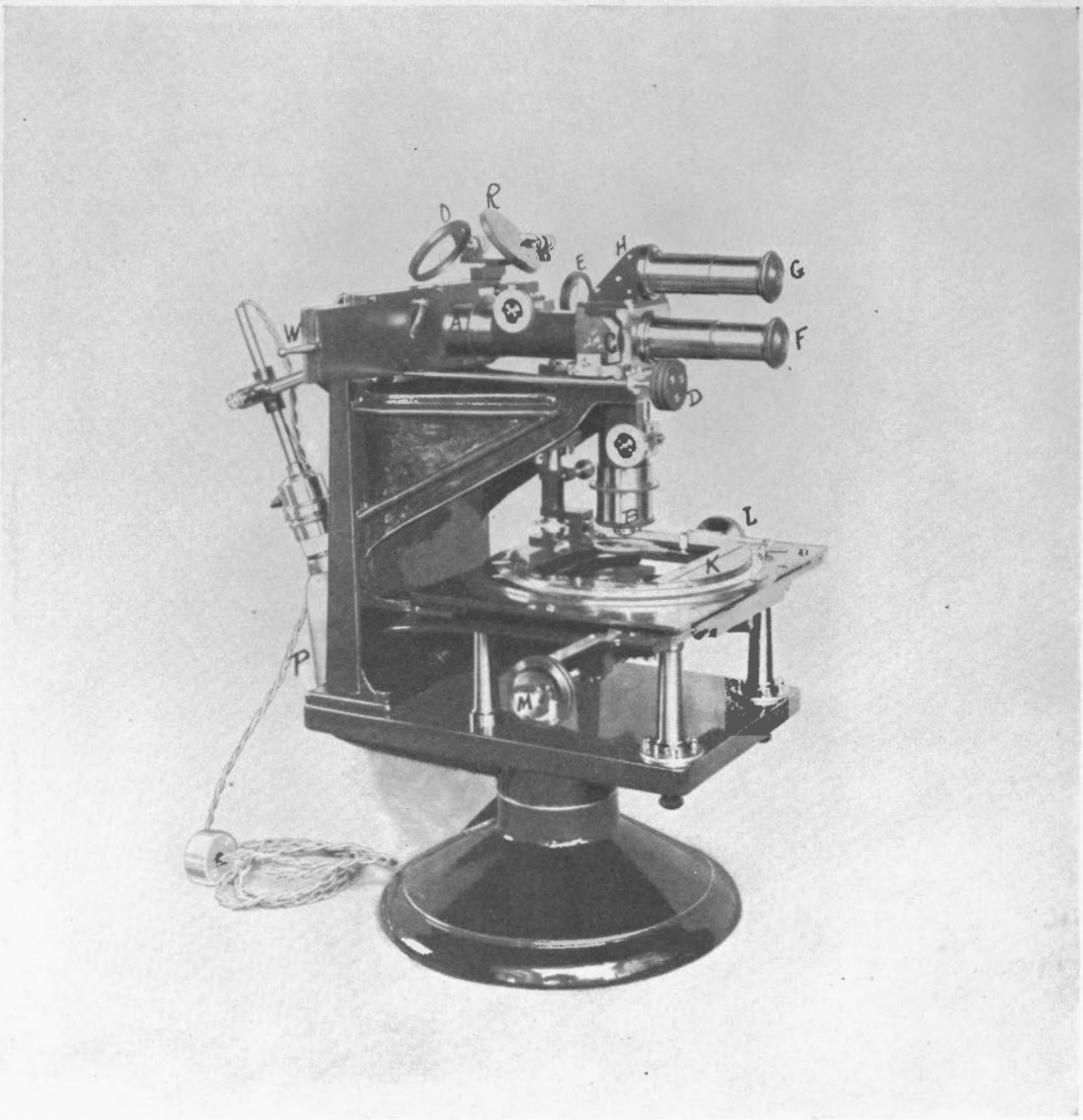

FIG. 7—Microphotometer

gives log D^2, the logarithm of the relative area, hence the logarithm of the relative amount of light admitted by each hole. Column four gives the relative amount of light expressed in magnitudes. Column five is 4·00 minus column four, thus expressing the relative magnitudes of the images produced through the sensitometer openings in a form convenient for use in stellar work. The application of these relative magnitudes to the star images on the plates will be fully explained in a later paragraph.

TABLE I

Hole	Diam.	Log D^2	$\frac{\Delta \text{ Log } D^2}{\cdot 4}$	Δ Mag.	Hole	Diam.	Log D^2	$\frac{\Delta \text{ Log } D^2}{\cdot 4}$	Δ Mag.
	mm.					mm.			
1	0·7391	9·73740	0·000	4·00	11	1·8109	0·51580	1·946	2·05
2	0·8229	9·83072	0·233	3·77	12	2·0192	0·61036	2·182	1·82
3	0·8788	9·88778	0·376	3·62	13	2·1919	0·68164	2·360	1·64
4	0·9677	9·97146	0·585	3·42	14	2·4535	0·77958	2·605	1·40
5	1·0388	0·03306	0·739	3·26	15	2·7532	0·87968	2·855	1·15
6	1·1302	0·10634	0·922	3·08	16	2·9920	0·95192	3·036	0·96
7	1·1887	0·15012	1·032	2·97	17	3·3170	1·04150	3·260	0·74
8	1·3284	0·24662	1·273	2·73	18	3·6066	1·11420	3·442	0·56
9	1·4122	0·29976	1·406	2·59	19	3·9089	1·18410	3·617	0·38
10	1·6103	0·41380	1·691	2·31	20	4·3609	1·27916	3·852	0·15

Exposure and Development of Plates

Seed 30, Gilt Edge, plates have been used for all photometric work as they are fast and comparatively free from chemical fog. The holders are loaded in the dark (no red light) and wrapped in black cloth until the telescope is ready. The dome is kept dark during exposure, only a 2 c.p. lamp enclosed in a wooden tube being used. It was originally intended to expose each plate in the sensitometer box on the following day, just before developing, but for reasons which will be given later this practice was soon given up and only a certain number of plates of each emulsion exposed in the sensitometer box.

Hydrochinone developer has been used in all the work. The formula as given by Prof. Parkhurst follows:—

A.		B.	
Water	64 oz.	Water	64 oz.
Sulphite of soda, dry	2 oz.	Sulphite of Soda, dry	2 oz.
Hydrochinone	$2\frac{1}{2}$ oz.	Potassium Carbonate	8 oz.
Sulphuric Acid c.p.	2 drs.	Potassium Bromide	200 grs.

Equal parts A and B.

A wooden tank 18 by 8 by 8 inches, lined with block tin, is used to control the temperature of the developer. In the winter this tank is filled with water and an electric heating element controlled by a contact thermometer, whose bulb is in the water, keeps the temperature of the water at 20° C. In the summer the water from the tap runs around the tank, the flow being regulated according to the temperature of the room. The developer is put in an Eastman developing tank which is then put in the temperature bath and

the plates immersed as the timer is started. The developer is kept in 16-oz. bottles which stand in one end of the temperature tank so that the developer is always at the required temperature. The time of development is eight minutes. The plates are then fixed for twenty minutes on edge in a hypo bath, to which has been added Velox liquid hardener. This has proved to be an excellent fixer both for clearness of plates and keeping properties of the fixer. There is some doubt as to the effect of developing from one to six plates in the same quantity of developer. Whether there would be any change in the form of the reduction curve has not been investigated.

Measurement of Plates

The densities of the sensitometer images and the out-of-focus images of the stars are measured with a Hartmann microphotometer, shown in Fig. 7. This instrument is similar to that used by Prof. Parkhurst and fully described in Astrophysical Journal, Vol. 10, p. 321. A and B are microscope objectives through which the light shines from source P., two mirrors reflecting the light into these objectives. C is a Lummer-Brodhun cube, in the centre of which a small silvered portion reflects the light from B to the eye-piece F, while the remaining surface of the cube C permits the light from A to pass directly to F. The photographic plate to be measured is placed on the table K and adjusted by means of screws L and M until the star image is directly beneath B. In this way the intensity of the light through B is controlled by the density of the star image. Now in the centre of the field of view of F we have the light coming through the image whose density we wish to measure. Around this we have the light from A. To equalize the two parts of the field of view a photographic wedge W is placed in front of A. This wedge can be moved across the field of A by the knurled head D until the light through A just equals that through B. A millimetre scale to the right of A gives the position of the wedge for each setting.

The eye-piece G, together with the 45° prism H, gives a clear view of the plate through the objective B, only a very small part in the centre of the field being obscured by the silver spot on C. By means of the plate carrier K, controlled by screws L and M, one can quickly bring any part of the photographic plate within the field of the objective B. In this way it is very easy to set the silver spot on the desired star image. The lens E magnifies the scale on the wedge carrier, thus giving quick and accurate readings to one-tenth of a millimetre. O and R are mirrors for reflecting the light from the source P to the scale. The source P is a 40-watt Mazda lamp, frosted. The light passes through ground glass before being reflected to objectives A and B.

The wedge W was very kindly furnished by the late Professor E. C. Pickering. The plates used being Seed 30 and the wedge being made from Seed 23, the difference in grain is very apparent when wedge and plate are in focus. This trouble was eliminated by adjusting objectives A and B so that the plate and wedge were both 2·0 mm. out of focus.

Three settings are made on each image and the mean taken as the scale reading. When the instrument was first adjusted an extra-focal plate of the Pleiades was measured several times and the mean of these measures is used to check up the instrument from time to time. In this way any change due to moving of the wedge or lamp, or defects in the mirrors, will be readily detected. Excellent agreement has always been obtained in repeating measures at irregular intervals.

Reduction of Measurements

The first step in the reduction of the scale readings of the microphotometer to relative star magnitudes is the construction of the so-called reduction curve. A plate which has been exposed in the sensitometer box before developing is placed in the instrument and the sensitometer images measured. These measures or scale readings are plotted against the relative magnitudes of the openings in the front plate of the sensitometer box, as given in the last column of Table I. A smooth curve through the plotted points gives the desired reduction curve. By means of this curve all wedge readings for star images may be converted to relative magnitudes.

It was at first intended to expose each plate in the sensitometer box and so have a separate reduction curve for each plate. This would require extra measuring but would provide for individual characteristics of all plates. However, even after much experimenting the sensitometer images often failed to give a satisfactory reduction curve. Lack of uniformity due to differences in the time of exposure in the sensitometer box was eliminated by cutting down the light so that the exposure was never less than one minute. The chief difficulty, however, was a sudden increase or decrease in density between successive rows of images, this change being lengthwise, crosswise or radial. The first produced a change in the slope of the curve for each row of images, the second gave a change in the height of the curve for each row while the last caused a bending of the curve for each row. A large percentage of the plates gave satisfactory curves but the number which gave useless curves was such as to lead to other methods. Moreover, a sudden change in the brightness of the sky while one was in the dark room often led to over or under exposure of the plate. Consequently it was decided to measure from eight to a dozen plates for each emulsion and take the mean curve. This was done for several emulsions and there has been such good agreement among the curves of the various emulsions that all measures to date have been re-examined and reduced by a curve formed from the means of the emulsions. Fig. 8 shows this curve. In view, however, of the experience of other observers regarding the change of the reduction curve with the change of emulsion a few trial curves are made for each emulsion. To date, however, the mean curve has been quite satisfactory.

Correction for Sky Fog on Plates

So far the reduction curve referred to is one constructed from measures on plates whose film measures have never been more than 6·0 on the microphotometer scale. This film measure is a setting made on the plate close to the star image under measurement. Such settings are made beside every image measured to detect any irregularities or defects around the image and also to determine the amount of fog over the surface of the plate. Where these film readings are more than 6·0 a change is produced in the form of the reduction curve, the lower end of the curve being raised. Knowing this fog effect before drawing up the specifications of the sensitometer box, the openings were so planned as to group them about the bend of the reduction curve but in the drilling of the plate the drills available did not permit of this being done to the extent desired. The following procedure serves to give any change in the reduction curve due to sky fog. Two exposures, one about five times the other, are made of the same star field on the one plate. This

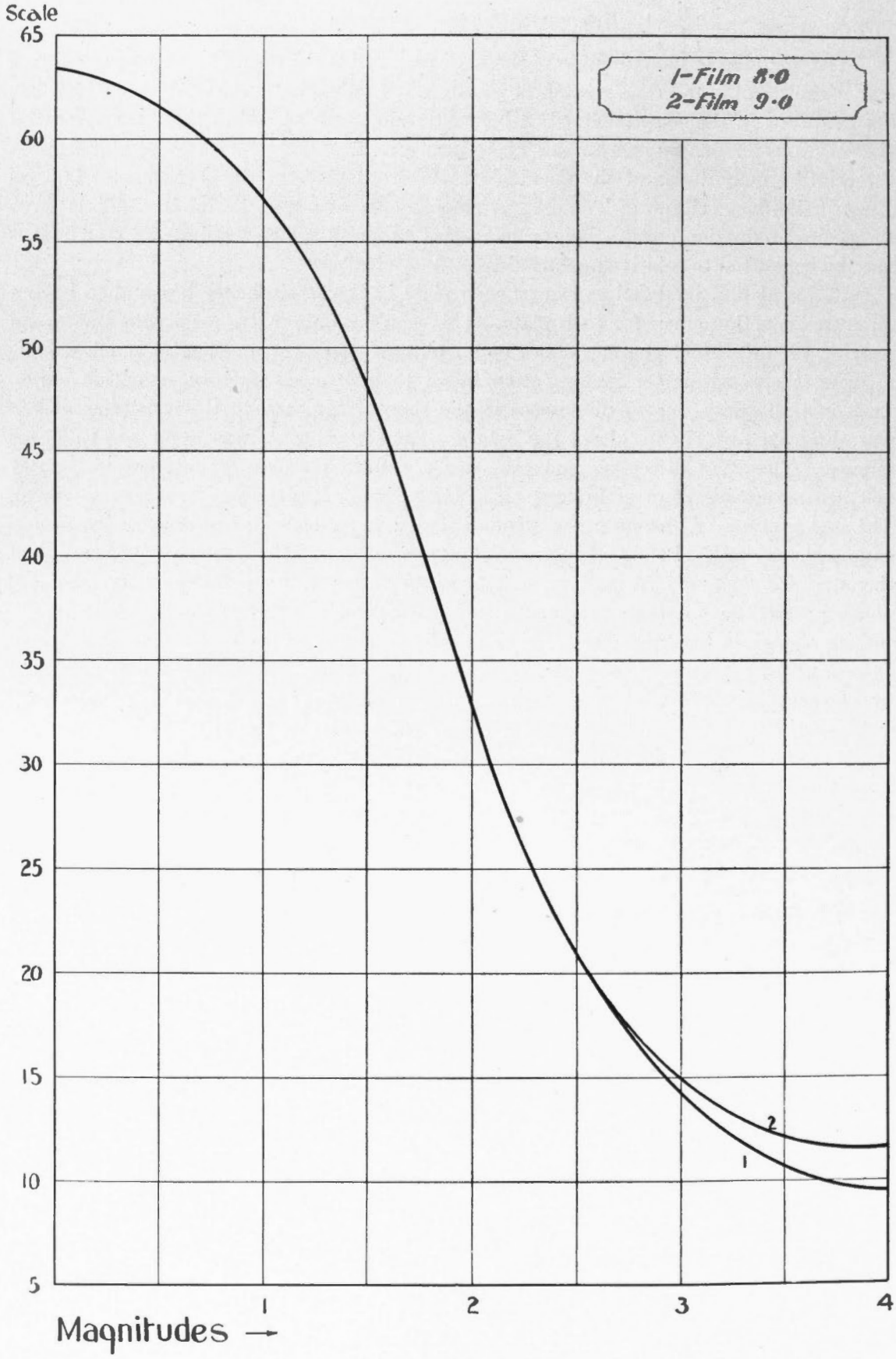

Fig. 8—Reduction Curve

gives dense images and faint images of the same stars and the difference between these dense and faint images, expressed in magnitudes, should be the same for each pair. The denser images fall on the straight part of the curve which is unaffected by sky fog. The lower part of the curve, on which the measures of the fainter images fall, is then adjusted until there is the same difference for all pairs. This gives the correct reduction curve for any particular film reading of the plate. When the sky fog is so dense as to give a film reading beyond 10·5 the effect on the reduction is such as to render it useless for accurate reductions. Consequently, all plates with film readings greater than 10·5 are discarded. Any exposure sufficiently long to give measurable images of the fainter stars fogs the plate well beyond film reading 10·5, so it will be readily seen that this method is not suitable for photometric work at this observatory.

Correction for Curvature of Field of Camera

Since the focus of the centre of the field of the camera is longer than that of the outer parts of the field, the centre of the plate is not so far out of focus as are the surrounding parts. Consequently, the size of the star image increases according to its distance from the optical centre. This increase in the size of the image means that the image of a star will be more dense when it is in the centre of the plate than if it were out some distance. In order that we may have the relative magnitudes of the stars on the plate it is necessary to apply a correction dependent on the distance of the star from the centre of the field. This correction is determined in the following manner. The telescope is set so that Polaris or some other star near it is in the centre of the field, a star near the pole being chosen so that there will be no marked change in zenith distance during the exposure. After an exposure sufficient to give a good image the telescope is moved about 20 minutes in declination and another exposure made. This is repeated across the plate to a distance of about 3 degrees each way from the centre. Care must be taken to have the exposure times as nearly the same as possible, and also the sky must be uniformly clear during the entire series of exposures. The densities of the resulting images are measured and converted to relative magnitudes from the reduction curve.

These relative magnitudes are subtracted from the magnitude of the central image and the resulting differences plotted against the distances of the respective images from the centre. The curve thus formed (Fig. 9) gives the corrections necessary to reduce all measures to the centre of the plate. Table II gives these corrections in tabulated form. Any errors in the curve due to wrong exposure time or uneven sky are reduced to a minimum by taking the mean of a large number of plates.

Atmospheric Absorption

As the effective field of the 6-inch doublet as used in photometric work has a diameter of nearly 6 degrees the zenith distances of the stars on a plate differ. If the field being photographed is far south or far east or west of the meridian, this difference in zenith distance means a difference in the relative magnitudes due to a difference in the atmospheric absorption. The zenith distance of the centre of the plate at the middle of the exposure and also the angle pole-star-zenith are measured directly from a globe and the differences in zenith distance, ΔZ, between the centre star and the others are then read directly from the plate by a graphic method of Prof. Parkhurst's. Using the extinction

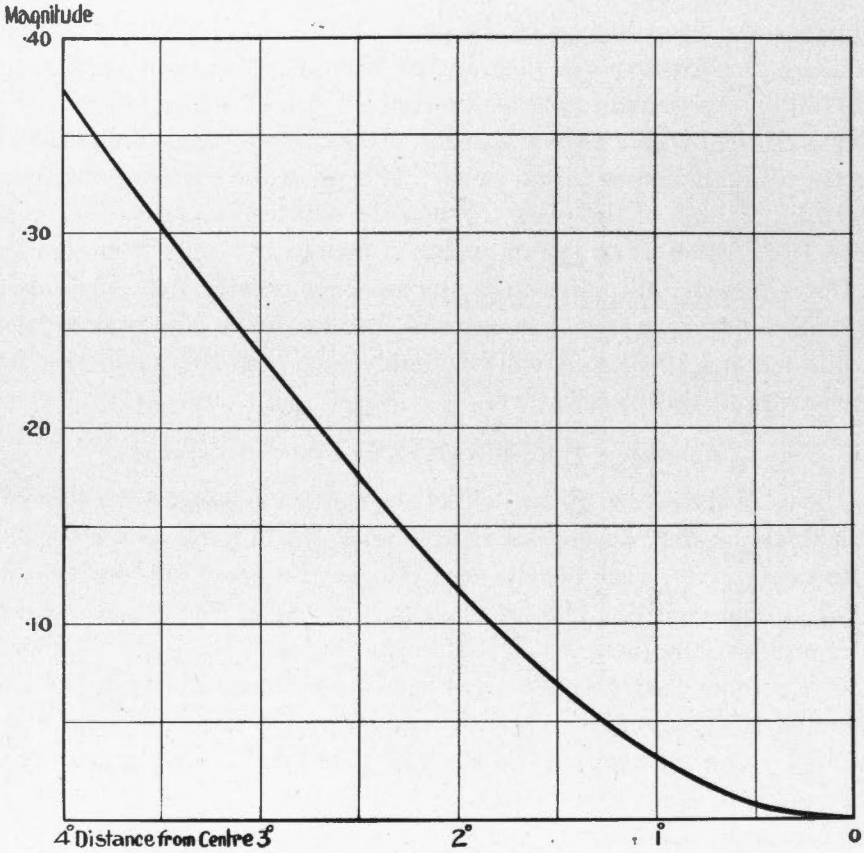

Fig. 9—Correction Curve for Distance from Centre of Plate

curve of Wirtz [1] the change in magnitude, ΔM, due to the difference in zenith distance, ΔZ, is determined. Table III gives the quantity, $\frac{\Delta M}{\Delta Z}$ for various zenith distances as derived from the Wirtz curve. This quantity multiplied by ΔZ gives the required ΔM.

TABLE II

CORRECTIONS FOR DISTANCE FROM CENTRE OF FIELD

ρ Distance from centre	Correction*	ρ Distance from centre	Correction*	ρ Distance from centre	Correction*	ρ Distance from centre	Correction*
°	M	°	M	°	M	°	M
0·1	0·00	0·9	0·03	1·7	0·09	2·5	0·18
0·2	0·00	1·0	0·03	1·8	0·10	2·6	0·19
0·3	0·00	1·1	0·04	1·9	0·11	2·7	0·20
0·4	0·01	1·2	0·05	2·0	0·12	2·8	0·22
0·5	0·01	1·3	0·06	2·1	0·13	2·9	0·23
0·6	0·01	1·4	0·06	2·2	0·14	3·0	0·24
0·7	0·02	1·5	0·07	2·3	0·15	3·1	0·26
0·8	0·02	1·6	0·08	2·4	0·17	3·2	0·27

*This correction is necessarily negative as the distance out of focus increases with distance from centre; hence the images are larger and less dense, and the star would appear to be fainter than it really is. To correct for this apparent faintness we must increase its magnitude, that is, apply a negative correction.

[1] A. N., Vol. 154, p. 349, 1900.

TABLE III

Zenith distance	$\frac{\Delta M}{\Delta Z}$	Zenith distance	$\frac{\Delta M}{\Delta Z}$	Zenith distance	$\frac{\Delta M}{\Delta Z}$	Zenith distance	$\frac{\Delta M}{\Delta Z}$
°	M	°	M	°	M	°	M
10	0·001	37	0·007	50	0·013	58	0·020
15	0·002	40	0·008	51	0·014	59	0·021
20	0·002	42	0·009	52	0·015	60	0·023
25	0·003	44	0·010	53	0·016	61	0·025
30	0·005	46	0·010	54	0·017	62	0·028
34	0·006	47	0·011	55	0·018	63	0·030
35	0·006	48	0·011	56	0·019	64	0·032
36	0·007	49	0·012	57	0·019	65	0·035

The following sample reduction of some stars on plate No. 517, as given in Table IV, will make clear the method of measurement and reduction of the star images.

TABLE IV

Plate 517 (part) H.A. $=2^{h}\cdot 8$ W; $z=36°\cdot 5$; $q=128°\cdot 5$; $\frac{\Delta M}{\Delta Z}=\cdot 007$

Star	Scale Reading	Rel. Mag.	ρ	ΔZ	Corrn. for ρ	ΔM	Corr'd. Rel. Mag.	Park. Mag. −Corr'd. Rel. Mag.	Final Mag.	Observed Mag. −Park. Mag.
B.D.			°	°						
77° 641	46·8	1·19	0·5	±0·1	−·01	·00	1·18	5·42	6·53	−·02
77 634	54·9	0·86	1·1	−0·3	−·04	·00	0·82	5·54	6·22	−·14
78 562	25·1	2·09	1·3	−0·8	−·06	−·01	2·02	5·47	7·42	−·07
77 627	25·1	2·09	1·7	−0·9	−·09	−·01	1·99	5·44	7·39	−·04
79 511	21·6	2·30	1·4	−1·3	−·06	−·01	2·23	5·27	7·63	+·13
80 519	20·8	2·36	2·2	−1·9	−·14	−·01	2·21	5·32	7·61	+·08
79 540	25·7	2·06	1·5	0·0	−·07	·00	1·99	5·36	7·39	+·04

H.A. is the hour angle of the centre of the plate at the middle of exposure.
z is the zenith distance of the centre of the plate at the middle of exposure.
q is the angle pole-star-zenith and is measured directly from a globe. This angle is necessary in order that ΔZ may be read graphically from the plates.
$\frac{\Delta M}{\Delta Z}$ as stated above is from Wirtz's extinction curve and its value, depending on the zenith distance, is given in Table III.

Column (1) gives the B.D. number of the star.
Column (2) gives the density of the star image in terms of the scale on the microphotometer.
Column (3) gives the relative magnitude of each star as read from the mean reduction curve.
Column (4) gives the distance of each star from the centre of the plate.
Column (5) gives the difference in zenith distance between each star and the centre of the plate.
Column (6) gives the correction for reducing each measure to the centre of the plate, being read directly from Table II.
Column (7) gives the correction for atmospheric absorption being derived from ΔZ and Table III, which gives $\frac{\Delta M}{\Delta Z}$ for the zenith distance of the centre of the plate.
Column (8) gives relative magnitudes to which the corrections have been applied.
Column (9) gives difference between Parkhurst's magnitudes and the relative corrected magnitudes. The mean of the quantities in column (9) gives the quantity to be added to column (8) to give the final magnitudes as in column (10). For this plate the mean of column (9) was 5·49.
Column (10) gives the residuals, observed magnitudes minus Parkhurst's magnitudes.

While the most outstanding sources of error have doubtless been taken care of by the methods described there are still possible sources of minor errors. The variation in the thickness of the glass in the photographic plate must produce errors which are classed as accidental along with all other irregularities of the film not revealed by the film readings. The sky fog is taken care of up to a certain density beyond which it is well to discard the plate. Also much greater accuracy is assured by discarding all measures of star images below 20 and above 55 as the reduction curve is much more uncertain beyond these points and there is a lack of agreement between successive settings of the wedge.

TABLE OF EXPOSURES

TABLE V

Plate	Date					Julian Day	Exposure	
		d	h	m	s		h	m
	1917—							
267	April	21	15	52	55	2421340·6617	0	10
268			16	17	55	340·6791	0	10
269			17	18	55	340·7215	0	10
270			17	46	55	340·7409	0	10
276	May	14	15	51	56	363·6610	0	10
	1919—							
517	July	24	16	47	00	2422164·6993	0	15
518			17	16	00	164·7194	0	15
530	Sept.	26	14	01	30	228·5844	0	15
536	Oct.	29	15	21	30	261·6399	0	15
	1920—							
539	May	10	14	50	00	455·6181	0	15
540			16	03	00	455·6687	0	15
541			16	33	00	455·6896	0	15
542	June	7	15	00	00	483·6250	0	15
543			15	56	30	483·6642	0	15
544			16	26	30	483·6851	0	15
545	June	11	15	52	00	487·6611	0	8
546			16	12	30	487·6753	0	15
547	June	13	15	50	30	489·6601	0	15
548			16	16	00	489·6778	0	8
	1921—							
585	Mar.	3	17	32	00	752·7306	0	24
586			18	17	30	752·7622	0	25
587	April	1	17	16	00	781·7194	0	10
588			17	59	00	781·7493	0	30
589	April	5	17	25	30	785·7260	0	15
590			17	56	00	785·7472	0	30
591			18	43	00	785·7799	1	00

CATALOGUE OF RESULTS

Star B.D.	Plate	Position, 1900 R.A.	Position, 1900 Dec.	Spec.	Magnitude		P.E.	O-P
°		h m	° ′					
77 27	536	00 43·6	77 25	A_5		7·10	.....	+·20
85 19	589	00 55·0	85 43	K_0	5·55			
	590	.....	.....	.....	5·54	5·54	·00	+·07
88 4	587	00 55·6	88 30	A_2	6·32			
	588	.....	.....	.....	6·34			
	589	.....	.....	.....	6·36			
	590	.....	.....	.....	6·37	6·35	·01	−·08
73 51	536	00 57·6	73 50	A_0		6·87	.....	+·12
86 17	589	00 59·1	86 37	K_0	7·31			
	590	.....	.....	.....	7·28			
	591	.....	.....	.....	7·27	7·29	·01	−·06
76 40	536	01 12·0	77 02	G_5		7·24	.....	+·01
75 58	536	01 13·8	76 11	K_0		7·99	.....	+·10
73 66	536	01 13·8	74 03	A_2		7·26	.....	−·03
75 59	536	01 13·8	75 43	A_3		6·68	.....	+·06
77 49	536	01 15·0	78 12	A_2		6·45	.....	+·14
73 75	536	01 21·0	73 41	G_5		7·58	.....	−·16
73 81	536	01 29·2	73 47	B_8		6·46	.....	−·07
77 58	536	01 31·6	77 28	B_9		6·58	.....	−·06
75 72	536	01 36·0	75 22	F_0		7·24	.....	−·13
74 84	536	01 42·7	75 06	F_5		7·13	.....	−·12
75 76	536	01 46·2	75 44	A_5		7·10	.....	−·10
74 87	536	01 48·7	74 50	G_5		7·51	.....	−·01
86 51	589	03 33·9	86 20	F_5	6·22			
	590	.....	.....	.....	6·12	6·17	·03	+·04
89 13	587	07 58·0	88 56	A_3	7·19			
	588	.....	.....	.....	7·08			
	589	.....	.....	.....	7·15			
	590	.....	.....	.....	7·15			
	591	.....	.....	.....	7·19	7·15	·01	+·03
79 328	267	10 05·8	79 27	A_0	6·87			
	539	.....	.....	.....	6·88	6·87	·00	−·08
81 343	539	10 25·7	81 01	G_5		7·52	.....	+·05
76 393	267	10 26·6	76 14	G_5	5·89			
	539	.....	.....	.....	5·96	5·92	·02	+·05
77 406	539	10 32·9	77 45	A_0		7·37		
81 349	267	10 33·6	80 57	A_0	6·77			
	539	.....	.....	.....	6·73	6·75	·01	+·04
78 359	539	10 34·5	77 56	B_9		7·32	.....	−·25
76 402	539	10 43·5	76 32	A_3		7·26	.....	−·01
80 347	539	10 50·7	80 13	F_8		7·71	.....	+·03
76 406	539	10 51·5	76 15	F_5		7·80	.....	−·01
78 567	539	10 52·0	78 18	G_5		7·19	.....	−·01
88 64	587	11 04·2	88 11	B_8	7·36			
	588	.....	.....	.....	7·28			
	590	.....	.....	.....	7·42			
	591	.....	.....	.....	7·38	7·36	·02	+·09
78 385	539	11 16·0	77 55	F_5		7·72		
80 370	585	11 54·5	80 09	F_8		8·17		
87 101	588	11 54·6	87 33	A_2		7·78		
81 389	585	11 55·1	81 28	Ma		7·98		

CATALOGUE OF RESULTS—*Continued*

Star B.D.	Plate	Position, 1900 R.A.	Position, 1900 Dec.	Spec.	Magnitude		P.E.	O-P
°		h m	° ′					
76 439	540	11 58·8	76 37	A_3		7·56		
86 176	587	11 59·7	86 08	F_5	6·75			
	588	.....	.....	.....	6·82	6·78	·01	+·10
77 461	268	12 00·2	77 28	K_0	6·80			
	540	.....	.....	.....	6·81	6·80	·01	−·03
75 469	268	12 04·9	75 13	F_5	6·61			
	540	.....	.....	.....	6·64	6·62	·01	+·02
78 411	268	12 07·1	78 00	A_0		6·47	.....	−·07
78 412	268	12 07·5	78 10	A_5		5·47	.....	+·07
87 107	587	12 13·9	86 59	F_2	6·61			
	588	.....	.....	.....	6·67	6·64	·02	+·10
88 71	587	12 14·4	88 15	F_0	6·43			
	588	.....	.....	.....	6·54			
	589	.....	.....	.....	6·48			
	590	.....	.....	.....	6·55	6·50	·02	+·14
81 400	585	12 31·1	80 48	F_2		7·50	.....	+·05
80 389	585	12 34·1	79 46	G_0		7·46	.....	−·04
86 182	587	12 34·6	86 17	F_0	7·28		·03	
	588	.....	.....	.....	7·37	7·32	.....	+·04
81 402	585	12 41·9	81 10	A_0		6·44	.....	+·05
76 470	540	12 51·1	75 57	K_0		7·83	.....	+·05
76 473	540	12 55·9	76 00	K_0	7·00			
	541	.....	.....	.....	7·01	7·00	·00	−·05
81 412	585	12 58·6	81 25	G_0		7·84	.....	−·07
86 187	588	12 59·7	86 25	F_8		8·03	.....	−·04
77 506	540	13 10·4	77 44	A_2	7·73			
	541	.....	.....	.....	7·69	7·71	·01	
81 416	585	13 11·5	81 00	G_5		7·17	.....	−·04
85 222	588	13 18·7	85 17	G_0		7·65		
79 422	269	13 26·1	79 10	G_5	6·46			
	541	.....	.....	.....	6·48	6·47	·01	+·05
76 492	541	13 32·6	76 17	A_0		7·63	.....	−·09
77 519	269	13 39·7	77 20	A_5	6·61			
	541	.....	.....	.....	6·62	6·61	·00	−·06
78 466	269	13 42·2	78 34	K_0	6·94			
	541	.....	.....	.....	6·93	6·93	·00	+·07
76 502	541	13 48·5	76 04	F_0		7·48	.....	−·19
86 201	588	13 59·4	86 14	F_0		7·54	.....	−·05
75 529	269	14 06·2	75 04	A_3	6·41			
	541	.....	.....	.....	6·42	6·41	·00	−·02
78 478	269	14 09·2	78 01	K_0	6·31			
	541	.....	.....	.....	6·33	6·32	·01	−·05
81 482	586	14 33·0	81 15	G_5		7·63	.....	−·02
80 448	586	14 36·4	80 06	K_0		7·78	.....	+·19
76 536	542	14 48·1	76 29	A_2	7·48			
	547	.....	.....	.....	7·59	7·53	·04	+·05
86 217	588	14 49·6	86 22	K_0		8·01		
81 495	586	14 55·0	81 09	A_0		7·20	.....	+·04
78 501	542	14 55·4	78 34	K_0	7·53			
	547	.....	.....	.....	7·56			
	586	.....	.....	.....	7·60	7·56	·01	+·04

CATALOGUE OF RESULTS—*Continued*

Star B.D.	Plate	Position, 1900 R.A.	Position, 1900 Dec.	Spec.	Magnitude		P.E.	O-P
°		h m	° ′					
83 431	586	14 57·1	82 55	G_0		6·34	.....	+·14
77 592	270	15 34·4	77 41	K_5	6·55			
	542	.....	.....	.....	6·75			
	543	.....	.....	.....	6·76			
	545	.....	.....	.....	6·76			
	547	.....	.....	.....	6·67			
	548	.....	.....	.....	6·82	6·72	·03	+·09
80 480 }	586	15 35·0	80 47 }	G_5		6·84	.....	−·04
481 }	.....	15 35·2	80 47 }					
81 517	586	15 35·9	81 06	K_0		7·85	.....	−·07
76 563	542	15 36·8	76 47	A_2	7·63			
	543	.....	.....	.....	7·52			
	547	.....	.....	.....	7·59	7·58	·02	−·04
82 463	586	15 38·1	82 36	F_0		7·15	.....	−·10
81 523	586	15 42·9	80 56	G_5		7·79	.....	−·04
80 487	542	15 45·1	80 18	F_2	7·15			
	547	.....	.....	.....	7·16			
	586	.....	.....	.....	7·13	7·15	·01	−·05
85 265	588	15 47·2	85 13	.....		7·77		
81 531	586	15 51·4	81 14	K_2		8·34	.....	+·04
83 453	586	15 53·8	83 15	A_2		7·44	.....	−·17
82 470	586	15 55·0	82 39	F_0		8·19		
75 579	542	15 57·4	75 52	G_5	7·75			
	547	.....	.....	.....	7·69	7·72	·02	−·10
85 269	587	15 57·4	85 35	A_5	6·91			
	588	.....	.....	.....	6·85	6·88	·02	−·19
73 707	543	16 05·4	73 25	F_5		7·15	.....	−·20
77 616	270	16 06·8	77 04	A_0	5·66			
	276	.....	.....	.....	5·68			
	543	.....	.....	.....	5·77			
	545	.....	.....	.....	5·71			
	548	.....	.....	.....	5·69	5·70	·01	+·11
76 594	270	16 13·7	76 08	B_8	5·19			
	276	.....	.....	.....	5·21			
	545	.....	.....	.....	5·17			
	548	.....	.....	.....	5·14	5·18	·01	·00
75 586	543	16 15·0	75 28	K_2		7·68	.....	−·11
82 481	586	16 19·5	82 19	A_2		7·84		
73 713	276	16 16·2	73 38	A_0	5·83			
	543	.....	.....	.....	6·03			
	545	.....	.....	.....	5·91			
	548	.....	.....	.....	5·90	5·92	·03	−·02
76 596	276	16 20·4	75 59	F_0	5·24			
	545	.....	.....	.....	5·14			
	548	.....	.....	.....	5·18	5·19	·02	+·01
76 600	543	16 23·0	76 23	A_3	7·14			
	545	.....	.....	.....	7·15			
	548	.....	.....	.....	7·13	7·14	·00	−·09
82 485	586	16 25·0	82 49	.....		7·62		
77 627	517	16 34·9	77 39	G_5	7·40			
	543	.....	.....	.....	7·46			

CATALOGUE OF RESULTS—*Continued*

Star B.D.	Plate	Position, 1900 R.A.	Position, 1900 Dec.	Spec.	Magnitude		P.E.	O-P
° ′		h m	° ′					
	544	.....	.....	.....	7·37			
	546	.....	.....	.....	7·41	7·41	·01	−·02
80 519	517	16 37·7	80 00	G_0	7·62			
	544	.....	.....	.....	7·52	7·57	·03	+·04
77 628	517	16 37·8	77 53	A_2	7·70			
	543	.....	.....	.....	7·76			
	544	.....	.....	.....	7·61			
	546	.....	.....	.....	7·68	7·69	·02	
78 562	517	16 39·9	77 57	F_8	7·43			
	543	.....	.....	.....	7·52			
	544	.....	.....	.....	7·38			
	546	.....	.....	.....	7·41	7·43	·02	−·06
79 508	544	16 41·8	79 24	F_2	7·98			
	546	.....	.....	.....	8·03	8·00	·02	
79 511	517	16 43·6	79 06	K_0	7·64			
	544	.....	.....	.....	7·52			
	546	.....	.....	.....	7·58	7·58	·02	+·08
74 680	543	16 44·2	74 04	A_2	7·02			
	545	.....	.....	.....	7·01			
	548	.....	.....	.....	6·97	7·00	·01	+·01
77 634	276	16 47·5	77 41	F_2	6·27			
	517	.....	.....	.....	6·23			
	543	.....	.....	.....	6·40			
	544	.....	.....	.....	6·44			
	545	.....	.....	.....	6·27			
	546	.....	.....	.....	6·36			
	548	.....	.....	.....	6·31	6·33	·02	−·03
75 608	543	16 56·0	75 33	F_0		7·09	.....	+·06
77 639	517	16 56·8	77 01	F_0	7·58			
	543	.....	.....	.....	7·60			
	544	.....	.....	.....	7·57			
	546	.....	.....	.....	7·57	7·58	·00	−·03
77 641	517	17 00·9	77 48	A_0	6·59			
	544	.....	.....	.....	6·67			
	546	.....	.....	.....	6·69	6·65	·02	+·05
79 540	517	17 25·8	79 24	A_5	7·40			
	530	.....	.....	.....	7·35			
	544	.....	.....	.....	7·43			
	546	.....	.....	.....	7·34	7·38	·01	+·03
80·544	517	17 27·2	80 14	K_2	7·65			
	518	.....	.....	.....	7·35			
	530	.....	.....	.....	7·51			
	544	.....	.....	.....	7·55			
	546	.....	.....	.....	7·49	7·51	·03	+·19
79 556	518	17 44·2	79 16	F_2	7·54			
	530	.....	.....	.....	7·69	7·61	·05	−·06
79 564	518	17 55·6	79 21	F_2	7·76			
	530	.....	.....	.....	7·77	7·76	·00	−·01
78 616	518	17 55·8	78 19	K_5	7·86			
	530	.....	.....	.....	7·78	7·82	·03	+·10
78 621	518	18 00·1	78 41	F_2	7·79			

CATALOGUE OF RESULTS—*Concluded*

Star B.D.	Plate	Position, 1900		Spec.	Magnitude		P.E.	O-P
		R.A.	Dec.					
° ′		h m	° ′					
	530	.....	.....	.....	7·71	7·75	·03	−·06
86 272	587	18 07·8	87 00	A_3	5·86			
	589	.....	.....	.....	5·79			
	590	.....	.....	.....	5·88	5·84	·02	−·07
79 587	530	18 30·6	79 09	K_0		7·85	.....	+·06
79 590a	518	18 33·1	79 33	A_5	7·56			
	530	.....	.....	.....	7·62	7·59	·02	+·01
77 699	518	18 34·6	77 28	K_0	6·98			
	530	.....	.....	.....	7·04	7·01	·02	+·09
77 702	518	18 42·3	77 35	F_0	7·19			
	530	.....	.....	.....	7·20	7·19	·00	−·06
88 112	588	19 22·5	88 59	Mb	7·97			
	591	.....	.....	.....	7·92	7·94	·02	−·15
87 205	589	22 24·2	87 34	A_2	7·34			
	590	.....	.....	.....	7·34			
	591	.....	.....	.....	7·38	7·35	·01	−·13
85 399	589	23 24·4	85 52	A_6	6·78			
	590	.....	.....	.....	6·75			
	591	.....	.....	.....	6·79	6·77	·01	−·02
85 401	591	23 27·5	86 00	.....		7·46		
86 344	589	23 27·8	86 45	A_4	5·67			
	590	.....	.....	.....	5·64	5·65	·01	+·03
85 403	589	23 30·4	85 38	.....	7·22			
	590	.....	.....	.....	7·13			
	591	.....	.....	.....	7·19	7·18	·02	
85 409	589	23 54·8	86 09	.....	6·71			
	590	.....	.....	.....	6·64			
	591	.....	.....	.....	6·67	6·67	·01	

Column (1) gives the B.D. number of the star.
Column (2) gives the number of each plate on which each star was measured, the date of exposure of each plate being given in Table V.
Columns (3) and (4) give the position for 1900.
Column (5) gives the Harvard spectral type.
Column (6) gives the magnitude derived from each plate and also the mean magnitude for each star.
Column (7) gives the probable error of the mean magnitude.
Column (8) gives the difference between the Ottawa magnitude and that contained in Yerkes Actinometry.

The probable errors given in column (7) were plotted against the distance, ρ, of each star from the centre of the plate as a check on the values given in Table II. The resulting curve of the normal places was a line practically parallel to the ρ ordinate, so that the probable error is evidently in no way dependent on the position of the star image on the plate.

Similarly it was shown that there was no connection between the probable error and the spectral type.

The residuals in column (8) were plotted against spectral type, distance of star from centre of plate and magnitude, respectively, no apparent relation existing in any case.

All the plates listed in Table V were measured at least twice and the average taken, the measures being practically identical. The question of obtaining measurable plates, however, has been a problem owing to the proximity of the city lights. Where the exposure exceeded fifteen minutes there were at least five bad plates for every good one. The results, however, agree very closely with the magnitudes of the Yerkes Actinometry, as published by Prof. Parkhurst. The writer had the privilege of studying photometric work under the direction of Prof. Parkhurst and has followed his method as closely as possible.

DOMINION OBSERVATORY,
OTTAWA, CANADA,
September, 1924.

DEPARTMENT OF THE INTERIOR
CANADA

HON. CHARLES STEWART, *Minister* W. W. CORY, C.M.G., *Deputy Minister*

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Magnetic Results, 1921-1923

BY

C. A. FRENCH, B.A. AND R. G. MADILL, B.A.

OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1927

CONTENTS

	Page
Introduction	139
Instrumental equipment	140
Comparison of magnetic instruments with standards	146
Summary of results of declination comparisons	146
Summary of results of horizontal intensity comparisons	147
Summary of results of inclination comparisons	148
Determination of log C	149
Dip circle errors	153
Astronomical observations and their reduction	157
Magnetic work	159
Magnetic observatory data	159
Program of special declination observations	159
Method of deriving the mean declination	159
Reduction of special declination observations	160
Diurnal range of declination	176
Determination of diurnal variation corrections	177
Inclination observations	181
Horizontal intensity observations	182
Determination of total intensity by Lloyd's method	183
Summary of magnetic results	184
Selection and descriptions of stations	185
Magnetic observations, 1921	187
Magnetic observations, 1922	188
Magnetic observations, 1923	203
Magnetic stations and descriptions	213

376.8—1½

ILLUSTRATIONS

PAGE

Fig. 1. Stopping for Lunch 141
Fig. 2. Transportation on Hudson Bay Railway 143
Fig. 3. Magnetic Station, York Factory 143
Fig. 4. Looking Across Clearwater River 151
Fig. 5. Shooting Rapids on Kississing River 151
Fig. 6. Sundial at Chipewyan, Alta 155
Fig. 7. Nueltin Lake Narrows, N.W.T. 155

Fig. 8. (a) Magnetic Declination, Meanook, May 23, 1922 162
(b) Magnetic Declination, Fort St. John, May 23, 1922 162
(c) Magnetic Declination, corrected for disturbance, Fort St. John, May 23, 1922 162
Fig. 9. (a) Magnetic Declination, Meanook, June 24-25, 1922 163
(b) Magnetic Declination, Fort Vermilion, June 24-25, 1922 163
(c) Magnetic Declination, corrected for disturbance, Fort Vermilion, June 24-25, 1922 163
Fig. 10. (a) Magnetic Declination, Meanook, August 3-4, 1922 164
(b) Magnetic Declination, Resolution, B, August 3-4, 1922 164
(c) Magnetic Declination, corrected for distrubance, Resolution, B, August 3-4, 1922 164
Fig. 11. (a) Magnetic Declination, Meanook, June 10, 1923 165
(b) Magnetic Declination. McMurray, June 10, 1923 165
(c) Magnetic Declination, Kississing Lake, June 10, 1923 165
(d) Magnetic Declination, corrected for disturbance, McMurray, June 10, 1923 155
(e) Magnetic Declination, corrected for disturbance, Kississing Lake, June 10, 1923 165
Fig. 12. (a) Magnetic Declination, Meanook, August 10, 1923 166
(b) Magnetic Declination, McPherson, August 10, 1923 166
(c) Magnetic Declination, Churchill, August 10, 1923 166
Fig. 13. (a) Magnetic Declination, Meanook, August 20, 1923 167
(b) Magnetic Declination, Aklavik, August 20, 1923 167
(c) Magnetic Declination, York Factory, August 20, 1923 167
Fig. 14. (a) Magnetic Declination, Meanook, July 20-21, 1923 168
(b) Magnetic Declination, Norman, July 20-21, 1923 168

Diurnal Variation of Magnetic Declination derived from Results at Stations in Group 1 .....
Fig. 15. (a) Variation of Declination corresponding to H = ·0600 c.g.s. 169
(b) Variation of Declination corresponding to H = ·0700 c.g.s. 169
(c) Variation of Declination corresponding to H = ·0800 c.g.s. 169
(d) Variation of Declination corresponding to H = ·0900 c.g.s. 169
(e) Variation of Declination corresponding to H = ·1000 c.g.s. 169
(f) Variation of Declination corresponding to H = ·1100 c.g.s. 169
(g) Variation of Declination corresponding to H = ·1200 c.g.s. 169
(h) Variation of Declination corresponding to H = ·1300 c.g.s. 169
(i) Variation of Declination corresponding to H = ·1400 c.g.s. 169

Diurnal Variation of Magnetic Declination derived from Results at Stations in Group 2 .....
Fig. 16. Variation of Declination corresponding to H = ·0882 c.g.s. 170

Diurnal Variation of Magnetic Declination derived from Results at Stations in Group 3 .....
Fig. 17. (a) Variation of Declination corresponding to H = ·0600 c.g.s. 171
(b) Variation of Declination corresponding to H = ·0700 c.g.s. 171
(c) Variation of Declination corresponding to H = ·0800 c.g.s. 171
(d) Variation of Declination corresponding to H = ·0900 c.g.s. 171
(e) Variation of Declination corresponding to H = ·1000 c.g.s. 171
(f) Variation of Declination corresponding to H = ·1100 c.g.s. 171

MAGNETIC RESULTS, 1921-1923

INTRODUCTION

An account of the work accomplished by the Dominion Observatory in connection with the magnetic survey of the Dominion of Canada between 1907 and 1920 is contained in Vol. V, No. 5, of the Publications of the Dominion Observatory. The three magnetic elements, declination, dip and horizontal intensity were observed at points which represented 424 distinct localities, and at these were obtained 216 determinations from which secular variation data were derived. With the exception of twelve, which are along the Canadian National Railway in British Columbia, all the stations are south of latitude 54° and are distributed over the country extending from the Atlantic to the Pacific oceans.

In the present report it is intended to outline briefly the results of the operations of the three seasons 1921-1923. During 1921 field work was confined to certain sections in Eastern Canada where there was a lack of magnetic data. This may be considered as a filling-in process, more of which it is hoped will be done as the survey progresses. During the seasons 1922 and 1923 practically all of the work was done in portions of the country heretofore untouched by this branch. One party operated along the main waterway between Fort St. John on Peace river and Aklavik, which is near the mouth of Mackenzie river, and, in addition, for about one month along the railways in Alberta and Saskatchewan; the other covered portions of northern Saskatchewan and northern Manitoba, touching at points on Hudson bay.

Various organizations have in the past, however, carried on work in the greater part of the country covered by the operations of the two seasons 1922 and 1923. Among others may be mentioned the Carnegie Institution of Washington, and the Meteorological Service of Canada. The former organization occupied a series of stations between The Pas, Manitoba, and the northern boundary of Saskatchewan in 1908, and the latter sent an expedition down Mackenzie river in 1910 and one into Hudson bay in 1912. As a knowledge of secular change is necessary for reducing observations to epoch, as many as possible of the stations of these organizations were re-occupied.

The following summary contains the number of stations occupied during the period 1921-1923, and the approximate region in which those of a particular year are located. In some cases it was deemed advisable to establish two stations in the same locality, particularly where a repeat station did not appear likely to be available for future occupation; the transfer from the old site to the new was thus readily made. In the summary the number of these additional stations is given in the column headed "Secondary," as well as being included in the number representing the total. It sometimes happens, in the course of the work, that the exact position of an old station cannot be definitely located. In such cases it is the rule, if local attraction is suspected, to make tests by observing for declination at a point or points in the immediate vicinity of the station. In the summary no account is taken of these observations.

SUMMARY SHOWING THE NUMBER AND THE DISTRIBUTION OF MAGNETIC STATIONS, 1921-1923

Year	Number of Stations				Locality
	New	Repeat	Total	Secondary	
1921	39	6	45	2	Territory lying south of latitude 49°·3 and east of longitude 77°·9.
1922	48	1	49	1	Thirty-eight along Peace, Slave and Athabaska rivers, and eleven along the railways in the central part of Alberta and Saskatchewan.
1922	21	4	25	0	Seventeen from The Pas, Man., north to Nueltin lake along the water route in close proximity to the boundary between Manitoba and Saskatchewan, and eight along the Hudson Bay Railway.
1923	22	2	24	4	Northwest Territory between Fort Smith and Aklavik by way of Slave lake and Mackenzie river.
1923	27	0	27	0	These stations are in the northerly part of Manitoba between The Pas and Hudson bay.

INSTRUMENTAL EQUIPMENT

The usual instrumental equipment of the approved type was used throughout. In this were included the following instruments:—

Magnetometers—

(1) Tesdorpf magnetometer No. 1977, used in 1921.

(2) Combined magnetometer and dip circle C.I.W. No. 20, the property of the Dominion Observatory, used throughout the seasons 1921-23.

(3) Combined magnetometer and dip circle C.I.W. No. 19, the property of the Carnegie Institution of Washington. This instrument was loaned for the work of two seasons, 1922-23.

Dip circles—

(1) Dip circles of combined magnetometer and dip circle No. 20, and combined magnetometer and dip circle No. 19, used during the seasons 1922-23.

(2) Dover dip circle No. 145, used for determining dip in 1921, and for dip and total intensity in 1922.

Chronometers—

(1) Half-seconds pocket chronometer Kittle No. 261, used during the seasons 1922-23.

(2) Pocket watch Nardin No. 9015, used during seasons 1921-23. This beats as an ordinary watch but is capable of producing seconds beats when it is connected with a relay and battery.

(3) Half-seconds standard chronometer Bond No. 511, used during the seasons 1921-23.

(4) Half-seconds standard chronometer King No. 2992, used during the seasons 1922-23. This chronometer was loaned by the Carnegie Institution of Washington.

The various types of instruments referred to are doubtless familiar to those interested in the subject of Terrestrial Magnetism, hence a description is not considered necessary. Certain references, however, relative to the description of these, may be found in Publications of the Dominion Observatory, Ottawa, Vol. V, No. 5, pp. 133-134.

FIG. 1. STOPPING FOR LUNCH
On the west coast of Hudson bay, near Port Nelson, the water is generally quite shallow. The distance from the position of the canoe to shore is approximately one mile.

FIG. 2. TRANSPORTATION ON HUDSON BAY RAILWAY
Railway motor lorry on which the magnetic survey party made the trip from The Pas, Man., to the end of steel, a distance of approximately 330 miles.

FIG. 3. MAGNETIC STATION, YORK FACTORY, MAN.
The site of the magnetic station is indicated roughly by the location of the tent in the foreground. The buildings are part of those comprising the post of the Hudson's Bay Company at York Factory.

For determining the correction to the chronometers there was added to the usual equipment of each party in 1923, a wireless receiving set. These sets were constructed in the Department of Naval Service of the Dominion Government. These rendered such service that a set is now considered a necessary part of the equipment in connection with field work. The effectiveness of this piece of apparatus may be inferred from the results at the field stations. As an illustration, the results at Aklavik ($\varphi=68°$, $\lambda=135°$), N.W.T., the farthest north station occupied during the seasons 1922 and 1923, are selected. No attempt was made to receive signals from more than the four stations, Annapolis (NSS), Panama (NBA), San Diego (NPL) and Honolulu (NPM); the wave lengths corresponding to the stations are, respectively, 17140, 7000, 9800 and 12090. The following remarks appear in the records of the comparisons relative to the reception of the signals from the various stations:—

TABLE 1.—NOTES ON RECEPTION OF WIRELESS TIME SIGNALS WITH SMALL PORTABLE RECEIVING SET AT AKLAVIK, N.W.T.

Date 1923	Station	Time (105th Mer.)			Remarks
		h.	m.	s.	
Aug. 15.....	NBA	11	00	00	Signals clear.
" 15.....	NPM	17	00	00	" " , some static.
" 16.....	NSS	10	00	00	" faint.
" 16.....	NPM	17	00	00	" clear, static much in evidence.
" 17.....	NSS	10	00	00	" " but rather faint.
" 17.....	NBA	11	00	00	" " " "
" 18.....	NPL	13	00	00	" " static.
" 20.....	NPL	13	00	00	" " even without amplification.
" 21.....	NSS	10	00	00	" faint.
" 21.....	NPL	13	00	00	" clear.
" 22.....	NSS	10	00	00	" faint.
" 22.....	NPL	13	00	00	" clear.
" 22.....	NPM	17	00	00	" "

In a general way the reception of signals from these four stations at points along the Mackenzie may be summarized as follows:—

Signals from Annapolis (NSS) at 10h were faint, and at 20h were practically inaudible.

Signals from Panama (NBA) were slightly more distinct than those from Annapolis.

Signals from San Diego (NPL) were invariably clear and distinct.

Signals from Honolulu (NPM) were usually clear and distinct.

The wire used for the aerial at stations (magnetic) along Mackenzie river was cotton covered No. 22, the length used being approximately 130 feet. The height of the aerial was usually about 15 feet at one end and varied from 15 feet to 35 feet at the other, the greater heights being possible, or convenient, only when a flagstaff was available. At Aklavik both ends were about 25 feet in height, the masts being of dimensions that the observer and his assistant could easily erect.

The observer working in the vicinity of Hudson bay received signals clearly from Annapolis and Panama at the mouth of Seal river on Hudson bay ($\varphi=59°\cdot1$, $\lambda=94°\cdot8$) with the aerial at a distance of only two feet above the ground.

COMPARISON OF MAGNETIC INSTRUMENTS WITH STANDARDS

In accordance with the usual procedure, the field instruments were compared in the spring and fall, 1921-23, with standard instruments to determine the correction to be applied to reduce observations to the International Magnetic Standard. One series was made in the spring of 1921 at Washington. This was carried out by officers of the Carnegie Institution at the time the C.I.W. magnetometer No. 20 was sent over for minor repairs. In April, 1922, this instrument was compared at Ottawa with the C.I.W. magnetometer No. 19 which was loaned by the Carnegie Institution. This latter instrument was taken as the standard, the correction to this on I.M.S. being known. Magnetometer No. 20 was also compared in May at the standard observatory for Canada which is located at Agincourt, Ontario. This observatory is a branch of the Meteorological Service and is under the directorship of Sir Frederic Stupart. All other comparisons were made, also, at Agincourt.

Tables 2 to 5 contain a summary of the results of the comparisons made between 1921 and 1923.

TABLE 2.—SUMMARY OF RESULTS OF DECLINATION COMPARISONS, 1921-1923

(a) Results of Comparisons of Magnetometer C. I. W. No. 20

Date	Number of sets	I.M.S.-Mag'r	Mean value for year	Place of comparison
		′	′	
1921, July	.....	−0·7	−0·8	Washington.[1]
1921, Nov	16	−1·0	.....	Agincourt.
1922, April	18 (Wt. 8)	−0·4	.....	Ottawa.[2]
1922, May	12	−1·5	−0·9	Agincourt.
1922, Nov	12	−0·6	.....	"
1923, May	20	−0·9	−0·8	"
1923, Oct	24	−0·8	.....	"

(b) Results of Comparisons of Magnetometer, Tesdorpf No. 1977

Date	Number of sets	I.M.S.-Mag'r.	Mean value for year	Place of comparison
		′	′	
1921, Aug	22 (Wt. 1)	+2·7	+1·6	Ottawa.[3]
1921, Nov	32 (Wt. 1)	+0·5	.....	Agincourt.

[1] Dominion Observatory magnetometer, C. I. W. No. 20, compared with standard instrument at Washington by the Carnegie Institution after minor repairs were made to the instrument.

[2] The Dominion Observatory magnetometer, C. I. W. No. 20, was compared with the Carnegie Institution magnetometer, C .I. W. No. 19, the result being obtained by applying the quantity (I. M. S.—C. I. W. No. 19) = −0′·1.

[3] The result was obtained by comparison with the D. O. magnetometer, C. I. W. No. 20, and applying the quantity (I. M. S. —C. I. W. No. 20) = −0′·7.

(c) Results of Comparisons of the Carnegie Institution Magnetometer, C. I. W. No. 19.

Date	Number of sets	I.M.S.-Mag'r.	Mean value for year	Place of comparison
		′	′	
1922,	.....	−0·1[1]	−0·4	Washington.
1922, Nov	15	−0·7	.....	Agincourt.
1923, May	14	−0·4	−0·3	"
1923, Oct	24	−0·2	.....	"

TABLE 3.—SUMMARY OF RESULTS OF HORIZONTAL INTENSITY COMPARISONS, 1921-23

(a) Results of Comparisons of Magnetometer, C. I. W. No. 20

Date	Number of sets	I.M.S.-Mag'r.	Mean value for year	Place of comparison
1921, July	.....	−0·00010*H*	−0·00013*H*	Washington.[2]
1921, Nov	5	−0·00016*H*	.....	Agincourt.
1922, April	4	+0·00018*H*	.....	Ottawa.[3]
1922, May	4	−0·00051*H*	−0·00050*H*	Agincourt.
1922, Nov	3	−0·00049*H*	.....	"
1923, May	3	−0·00049*H*	−0·00048*H*	"
1923, Oct	6	−0·00048*H*	.....	"

(b) Results of Comparisons of Magnetometer, Tesdorpf No. 1977

Date	Number of sets	I.M.S.-Mag'r.	Mean value for year	Place of comparison
1921, Aug	6	−0·00211*H*	−0·00226*H*	Ottawa.[4]
1921, Nov	6	−0·00242*H*	.....	Agincourt.

(c) Results of Comparisons of the Carnegie Institution Magnetometer, C. I. W. No. 19

Date	Number of sets	I.M.S.-Mag'r.	Mean value for year	Place of comparison
1922,	.....	−0·00030*H*[5]	−0·00070*H*	Washington.
1922, Nov	8	−0·00109*H*	.....	Agincourt.
1923, May	3	−0·00115*H*	−0·00124*H*	"
1923, Oct	6	−0·00132*H*	.....	"

[1] The value was furnished by the Carnegie Institution.
[2] Result obtained by the Carnegie Institution.
[3] Dominion Observatory magnetometer C. I. W. No. 20 was compared with the Carnegie Institution magnetometer C. I. W. No. 19, using the value (I.M.S.—C.I.W. No. 19) = −0·00030*H*.
[4] The result was obtained by comparison with the D. O. magnetometer C.I.W. No. 20, and applying the quantity (I.M.S.—C.I.W. No. 20) = −0·00010*H*.
[5] Value furnished by the Carnegie Institution.

TABLE 4.—SUMMARY OF RESULTS OF INCLINATION COMPARISONS, 1921-23

(a) Results of Comparisons of Magnetometer-Dip Circle C. I. W. No. 20

Date	Number of sets	I.M.S.—No. 20				Place of comparison
		No. 1 of 20	No. 2 of 20	No. 5 of 20	No. 6 of 20	
		′	′	′	′	
1921, June	4	−0·5	−0·7	−0·2	+0·1	Washington.[1]
1921, Nov	10	+0·3	+0·3	0·0	+1·1	Agincourt.
	Mean	−0·1	−0·2	−0·1	+0·6	
1922, May	5	+0·6	−0·3	+0·9	+1·5	Agincourt.
1922, Nov	6	0·0	−1·0	0·0	+2·0	"
	Mean	+0·3	−0·6	+0·4	+1·8	
1923, May	6	+0·4	−1·4	−1·1	+2·4	Agincourt.
1923, Oct	7	+0·4	−0·1	+0·6	+2·1	"
	Mean	+0·4	−0·8	−0·2	+2·2	

(b) Results of Comparis ons of Carnegie Institution Magnetometer-Dip Circle C. I. W. No. 19

Date	Number of sets	I.M.S.—No. 19				Place of comparison
		No. 1 of 19	No. 6 of 19	No. 3 of 20	No. 4 of 20	
		′	′	′	′	
1922,		+1·7	−0·1	+2·1	+0·7	Washington.[1]
1922, Nov	6	+3·5	−0·2	+2·8	−1·8	Agincourt.
1923, May	6	+2·1	+0·1	+1·4	−1·5	"
1923, Oct	9	+5·0	−1·4	+2·0	−0·8	"
	Mean[2]	+3·1	−0·4	+2·0	−0·8	

[1] Results were obtained at Washington by the Carnegie Institution.
[2] Mean value adopted for both 1922 and 1923.

TABLE 4.—SUMMARY OF RESULTS OF INCLINATION COMPARISONS, 1921-23 *(concluded)*

(c) RESULTS OF COMPARISONS OF DOMINION OBSERVATORY DIP CIRCLE DOVER No. 145

Date	Number of sets	I.M.S.—No. 145 Needle No. 1	I.M.S.—No. 145 Needle No. 2	Place of comparison
		′	′	
1921, Aug.	5	+1·2	.....	Ottawa.[1]
1921, Aug.	11	.....	+0·4	"
1921, Nov.	10	−0·2	+0·6	Agincourt.
Weighted mean	.....	+0·3	+0·5	
1922, May	6	+0·2	+0·6	Agincourt.
1922, Oct.	6	+0·4	+0·7	"
Mean	.....	+0·3	+0·6	

TABLE 5.—RESULTS OF OBSERVATIONS FOR THE DETERMINATION OF THE INSTRUMENTAL CONSTANT, LOG C, OF THE D. O. DIP CIRCLE, DOVER No. 145, AT AGINCOURT, 1922

Date, 1922	Inclination °	Inclination ′	Log. C[2]
May 3	74	44·6	9·41207
" 3		44·5	222
" 3		44·1	190
" 3		44·0	222
Mean	.....		9·41210
Oct. 30	74	44·4	9·41025
" 31		47·0	206
" 31		46·3	186
" 31		47·0	233
" 31		46·6	196
Nov. 1		45·5	215
Mean	.....		9·41177
Weighted mean for season	.....		9·41190

[1] These results were obtained by comparison with the D. O. earth inductor Toepfer No. 1911 and applying the quantity (I.M.S.—D. O. No. 1911) = −0′·25, which was determined at Washington in 1915.

[2] Dover dip circle No. 145 was mounted on pier D of the absolute room of the magnetic observatory. Readings, which were practically simultaneous, were taken on the H- and V- variometers, and the dip circle.

Observers: Dover dip circle No. 145, C. A. French ; variometers ,R. G. Madill.

It will be noted that there were obtained some rather large differences between various determinations of the same year. As an example the results of Table 2, *a*, show that there was a difference in the mean value of (I.M.S.—C.I.W. No. 20) determined in the year 1922 at Agincourt, amounting to $0'\cdot9$, a quantity which is exceedingly large in comparison with the errors in the individual series. The records show that the values of (I.M.S.—C.I.W. No. 20) for the May comparisons lie between $-1'\cdot0$ and $-1'\cdot9$, and the values for the November series are included between $-0'\cdot3$ and $-1'\cdot0$. From these it is apparent that the difference is not entirely due to errors of observation, that is to say accidental, but is probably, for the most part at least, due to some instrumental change. There are other striking differences to be noted in the tables which admit of no simple explanation. The most conspicuous case is that resulting from the comparisons with Tesdorpf No. 1977. With respect to this particular instrument, however, discordant results have been rather common, and to ascertain the cause of these the Carnegie Institution in 1915 carried out an investigation by making some special test observations. The part of the report dealing with this is as follows: "Because of the range of the results of the declination comparisons at Washington, Ottawa and Agincourt, 1908-1915, special tests and observations were made at Washington in November, 1915, to determine whether there was any impurity in the copper dampers, or the brass of the magnet house, of this instrument. These tests showed that for normal positions of the dampers there is no effect on account of possible magnetic impurity of the metal, even when the suspended magnet is at highest or lowest possible positions in its housing. The variation of the declination correction for magnetometer No. 1977 may have to be ascribed to slight displacements of the reflecting mirror mounted in the hollow magnet, or to the fact that the short suspension bars of the magnet may not invariably take up the same positions in the suspension hook."

There are one or two marked differences in the value (I.M.S.—C.I.W. No. 20) in the intensity comparisons at Agincourt. The comparison in November, 1921, gives a value $-0\cdot00016H$. In May, 1922, the value is $-0\cdot00051H$ indicating, probably, that some instrumental change had taken place. This may be due to a change in the moment of inertia of the intensity magnet. Recent determinations at least tend to justify this conclusion. The following table contains a summary of the values of the instrumental constant log π^2K for temperature 0° C:—

TABLE 6.—RESULTS OF DETERMINATION OF LOG π^2K

Date	Log π^2K	Determined at
1916	2·80651	Washington.
1921, June	586[1]	"
1921, July	593[1]	"
1924, May	534	Ottawa.

[1] Values of June and July were determined, respectively, before and after removing cap and refilling cross lines in the magnet.

FIG. 4. LOOKING ACROSS CLEARWATER RIVER
The craft, locally known as a skiff, is equipped with an outboard motor, in which the magnetic survey party made the trip from McMurray to Fitzgerald. Smith portage was then crossed by wagon and Slave river and Great Slave lake by steamer, after which the journey was resumed in the skiff down Mackenzie river to Aklavik, a distance of about 1,000 miles.

FIG. 5. SHOOTING RAPIDS ON KISSISSING RIVER
One of the numerous rapids encountered by the survey party working in the territory lying adjacent to Hudson bay. As experienced canoemen are always engaged on these expeditions accidents of a serious nature seldom occur.

The change between 1916 and 1921 amounting to 0·00065 in the logarithm of π^2K is such that the horizontal intensities obtained in June, 1921, and computed using the value of π^2K determined in 1916, will give a value too great by a quantity amounting to 0·00076H. Between 1921 and 1924[1] a further decrease took place in the value of K amounting to 0·00059 in the logarithm of π^2K. By using the value determined in 1921 to reduce results obtained in 1924 the value of the horizontal intensity will be too great by an amount equal to 0·00068H. It will be seen that this exceeds the amount required to account for the change in the value of (I.M.S.—C.I.W. No. 20) between 1921 and 1924 by 0·00030H. This difference may be ascribed to (1) errors of observation, (2) possible change in the instrument, such as the moment of inertia of the magnet, between October, 1923, and May, 1924, or (3) to a difference in the determined value of the moment of inertia due to employing different inertia bars,[2] which might give results that are not strictly comparable.

The results in Table 3, *c*, indicate that a change took place in the C.I.W. magnetometer, C.I.W. No. 19, between the time of comparison in Washington in 1922 and the comparison at Agincourt in November, 1922. The two values of (I.M.S.—C.I.W. No. 20) given in Table 3, *a*, can be reconciled only on the assumption that the greater part of this change in C.I.W. No. 19 had taken place as early as April, 1922, or before the comparison at Ottawa in April. The results of (I.M.S.—C.I.W. No. 20) at Washington and Agincourt in 1921 indicate that the adopted values of I.M.S. at the two places are practically identical.

The corrections adopted for a particular instrument and applied to the field observations are represented by the mean values (I.M.S.—Instrument), given in the summary of comparisons. Thus the corrections applied to the field observations taken with magnetometer—dip circle C.I.W. No. 20 during 1921 are −0′·8 for declination, −0·00013H for horizontal intensity, and −0′·1, −0′·2, −0′·1 and +0′·6 for dips obtained, respectively, with needles No. 1, No. 2, No. 5, and No. 6. The adopted corrections to dip circle C.I.W. No. 19 were derived from the mean of the four series obtained in 1922 and 1923 giving equal weight to each series. These corrections were applied to the observations taken during the seasons 1922 and 1923.

DIP CIRCLE ERRORS

It is known that dip circle errors determined at a base station may not hold for all values of dip. This is evident from the values obtained with the four dip needles, No. 1, No. 2, No. 5 and No. 6, which were used with dip circle No. 20 during the seasons of 1922 and 1923. From a comparison of needle differences it was seen that No. 1 gave values which were high in comparison with the other three needles, especially when the dip was between 78° and 79°, and 81° and 82°. Needle No. 6 also appeared slightly erratic, while No. 2 and No. 5 gave values throughout which were most nearly in accord.

While the results were such that correction values were desirable, any values determined would necessarily depend upon the field observations. The needle differences,

[1] In order to account for the changes in the H-correction for magnetometer C.I.W. No. 20, the moment of inertia was determined in 1924. This being the first determination subsequent to 1921, the results are included in this report.

[2] Value for 1916 was determined using inertia bars Nos. 19, 27 and 28; in 1921 inertia bar No. 16 was used, and in 1924 inertia bar No. 20, which belongs to the instrument, was used.

No. 1-No. 2, No. 2-No. 5, No. 5-No. 6 and No. 6-No. 1, were tabulated and assembled into nine groups representing dips ranging from 76° to 82°; included in the results were some observations taken in 1921, as well as practically all those of 1922 and 1923. From these differences relative values of dip for each group with the four needles were determined. Where a value with a particular needle differed decidedly from the other three, this value was assumed to be in error. It was further assumed that the true value was that given by the mean of the other three needles. For groups where there were no outstanding values a mean was determined from the four needles. Differences between the mean value and that given by the individual needle were then determined. These were plotted and curves, somewhat smoothed, were drawn, from which the adopted corrections were taken. These are given in Table 7, and were applied to the observations of 1922 and 1923. During the season of 1921 the needles did not exhibit to any extent the characteristics shown in 1922 and 1923, consequently no corrections, except those determined from comparison with standards, were applied to the results of that year.

This method was also applied to the needles used with C.I.W. dip circle No. 19. The adopted corrections are given in Table 8.

TABLE 7.—ADOPTED CORRECTIONS TO DIP CIRCLE No. 20, 1921-23

I	Needle			
	No. 1	No. 2	No. 5	No. 6
°	′	′	′	′
76·0	−0·6	+1·6	+0·6	0·0
·5	0·0	+1·6	+0·4	−0·4
77·0	+0·4	+1·6	0·0	−1·0
·5	+0·5	+1·6	−0·4	−1·7
78·0	−0·4	+0·8	−0·6	−0·8
·5	−1·6	+0·4	−0·4	+0·2
79·0	−1·4	+0·4	+0·1	−0·2
·5	−1·2	+0·8	+0·8	−0·9
80·0	−1·8	+2·6	+1·2	−1·4
·5	−1·2	+2·4	+0·4	−0·8
81·0	0·0	0·0	+0·4	−0·6
·5	−4·8	0·0	+0·4	−0·6
82·0	−3·8	+0·5	+0·4	−0·9

TABLE 8.—ADOPTED CORRECTIONS TO DIP CIRCLE No. 19, 1921-23

I	Needle			
	No. 3	No. 4	No. 6	No. 2
°	′	′	′	′
80·0	+0·4	+2·0	+0·2	−0·1
·5	−0·3	+1·3	−0·4	−0·3
81·0	−0·8	+0·8	−0·4	−1·4
·5	−0·3	+0·7	0·0	−1·8
82·0	+0·1	+1·8	−0·2	−1·8
·5	−0·1	+2·8	+0·2	−1·2
83·0	0·0	+3·1	+0·5	−0·4
·5	+0·3	+2·8	+0·6	−1·0
84·0	+0·3	+1·1	+0·6	−0·9
·5	0·0	+1·1	+0·2	−0·1
85·0	−0·4	+2·6	−0·6	+0·8

ASTRONOMICAL OBSERVATIONS AND THEIR REDUCTION

The astronomical work consists in making a determination at each place of the latitude, the astronomical meridian and the true bearing of some well-defined object, and the local mean time from which the longitude may be obtained, the chronometer correction on standard time being known.

The method of sun observations was usually employed to determine these quantities, though there were occasions when they were derived solely from star observations. The method of sun observations, as applied to magnetic work, is described in detail in the report[1] covering the operations of the survey from 1907 to 1920. The methods[2] of deriving the latitude and the azimuth from star observations are explained in text books on spherical astronomy.

Not only was it occasionally of advantage in completing the work at a station to be able to resort to the method of star observations, but throughout the seasons of 1922 and 1923, when it was found convenient to do so, observations were taken on Polaris for the determination of azimuth. The purpose of these observations was, primarily, to make a comparison between the two methods. The method of Polaris consisted in taking four pointings on the star, two with circle left and two with circle right, noting the time of each bisection and the reading of the horizontal circle corresponding thereto, the four constituting a set. As a rule the azimuth, by this method, was derived from two such determinations. To facilitate in the reduction of the observations, the tables given in the American Ephemeris were used.

The results of these observations at all the stations along Mackenzie river where both methods were used are summarized in Table 9. The table includes the morning and afternoon values of the bearing[3] of the reference mark and the mean of the two, the bearing determined by the method of Polaris, and the difference between the results obtained by the two methods. The resulting differences determined by the two methods are, considering the type of instrument used, not greater than might be expected, with the possible exception of the two stations, Simpson A and Wrigley B, which give, respectively, $+1'\cdot4$ and $-1'\cdot4$. At both these stations (see table) the morning and afternoon values are in good agreement, from which it may be inferred that the discrepancy is probably not entirely due to errors in the sun observations.

The results given in Table 9, therefore, indicate that the method of sun observations for the determination of azimuth is quite satisfactory for purposes of magnetic work. Each method has certain advantages in its favour. With regard to the method of Polaris, the observation is comparatively simple provided it can be taken in the day time. This is possible, even with the type of instrument used on the magnetic survey, though it is necessary to wait until after sundown. The error in the azimuth resulting from a small error in the latitude, say one minute, is practically negligible. The main advantage in using the method of sun observations is in the convenience of observing during the period of the day when the magnetic work is in progress. With the aid of the time signals, which may be obtained daily, it affords a ready means of determining the longitude. An error[4]

[1] Publications of the Dominion Observatory, Vol. V, No. 5, pp. 134-135.
[2] See also Directions for Magnetic Measurements, by Daniel L. Hazard, pp. 40-52.
[3] All bearings are reckoned from north through east from 0° to 360°.
[4] The effect on azimuth and time of small changes in latitude is discussed in Researches of the Department of Terrestrial Magnetism, Vol. IV, pp. 26-27.

in latitude, however, has an appreciable effect on the azimuth and time. In order to minimize the effect due to an error in latitude, the greatest precaution has been taken throughout the work to secure observations of azimuth both in the forenoon and afternoon, at approximately equal hour angles before and after meridian passage of the sun.

As a number of the magnetic stations, occupied in 1922 and 1923, are near astronomic stations whose positions were accurately determined by the Dominion Observatory, an opportunity was afforded of testing the accuracy of the results of latitude and longitude determined by sun observations with the small portable instrument, used on magnetic work, and a wireless receiving set. The results are given in Table 10; magnetic station values are corrected to correspond to the position of the astronomic station.

TABLE 9.—SUMMARY OF BEARINGS OF REFERENCE MARKS DETERMINED FROM OBSERVATIONS OF SUN AND POLARIS, 1923

Station	Lat.	Bearing[1] of mark					Difference Polaris —Sun
		Sun				Polaris	
		A.M.	P.M.		Mean		
	° ′	° ′	′		° ′	° ′	′
Providence	61 21·4	306 46·6	45·5		306 46·0	306 45·1	− 0·9
Trout River	61 19·2	124 24·4	24·6		124 24·5	124 23·9	− 0·6
Simpson A	61 52·2	314 10·8	11·6		314 11·2	314 10·5	− 0·7
Simpson B	61 52·3	280 33·2	33·2		280 33·2	280 34·6	+ 1·4
Wrigley, A	63 16·3	148 07·0	07·8		148 07·4	148 06·0	− 1·4
Wrigley, B	63 16·3	148 33·0	....		148 33·0	148 33·8	+ 0·8
Birch Island	64 11·2	245 24·2	23·3		245 23·8	245 22·6	− 1·2
Norman	64 54·3	112 19·7	20·6		112 20·2	112 19·6	− 0·6
T. S. Monument 56 N	65 31·4	245 34·2	36·1		245 35·2	245 35·8	+ 0·6
Good Hope	66 15·5	201 56·1	57·7		201 56·9	201 57·0	+ 0·1
T. S. Monument O 44	66 43·8	16 06·8	08·6		16 07·7	16 07·6	− 0·1
T. S. Monument O 69	67 28·2	200 30·1	31·1		200 30·6	200 31·2	+ 0·6
Arctic Red River	67 26·7	242 11·0	13·6		242 12·3	242 12·9	+ 0·6
McPherson	67 26·4	1 29·5	30·9		1 30·2	1 30·6	+ 0·4
Aklavik	68 13·5	155 31·6	32·7		155 32·2	155 32·2	0·0
Hay River	60 51·8	144 35·8	37·6		144 36·7	144 36·6	− 0·1

[1] Bearings are reckoned from north through east from 0° to 360°.

ASTRONOMICAL OBSERVATIONS AND THEIR REDUCTION

TABLE 10.—SUMMARY OF THE LATITUDE AND LONGITUDE VALUES DETERMINED FROM SUN OBSERVATIONS WITH SMALL PORTABLE INSTRUMENT, AND FROM STAR OBSERVATIONS WITH TRANSIT MICROMETER

Method	Sun Observations		Transit Micrometer	
Station	Lat.	Long.	Lat.	Long.
	° ′	° ′	° ′	° ′
Chipewyan	58 42·7	111 08·7	58 42·73	111 08·75
Resolution	61 10·0	113 40·5	61 10·09	113 40·62
Providence	61 21·4	117 39·2	61 21·24	117 39·37
Simpson	61 52·2	121 20·0	61 51·66	121 20·67
Norman	64 54·1	125 34·4	64 54·01	125 34·23
Good Hope	66 15·4	128 37·9	66 15·25	128 38·25
Arctic Red River	67 26·7	133 44·2	67 26·62	133 44·25

MAGNETIC WORK

The magnetic work consists in making a determination of the three magnetic elements, declination, dip and horizontal intensity, at each station. In general the methods followed were similar to those outlined in the report[1] covering the work of the period 1907-1920. The main difference was in respect to the determination of declination, which will be explained in the subsequent portion of the report. The observing period of the day was extended somewhat during 1922 and 1923, in order to obtain all the magnetic data possible. The results, which are given on pages 188 to 212, will serve to indicate the extent to which this was carried out.

MAGNETIC OBSERVATORY DATA

As an aid in the reduction of declination observations there have always been available, through the courtesy of Sir Frederic Stupart, Director of the Meteorological Service of Canada, the records of the two magnetic observatories, Agincourt and Meanook. The former is well over 1,100 miles from the nearest point occupied during 1922 and 1923, and the latter is just on the southerly edge of the area covered during these two years. It was therefore considered uncertain to what extent the Meanook data could be made use of for correcting the field observations for diurnal variation and disturbance. As a result it was considered advisable to take special declination observations for the purpose of obtaining the diurnal variation at places remote from the base station Meanook.

PROGRAM OF SPECIAL DECLINATION OBSERVATIONS

According to the program for the season of 1922 each observer was to obtain, if possible, on three days of each month, sufficient observations of declination to indicate the course of the magnetic needle throughout as much of the day as possible. As a rule the day was devoted to taking declination readings at short intervals. At some stations observations were taken at intervals approximating an hour, the period intervening being devoted to other work. In the selection of stations preference was given to places where observations had previously been taken and which would probably be available for future occupation. For the season of 1923 these observations were to be taken, as in 1922, on three days of each month, but with this difference, the 10th, 20th and 30th of the month were selected for the work. There would thus be available the daily variation of magnetic declination for two, and with Meanook records, three distinct and comparatively widely separated points. In view of the conditions that would probably be encountered, it was not expected that the work could be carried out strictly in accordance with the program. The unsettled state of the weather sometimes made observing difficult if not impossible, and occasionally it was found necessary to travel on the day in question. In a few cases magnetic storms were so pronounced that either the observing was discontinued, or the results obtained were later discarded.

METHOD OF DERIVING THE MEAN DECLINATION

The method generally adopted in magnetic surveys is to refer all the results to the mean of the twenty-four hours of the day. This observatory, between 1907 and 1920, adopted the mean of the maximum and minimum[2] values for the day. The main objection to this is the difficulty of determining when these values occur, especially at certain times

[1] Publications of the Dominion Observatory, Vol. V, No. 5, pp. 136-139.
[2] Publications of the Dominion Observatory, Vol. V, No. 5, pp. 136-137.

of the year. It was decided, therefore, to make a change in the method of reduction. The adoption of the twenty-four hourly values was considered unsuitable owing to the lack of information respecting the diurnal variation at places remote from the two magnetic observatories, Meanook and Agincourt; furthermore, it was obviously impracticable, if not impossible, to carry out a program of special observations to cover the twenty-four hours where there was but one observer in the party. It was finally decided to adopt the period of the day included between 7h and 18h. The results, therefore, contained in the report are all referred to the period of the day represented by the mean of the hourly values from 7h to 18h. For comparison with results at stations previously occupied it will be necessary to apply a small correction to the values referred to elongation. In Table 11 are given the mean values at a number of field stations referred to the period 7h to 18h, and also the mean of the maximum and minimum values.

REDUCTION OF SPECIAL DECLINATION OBSERVATIONS

The declinations derived from the special observations were represented graphically as were all the corresponding observations obtained from Meanook records. The results at a few of the stations are given in Figures 8-14. These were selected as being typical of the results obtained during the two seasons 1922 and 1923. Both field data and Meanook data were plotted against 105th meridian time, thus making it easy to compare visually the results at the two stations. The field results were then corrected for disturbance, which is defined as the difference between the adopted monthly mean value of declination and the value for the day at the same instant. This quantity was determined from the Meanook data on the assumption that it is the same at the field station as at the base station. A comparison of the graphs will show that this is not a legitimate assumption. In general, however, the nearer the location of the station to the base station, which, in this case is Meanook, the smoother are the curves representing the daily variation after the corrections for disturbance have been applied. For distant stations it is doubtful if the results are materially improved by applying these disturbance factors. There were at the most northerly stations distinct movements of the needle which could not be detected on the Meanook magnetograms. The results at Meanook and Norman illustrate the differences between disturbance effects at two distant stations. Where disturbances such as the one encountered at Norman are in evidence observing is usually discontinued The results at the two stations, obtained on July 20 and 21, 1923, are given in Figure 14. The points on the graphs are not single, instantaneous readings but represent the means of a number of readings. The disturbance was in evidence at the time observing was commenced on the morning of July 20 but subsided, for the most part, about 11h (L.M.T.). If the mean curve is drawn through the values for Norman it will be found that the declination at, or about, 9h exceeds that on the following day by about 30′, while the corresponding difference at Meanook amounts to about 6′. The declination on July 21 at Meanook was approximately normal.

A comparison between the values on August 10 at McPherson and Churchill, Figure 12*b*, and Figure 12 *c*, shows that the diurnal variation at the two places differs to a marked degree, especially in the afternoon. As the same thing is apparent in the results at Aklavik and York Factory on August 20 one is led to the conclusion that the diurnal variation is

probably quite different for these two localities. The curves at the two field stations both on August 10 and August 20 differ from those at Meanook, the latter occupying a mean position with respect to the other two.

The special observations with the so-called disturbance corrections applied were plotted with respect to local mean time, as, for example in Figure 8 *c*, and a mean curve drawn. From the smooth curves, hourly values were obtained which are given in Table 11. The table contains, in addition to the hourly values of declination, the mean of the twenty-four hourly values at a few stations, the mean of the hourly values for the period 7h to 18h at all the stations, and also the mean of the maximum and minimum at all stations. The differences between the hourly values and the adopted mean for the day, that is for the period 7h to 18h, are given as representing the diurnal variation. The results given in italics are simply to distinguish between the period of the day included between 7h and 18h and the remaining portion of the day.

The problem was to obtain from these results a series of values to correct for diurnal variation observations taken at all stations occupied during the two seasons.

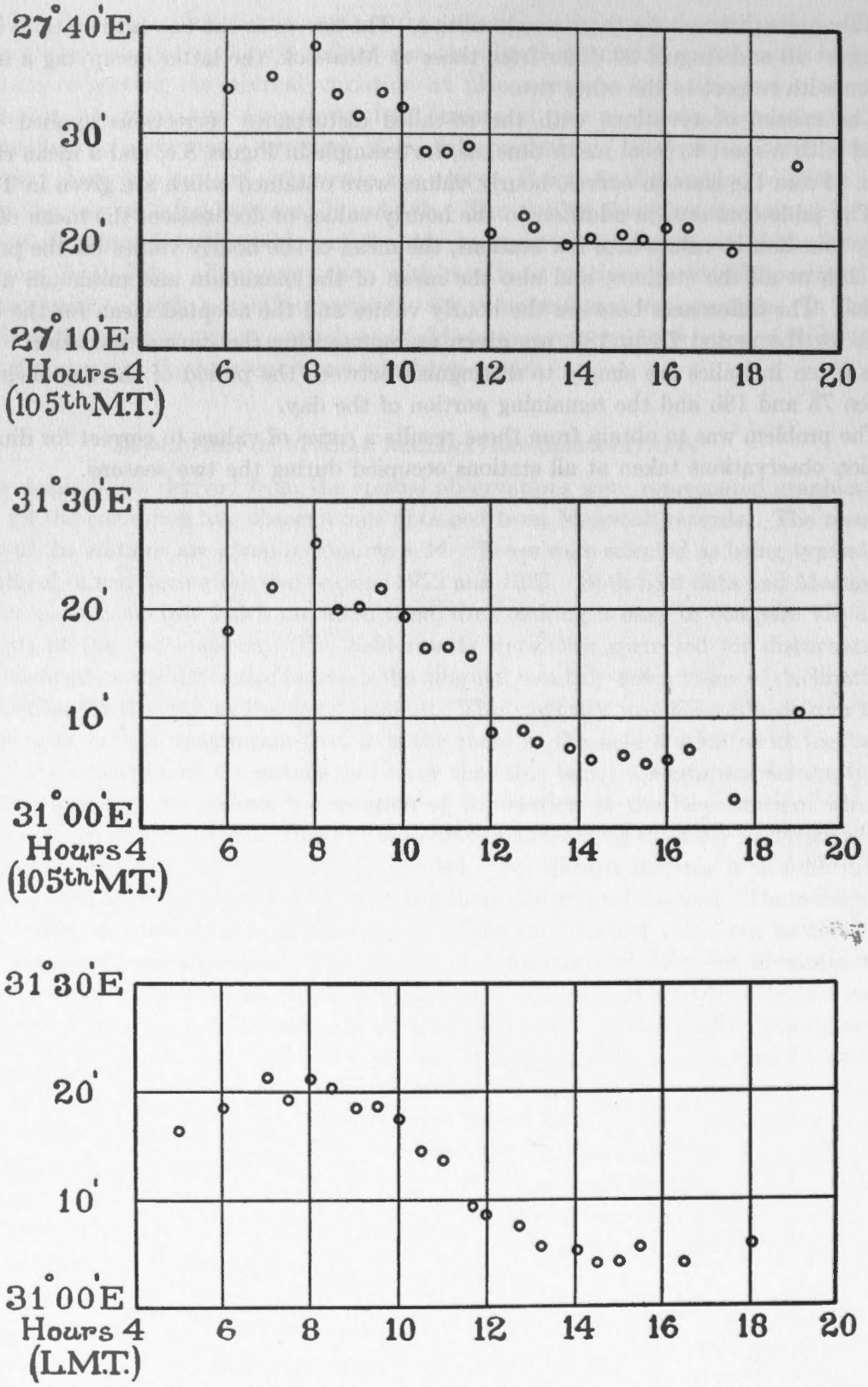

FIG. 8. Magnetic declination: (*a*) at Meanook; (*b*) at Fort St. John; (*c*) at Fort St. John corrected for disturbance.

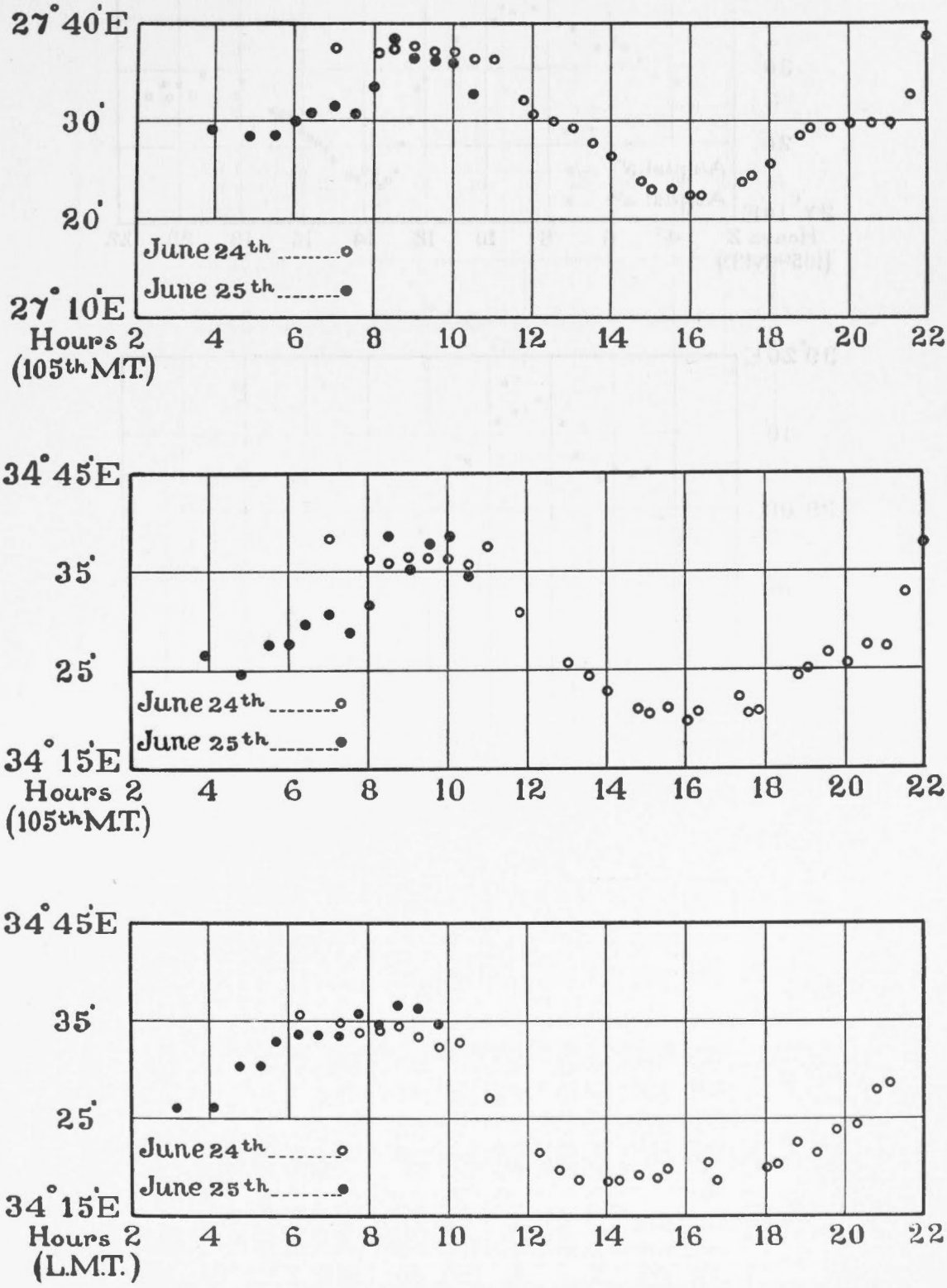

FIG. 9. Magnetic declination: (*a*) at Meanook; (*b*) at Fort Vermilion; (*c*) at Fort Vermilion corrected for disturbance.

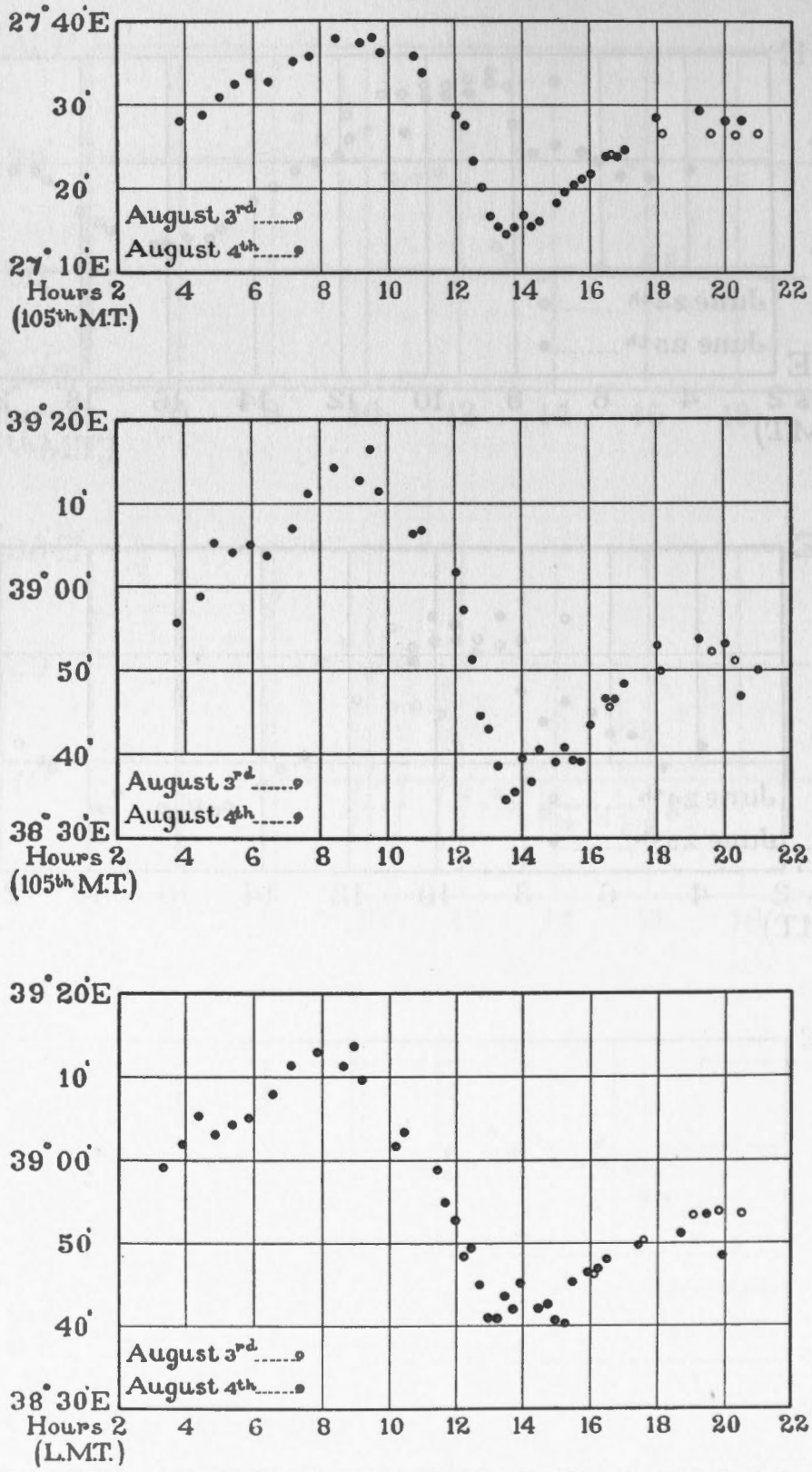

FIG. 10. Magnetic declination: (*a*) at Meanook; (*b*) at Resolution B; (*c*) at Resolution B corrected for disturbance.

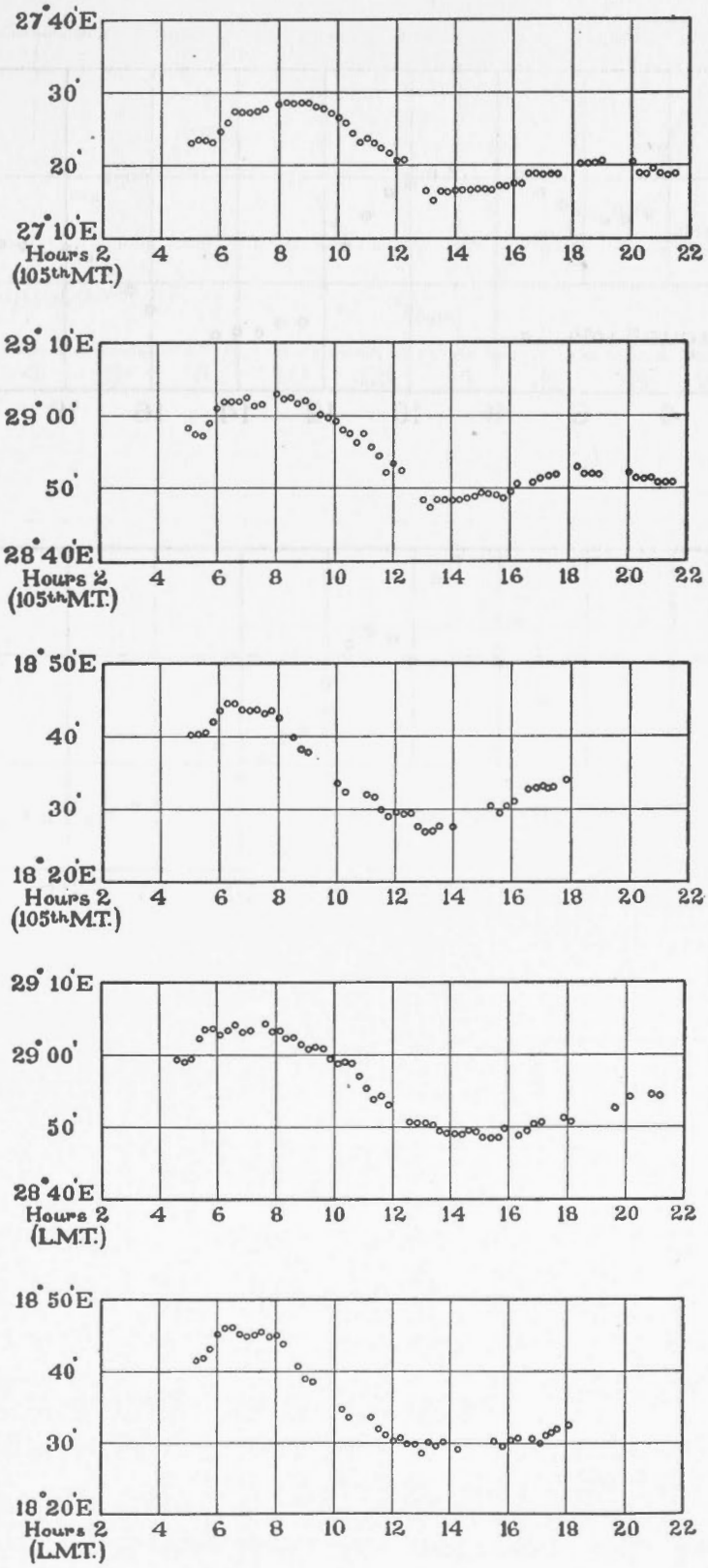

FIG. 11. Magnetic declination: (*a*) at Meanook; (*b*) at McMurray; (*c*) at Kississing lake; (*d*) at McMurray corrected for disturbance; (*e*) at Kississing lake corrected for disturbance.

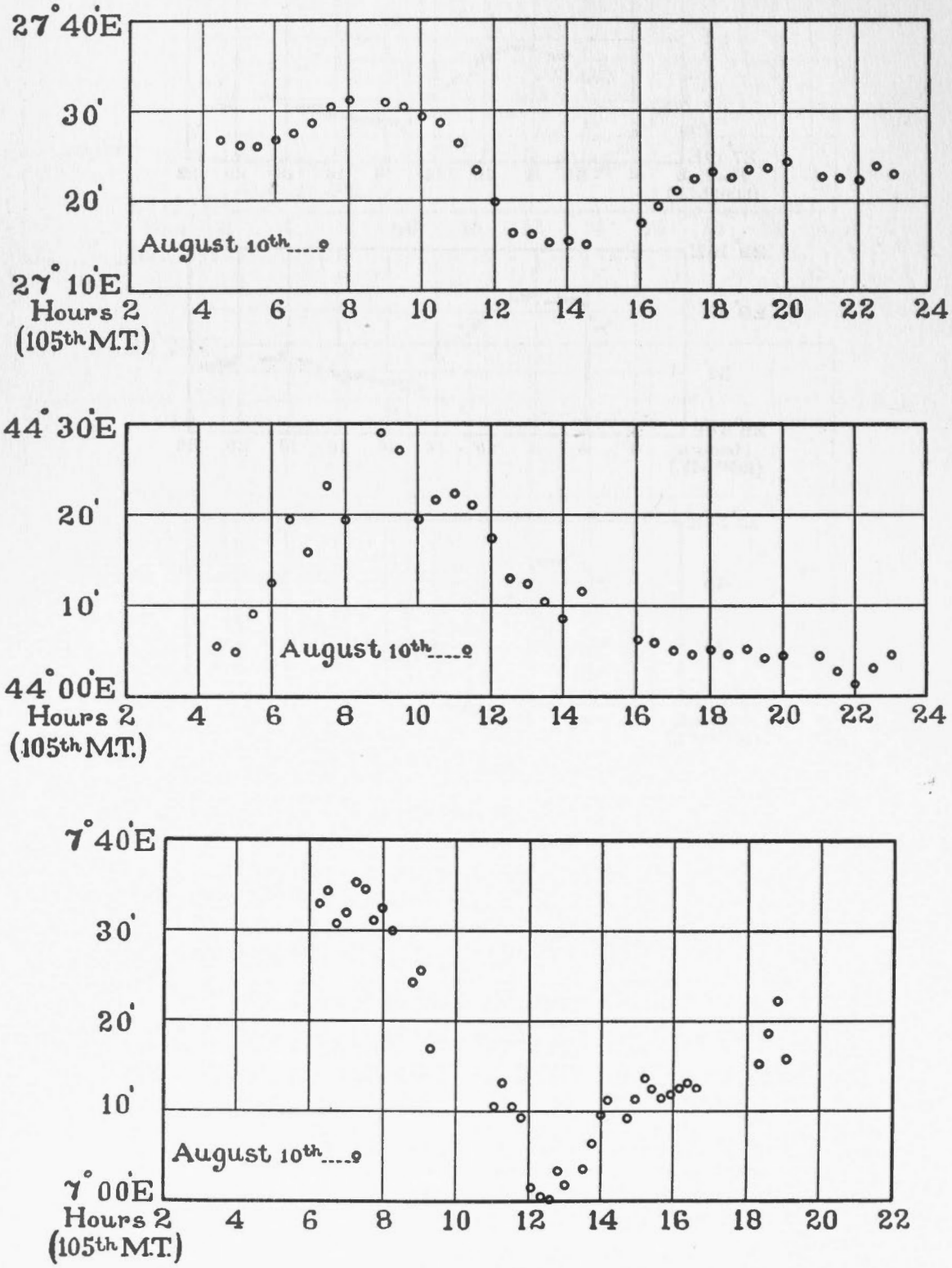

FIG. 12. Magnetic declination: (*a*) at Meanook; (*b*) at McPherson; (*c*) at Churchill.

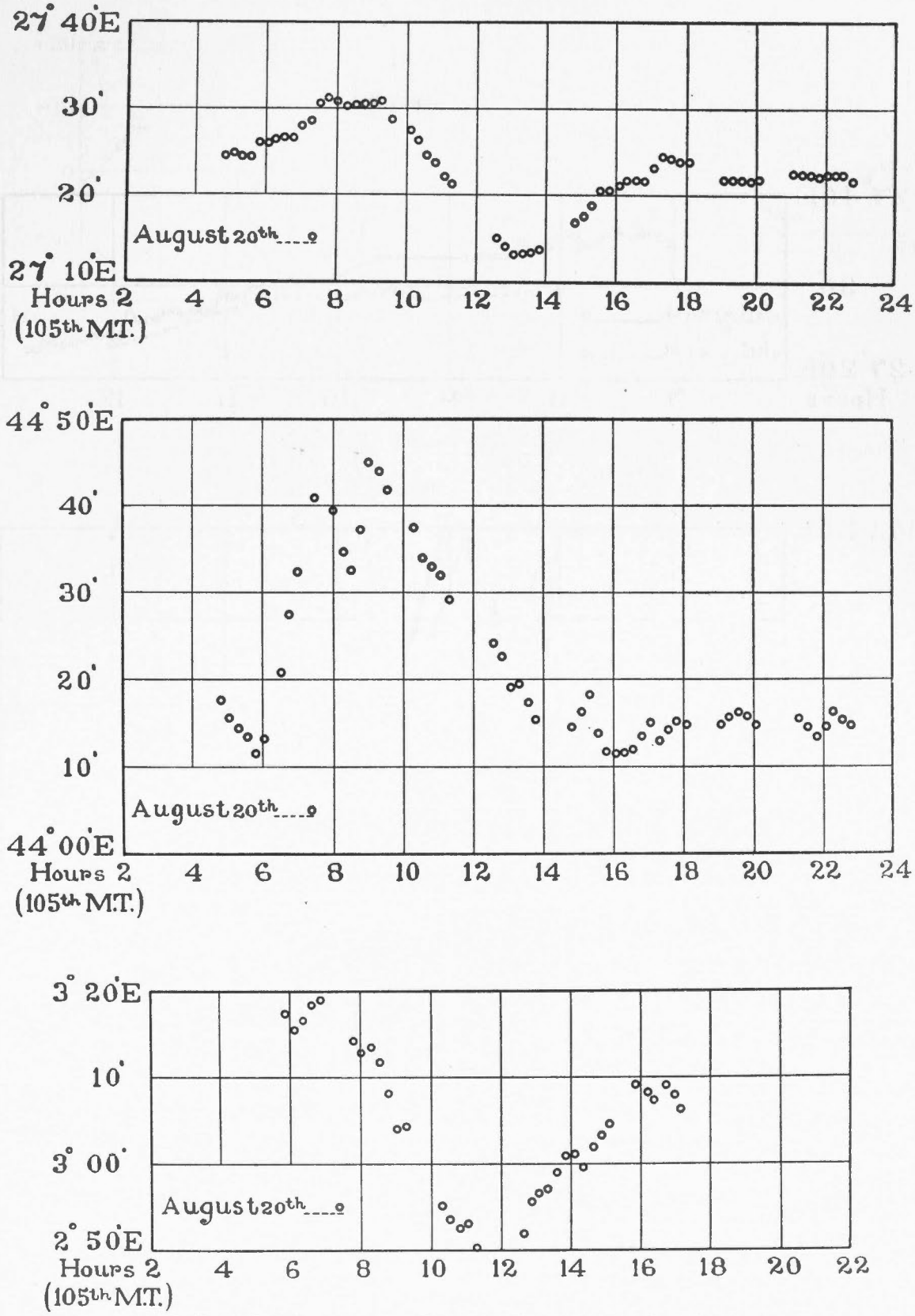

FIG. 13. Magnetic declination: (*a*) at Meanook; (*b*) at Aklavik; (*c*) at York Factory.

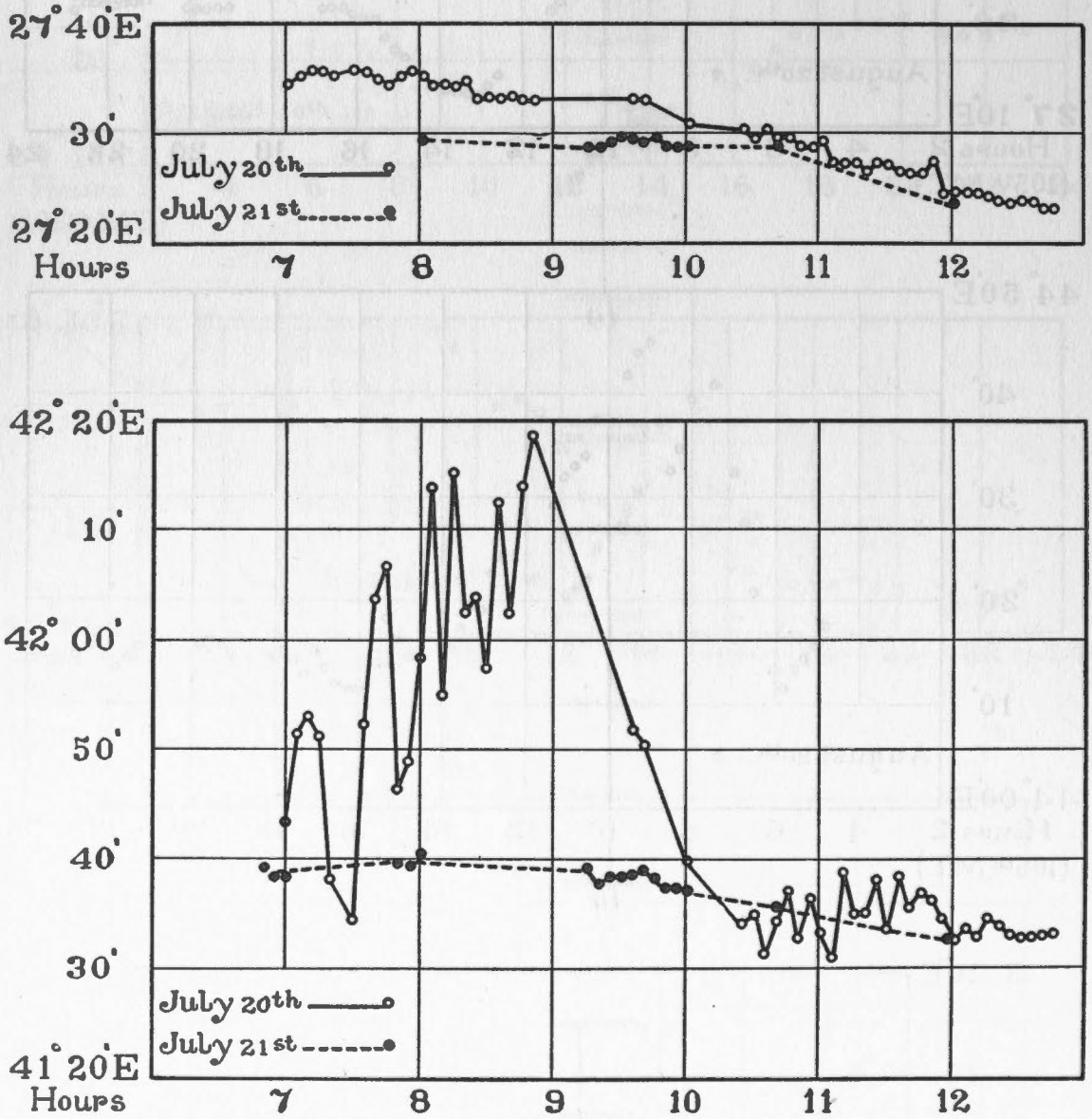

FIG. 14. Magnetic declination: (*a*) at Meanook; (*b*) at Norman.

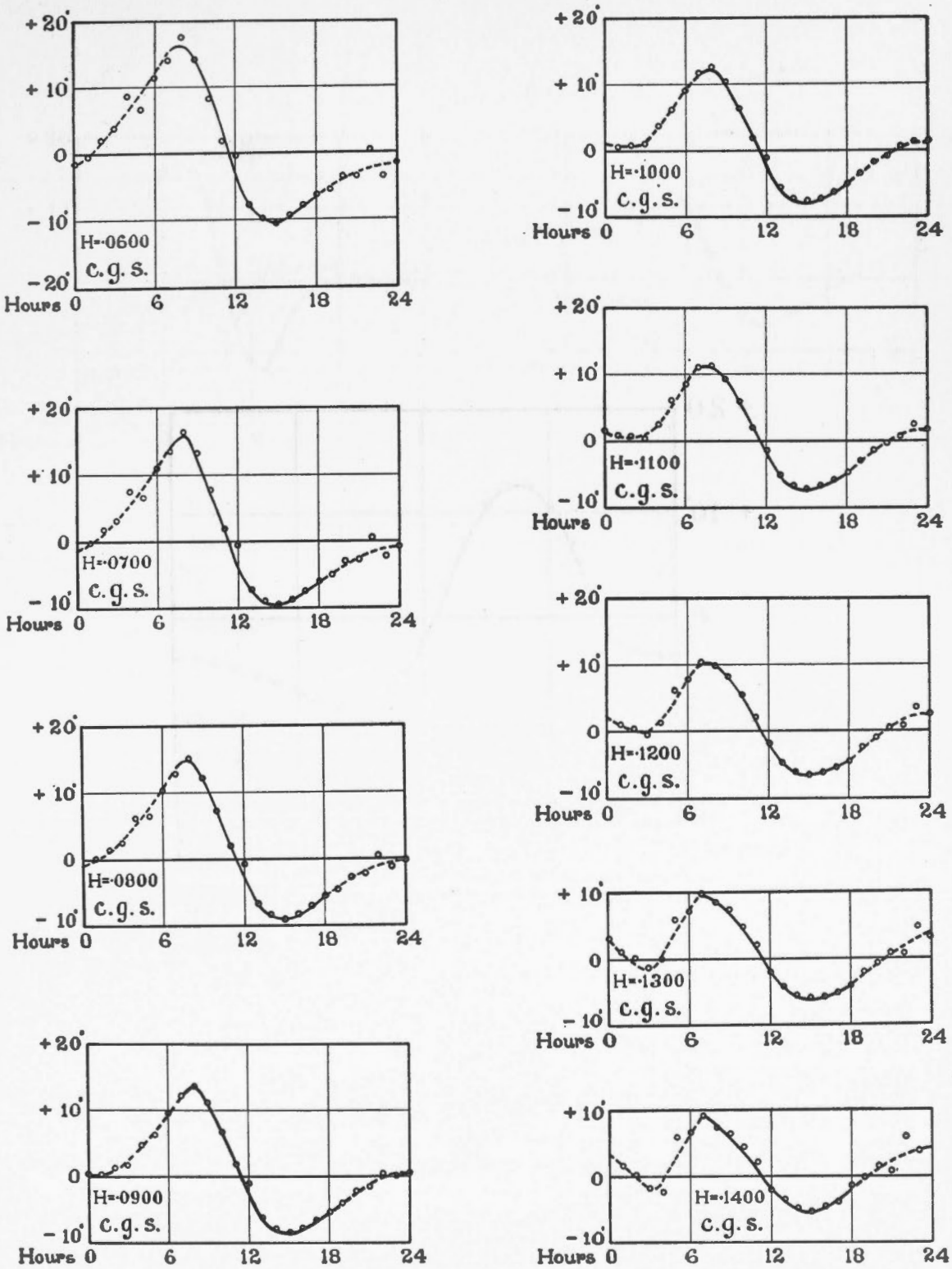

FIG. 15. Diurnal variation of magnetic declination derived from results at stations in Group I corresponding to different values of H.

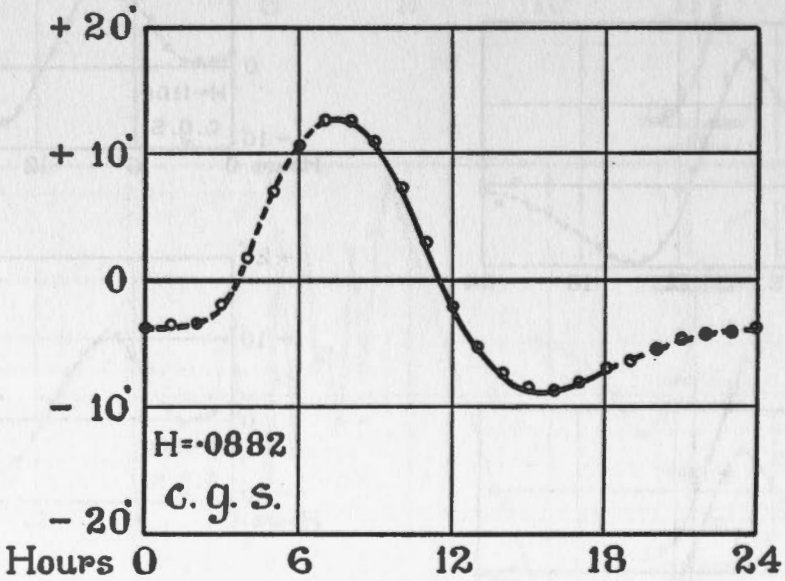

FIG. 16. Diurnal variation of magnetic declination derived from results at stations in Group 2.

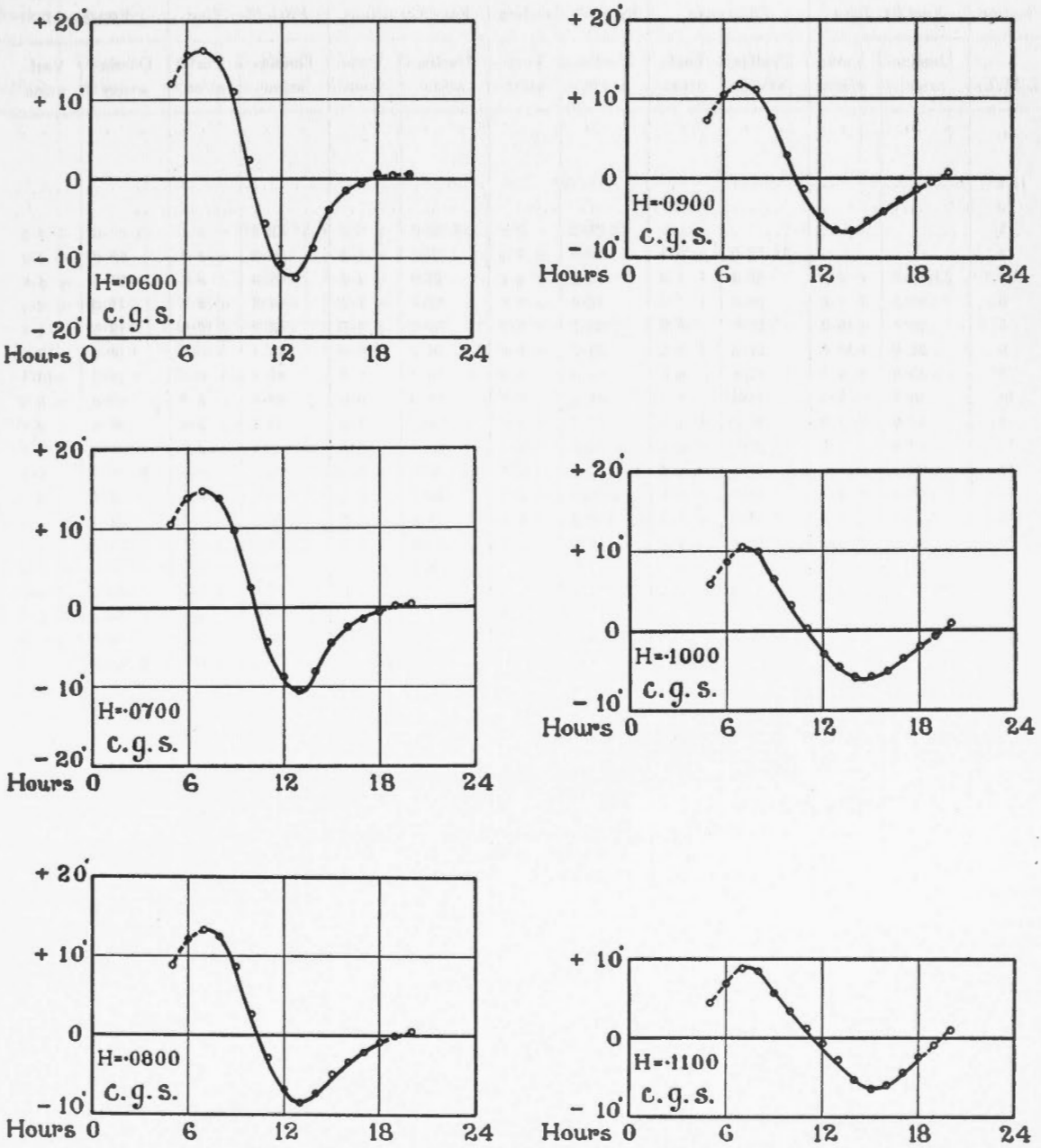

FIG. 17. Diurnal variation of magnetic declination derived from results at stations in Group 3 corresponding to different values of H.

TABLE 11.—RESULTS OF SPECIAL OBSERVATIONS FOR DIURNAL VARIATION OF DECLINATION AT STATIONS OCCUPIED IN 1922-1923

Date	May 23, 1922		May 29-30, 1922		June 9-10, 1922		June 24-25, 1922		July 3-5, 1922		July 22-23, 1922	
Station	Fort St. John		Dunvegan		Brown's Landing		Fort Vermilion		Fifth Meridian		Fitzgerald	
L.M.T.	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation
h.	° ′	′	° ′	′	° ′	′	° ′	′	° ′	′	° ′	′
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3	.....	.....	.....	.....	32 24·3	− 0·8	34 25·6	+ 0·3	31 32·2	− 0·5	31 01·0	− 1·2
4	.....	.....	31 18·0	− 0·9	26·5	+ 1·4	27·0	+ 1·7	36·0	+ 3·3	03·6	+ 1·4
5	31 16·3	+ 5·6	21·8	+ 2·9	29·2	+ 4·1	30·0	+ 4·7	42·0	+ 9·3	07·8	+ 5·6
6	18·5	+ 7·8	26·0	+ 7·1	31·9	+ 6·8	32·7	+ 7·4	44·8	+12·1	11·0	+ 8·8
7	20·7	+10·0	27·8	+ 8·9	33·7	+ 8·6	35·0	+ 9·7	45·0	+12·3	13·6	+11·4
8	21·0	+10·3	27·2	+ 8·3	34·7	+ 9·6	36·2	+10·9	43·3	+10·6	14·6	+12·4
9	19·0	+ 8·3	25·4	+ 6·5	34·0	+ 8·9	35·2	+ 9·9	41·4	+ 8·7	12·3	+10·1
10	16·3	+ 5·6	23·0	+ 4·1	31·8	+ 6·7	32·2	+ 6·9	38·6	+ 5·9	09·0	+ 6·8
11	12·6	+ 1·9	20·3	+ 1·4	28·3	+ 3·2	27·2	+ 1·9	35·7	+ 3·0	05·0	+ 2·8
12	09·0	− 1·7	16·8	− 2·1	25·0	− 0·1	22·8	− 2·5	32·2	− 0·5	01·1	− 1·1
13	06·3	− 4·4	14·3	− 4·6	21·6	− 3·5	19·0	− 6·3	29·1	− 3·6	30 57·3	− 4·9
14	05·0	− 5·7	13·3	− 5·6	19·0	− 6·1	18·2	− 7·1	26·3	− 6·4	55·7	− 6·5
15	04·3	− 6·4	13·3	− 5·6	18·0	− 7·1	18·3	− 7·0	24·0	− 8·7	54·3	− 7·9
16	04·0	− 6·7	14·1	− 4·8	17·8	− 7·3	19·0	− 6·3	24·0	− 8·7	54·0	− 8·2
17	04·3	− 6·4	15·5	− 3·4	18·0	− 7·1	19·7	− 5·6	25·4	− 7·3	54·3	− 7·9
18	31 05·6	− 5·1	16·0	− 2·9	19·1	− 6·0	20·7	− 4·6	27·0	− 5·7	55·8	− 6·4
19	.....	.....	16·8	− 2·1	22·0	− 3·1	22·2	− 3·1	28·4	− 4·3	58·1	− 4·1
20	.....	.....	17·7	− 1·2	24·2	− 0·9	25·0	− 0·3	29·3	− 3·4	59·3	− 2·9
21	.....	.....	18·5	− 0·4	25·7	+ 0·6	34 27·3	+ 2·0	31 29·8	− 2·9	31 00·3	− 1·9
22	.....	.....	31 18·5	− 0·4	32 26·2	+ 1·1	.....	.....	.....	.....	.....	.....
23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mean 1h to 24h	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7h to 18h	31 10·7	.....	31 18·9	.....	32 25·1	.....	34 25·3	.....	31 32·7	.....	31 02·2	.....
Max. and min...	31 12·5	.....	31 20·6	.....	32 26·2	.....	34 27·2	.....	31 34·5	.....	31 04·3	.....

TABLE 11.—RESULTS OF SPECIAL OBSERVATIONS FOR DIURNAL VARIATION OF DECLINATION AT STATIONS OCCUPIED IN 1922-1923—(*continued*)

Date	Aug. 2-3, 1922		Aug. 3-4, 1922		Aug. 17-18, 1922		Sept. 5-6, 1922		June 10, 1923		June 20, 1923	
Station	Resolution, A		Resolution, B		Chipewyan		McMurray		McMurray		Fort Smith	
L.M.T.	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation
h.	° ′	′	° ′	′	° ′	′	° ′	′	° ′	′	° ′	′
1	.....	.....	.....	.....	27 50·6	*0·0*	28 59·5	*+ 0·9*	.....	.....	.....	.....
2	.....	.....	.....	.....	51·0	*+ 0·4*	59·5	*+ 0·9*	.....	.....	.....	.....
3	.....	.....	39 00·7	*+ 5·5*	52·0	*+ 1·4*	29 01·0	*+ 2·4*	.....	.....	.....	.....
4	.....	.....	01·9	*+ 6·7*	53·4	*+ 2·8*	06·0	*+ 7·4*	28 58·5	*+ 3·8*	.....	.....
5	.....	.....	03·3	*+ 8·1*	55·5	*+ 4·9*	10·0	*+11·4*	29 00·0	*+ 5·3*	32 10·0	*+ 5·7*
6	38 47·0	+11·6	05·6	*+10·4*	59·5	*+ 8·9*	11·8	*+13·2*	02·6	*+ 7·9*	13·0	*+ 8·7*
7	51·0	+15·6	10·0	+14·8	28 02·8	+12·2	11·7	+13·1	04·6	+ 9·9	18·0	+13·7
8	54·0	+18·6	13·2	+18·0	04·0	+13·4	09·0	+10·4	04·0	+ 9·3	21·0	+16·7
9	50·0	+14·6	11·0	+15·8	00·7	+10·1	07·7	+ 9·1	02·0	+ 7·3	17·0	+12·7
10	43·2	+ 7·8	04·8	+ 9·6	27 56·2	+ 5·6	01·5	+ 2·9	28 59·0	+ 4·3	11·0	+ 6·7
11	36·3	+ 0·9	38 58·8	+ 3·6	51·0	+ 0·4	28 57·0	− 1·6	56·0	+ 1·3	06·6	+ 2·3
12	30·0	− 5·4	51·0	− 4·2	46·6	− 4·0	53·7	− 4·9	52·6	− 2·1	02·8	− 1·5
13	27·0	− 8·4	43·6	−11·6	43·0	− 7·6	52·2	− 6·4	50·2	− 4·5	31 59·8	− 4·5
14	25·2	−10·2	41·2	−14·0	42·2	− 8·4	52·2	− 6·4	49·3	− 5·4	57·8	− 6·5
15	24·8	−10·6	42·2	−13·0	43·2	− 7·4	53·2	− 5·4	48·7	− 6·0	56·0	− 8·3
16	26·0	− 9·4	46·0	− 9·2	44·6	− 6·0	54·1	− 4·5	49·0	− 5·7	54·6	− 9·7
17	27·7	− 7·7	49·2	− 6·0	45·8	− 4·8	55·0	− 3·6	49·8	− 4·9	53·5	−10·8
18	30·0	− 5·4	51·0	− 4·2	47·1	− 3·5	56·2	− 2·4	51·0	− 3·7	53·0	−11·3
19	31·8	*− 3·6*	52·2	*− 3·0*	48·0	*− 2·6*	57·7	*− 0·9*	52·3	*− 2·4*	53·0	*−11·3*
20	33·7	*− 1·7*	53·0	*− 2·2*	49·8	*− 0·8*	58·7	*+ 0·1*	53·6	*− 1·1*	53·2	*−11·1*
21	38 36·0	*+ 0·6*	38 53·6	*− 1·6*	50·8	*+ 0·2*	59·8	*+ 1·2*	28 54·3	*− 0·4*	31 53·6	*−10·7*
22	.....	.....	.....	.....	51·0	*+ 0·4*	29 00·6	*+ 2·0*	.....	.....	.....	.....
23	.....	.....	.....	.....	50·5	*− 0·1*	01·0	*+ 2·4*	.....	.....	.....	.....
24	.....	.....	.....	.....	27 50·2	*− 0·4*	29 00·3	*+ 1·7*	.....	.....	.....	.....
Mean 1h to 24h	.....	.....	.....	.....	27 51·2	.....	29 00·4	.....	.....	.....	.....	.....
7h to 18h	38 35·4	.....	38 55·2	.....	50·6	.....	28 58·6	.....	28 54·7	.....	32 04·3	.....
Max. and min...	38 39·4	.....	38 57·2	.....	27 53·1	.....	29 02·0	.....	28 56·6	.....	32 07·0	.....

TABLE 11.—RESULTS OF SPECIAL OBSERVATIONS FOR DIURNAL VARIATION OF DECLINATION AT STATIONS OCCUPIED IN 1922-1923—(*continued*)

Date	June 22-23, 1923		July 20-21, 1923		July 30-31, 1923		Aug. 10, 1923		Aug. 16-22, 1923		May 19-20, 1922	
Station	Fort Smith		Norman		Good Hope		McPherson		Aklavik		Mile 100, H.B.R.	
L.M.T.	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation
h.	° ′	′	° ′	′	° ′	′	° ′	′	° ′	′	° ′	′
1	32 01·3	+ 0·4	41 29·5	+ 0·8	42 37·8	− 1·2	44 04·0	− 7·6	44 15·3	− 5·8	.....	.....
2	02·5	+ 1·6	29·8	+ 1·1	38·4	− 0·6	04·0	− 7·6	14·8	− 6·3	.....	.....
3	06·0	+ 5·1	30·6	+ 1·9	39·7	+ 0·7	06·5	− 5·1	15·6	− 5·5	.....	.....
4	08·7	+ 7·8	33·0	+ 4·3	42·2	+ 3·2	12·5	+ 0·9	20·0	− 1·1	.....	.....
5	09·6	+ 8·7	36·1	+ 7·4	44·8	+ 5·8	18·1	+ 6·5	29·0	+ 7·9	14 55·8	+ 6·4
6	10·2	+ 9·3	38·9	+10·2	46·8	+ 7·8	22·0	+10·4	34·6	+13·5	58·0	+ 8·6
7	10·4	+ 9·5	40·0	+11·3	48·9	+ 9·9	24·2	+12·6	37·8	+16·7	15 00·0	+10·6
8	10·3	+ 9·4	39·3	+10·6	51·2	+12·2	23·0	+11·4	37·4	+16·3	00·1	+10·7
9	09·0	+ 8·1	36·4	+ 7·7	52·3	+13·3	21·0	+ 9·4	34·5	+13·4	14 58·8	+ 9·4
10	06·8	+ 5·9	33·0	+ 4·3	50·1	+11·1	18·2	+ 6·6	28·3	+ 7·2	55·8	+ 6·4
11	03·3	+ 2·4	29·8	+ 1·1	44·6	+ 5·6	14·8	+ 3·2	23·0	+ 1·9	52·5	+ 3·1
12	31 59·7	− 1·2	26·7	− 2·0	37·5	− 1·5	11·3	− 0·3	17·8	− 3·3	48·5	− 0·9
13	56·5	− 4·4	24·1	− 4·6	32·6	− 6·4	08·7	− 2·9	14·3	− 6·8	45·0	− 4·4
14	54·5	− 6·4	22·6	− 6·1	29·8	− 9·2	06·5	− 5·1	11·8	− 9·3	42·3	− 7·1
15	53·8	− 7·1	22·2	− 6·5	29·3	− 9·7	04·2	− 7·4	10·6	−10·5	40·7	− 8·7
16	54·0	− 6·9	22·5	− 6·2	29·5	− 9·5	03·0	− 8·6	10·9	−10·2	41·0	− 8·4
17	55·5	− 5·4	23·3	− 5·4	30·0	− 9·0	02·4	− 9·2	12·8	− 8·3	43·0	− 6·4
18	57·3	− 3·6	24·3	− 4·4	31·6	− 7·4	02·2	− 9·4	14·3	− 6·8	45·0	− 4·4
19	59·0	− 1·9	25·2	− 3·5	33·0	− 6·0	02·2	− 9·4	14·9	− 6·2	47·5	− 1·9
20	32 00·0	− 0·9	26·0	− 2·7	34·7	− 4·3	02·7	− 8·9	15·5	− 5·6	14 50·0	+ 0·6
21	00·6	− 0·3	26·7	− 2·0	35·3	− 3·7	03·7	− 7·9	16·1	− 5·0	.....	.....
22	00·7	− 0·2	27·0	− 1·7	36·0	− 3·0	04·0	− 7·6	16·5	− 4·6	.....	.....
23	00·7	− 0·2	27·8	− 0·9	36·6	− 2·4	04·0	− 7·6	16·1	− 5·0	.....	.....
24	32 01·2	+ 0·3	41 28·5	− 0·2	42 37·2	− 1·8	44 04·0	− 7·6	44 15·7	− 5·4	.....	.....
Mean 1h to 24h	32 02·2	.....	41 29·3	.....	42 38·7	.....	44 09·5	.....	44 19·9	.....	.....	.....
7h to 18h	00·9	.....	28·7	.....	39·0	.....	11·6	.....	21·1	.....	14 49·4	.....
Max. and min...	32 02·1	.....	41 31·1	.....	42 40·8	.....	44 13·2	.....	44 24·2	.....	14 50·4	.....

TABLE 11.—RESULTS OF SPECIAL OBSERVATIONS FOR DIURNAL VARIATION OF DECLINATION AT STATIONS OCCUPIED IN 1922-1923 *(concluded)*

Date	June 1, 1922		June 10, 1923		Aug. 10, 1923		Aug. 20, 1923		Sept. 12, 1923		Sept. 20, 1923	
Station	Kettle Rapids		Kississing Lake		Churchill		York Factory		Hayes R. The Rock		Swampy Lake	
L.M.T.	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation
h.	° ′	′	° ′	′	° ′	′	° ′	′	° ′	′	° ′	′
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4	.....	.....	18 39·8	+ *5·6*	.....	.....	.....	.....	.....	.....	.....	.....
5	7 15·0	+*13·1*	40·6	+ *6·4*	.....	.....	3 13·0	+ *8·2*	.....	.....	9 02·0	+ *4·7*
6	18·8	+*16·9*	43·8	+ *9·6*	.....	.....	16·5	+*11·7*	.....	.....	04·5	+ *7·2*
7	20 0	+18·1	46·2	+12·0	7 32·0	+15·4	18·8	+14·0	6 16·7	+10·4	06·4	+ 9·1
8	18·0	+16·1	44·7	+10·5	32·0	+15·4	16·3	+11·5	17·0	+10·7	06·1	+ 8·8
9	13·0	+11·1	39·4	+ 5·2	28·7	+12·1	12·1	+ 7·3	13·2	+ 6·9	03·7	+ 6·4
10	06·0	+ 4·1	35·3	+ 1·1	21·3	+ 4·7	04·0	− 0·8	06·5	+ 0·2	00·4	+ 3·1
11	6 58·6	− 3·3	32·7	− 1·5	14·1	− 2·5	2 57·7	− 7·1	01·6	− 4·7	8 57·0	− 0·3
12	53·2	− 8·7	30·6	− 3·6	08·5	− 8·1	54·8	−10·0	5 58·5	− 7·8	53·0	− 4·3
13	51·8	−10·1	29·4	− 4·8	04·4	−12·2	56·0	− 8·8	58·4	− 7·9	49·7	− 7·6
14	52·8	− 9·1	29·2	− 5·0	06·0	−10·6	3 00·7	− 4·1	6 00·5	− 5·8	48·8	− 8·5
15	54·5	− 7·4	29·5	− 4·7	10·0	− 6·6	03·4	− 1·4	04·0	− 2·3	51·7	− 5·6
16	56·5	− 5·4	30·0	− 4·2	12·8	− 3·8	04·4	− 0·4	05·7	− 0·6	55·0	− 2·3
17	58·3	− 3·6	30·9	− 3·3	14·2	− 2·4	04·7	− 0·1	06·5	+ 0·2	57·3	0·0
18	59·8	− 2·1	18 32·4	− 1·8	15·8	− 0·8	3 04·9	+ 0·1	06·8	+ 0·5	58·3	+ 1·0
19	7 00·2	− *1·7*	.....	.....	16·7	+ *0·1*	.....	.....	07·1	+ *0·8*	58·8	+ *1·5*
20	7 00·4	− *1·5*	.....	.....	7 17·5	+ *0·9*	.....	.....	07·5	+ *1·2*	58·9	+ *1·6*
21	.....	.....	.....	.....	.....	.....	.....	.....	6 07·8	+ *1·5*	58·8	+ *1·5*
22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8 58·3	+ *1·0*
23	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mean 1h to 24h	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
7h to 18h	7 01·9	.....	18 34·2	.....	7 16·6	.....	3 04·8	.....	6 06·3	.....	8 57·3	.....
Max. and min...	7 05·9	.....	18 37·7	.....	7 18·2	.....	3 06·8	.....	6 07·7	.....	8 57·6	.....

DIURNAL RANGE OF DECLINATION

As a matter of interest the results were examined with a view to determine the relationship between the range of declination and the horizontal force, as well as that between the range of declination at the field station and Meanook for corresponding days. The results confirmed the general law that the range becomes greater as the horizontal intensity decreases. The range on two successive days at the same station may be quite different, however, with practically no change in the horizontal force. The two stations, Resolution and Fort Smith illustrate this. For purposes of comparison stations A and B at Resolution may be considered identical, as the values of the force at the two places are practically the same. The diurnal range values at Meanook for the two days are 15′·2 and 22′·4, while at Resolution they are 28′ and 37′; the ranges on the other two days are, at Meanook, 18′·2 and 9′·0, while at Fort Smith they are 30′·0 and 14′·5. These results are given in Table 12. It will be noticed that the ranges at Meanook are practically in the same ratio as at the field stations for corresponding days. From an examination of the results it was found that the relation between the range at Meanook and that at the field station for the same day is approximated by the expression,

$$d = d_m \times \frac{H_m}{H}.$$

when d = range at field station, d_m = range at Meanook, H_m = the horizontal force at Meanook and H = horizontal force at the field station. Theoretical values of the range were accordingly computed for the days on which there were special observations. Table 12 contains, in addition to the observed values of the range at Meanook and the field stations, the values of the horizontal force H, at the field stations, the computed value of the range at the field stations and the difference between the computed and observed values of the range. The values adopted for the force at Meanook were ·1290 c.g.s. for 1922 and ·1288 c.g.s. for 1923. Better agreement might reasonably be expected if the principal phases, maximum and minimum, of the declination occurred simultaneously at the two stations. The greatest easterly (maximum) value of declination occurs, for example, at York Factory approximately 1·4h before the corresponding phenomenon at Meanook, and 2·9h in advance of that at Aklavik.

TABLE 12.—DIURNAL RANGE OF MAGNETIC DECLINATION AT FIELD STATIONS

Station	Date	Hor. Int.	Range of declination			Computed-Observed
			Meanook	Field Station		
				Computed	Observed	
	1922	c.g.s.	′	′	′	′
Fort St. John	May 22	·1329	16·6	16·1	17·0	−0·9
Dunvegan	" 30	·1272	14·5	14·7	14·5	+0·2
Browns Landing	June 9–10	·1215	14·3	15·2	15·2	0·0
Fort Vermilion	" 23–24	·1070	15·2	18·3	17·5	+0·8
Fifth Meridian	July 3– 5	·1022	13·4	16·9	19·6	−2·7
Fitzgerald	" 21–22	·0868	10·1	15·0	15·0	0·0
Resolution, A	Aug. 2– 3	·0858	15·2	22·8	28·0	−5·2
Resolution, B	" 3– 4	·0858	22·4	33·7	37·0	−3·3
Chipewyan	" 17	·0958	13·8	18·6	19·6	−1·0

TABLE 12.—DIURNAL RANGE OF MAGNETIC DECLINATION AT FIELD STATIONS—*Concluded*

Station	Date	Hor. Int.	Range of declination			Computed-Observed
			Meanook	Field Station		
				Computed	Observed	
McMurray	Sept. 5– 6	·1080	17·2	20·5	24·5	−4·0
Mile 100, H.B.R.	May 19–20	·1008	15·0	19·2	20·0	−0·8
Kettle Rapids	June 1	·0780	18·0	29·8	27·0	+2·8
	1923					
Kississing Lake	June 10	·0972	12·3	16·3	16·7	−0·4
McMurray	" 10	·1082	12·3	14·6	14·5	+0·1
Fort Smith	" 20	·0862	18·2	27·2	30·0	−2·8
Fort Smith	" 22–23	·0862	9·0	13·4	14·5	−1·1
Norman	July 20–21	·0888	12·0	17·4	17·8	−0·4
Good Hope	" 30	·0868	12·8	19·0	21·6	−2·6
McPherson	Aug. 10	·0912	16·0	22·6	22·0	+0·6
Churchill	" 10	·0610	16·0	33·8	28·5	+5·3
Aklavik	" 20	·0858	17·5	26·3	27·2	−0·9
York Factory	" 20	·0727	17·5	31·0	28·2	+2·8
The Rock	Sept. 4	·0842	12·5	19·1	21·5	−2·4
Swampy Lake	" 20	·0874	7·8	11·5	16·6	−5·1

DETERMINATION OF DIURNAL VARIATION CORRECTIONS

The problem of deriving corrections for diurnal variation is complicated for various reasons. The only data available, especially in the northern part of the country were obtained during field work; there was also the fact of the apparent difference of the diurnal variation for the same period of the day at stations where the horizontal force values differed by small amounts as in the case of Aklavik and York Factory. It was hoped that the errors in the finally adopted correction values would, to a certain extent, be neutralized when applied to the field data, owing to the precaution taken throughout to secure at each station observations spread over the greater part of the day.

Owing to the apparent difference between the type of diurnal variation in the vicinity of Hudson bay and that along Mackenzie river, while both differed from Meanook, the stations given in Table 11 were grouped as follows:—

Group 1.—Fort St. John, Dunvegan, Browns Landing, Fort Vermilion, Fifth Meridian, Fitzgerald, Fort Smith, Resolution, Chipewyan and McMurray.

Group 2.—Norman, Good Hope, McPherson and Aklavik.

Group 3.—Mile 100 H.B.R., Kettle Rapids, Kississing lake, Churchill, York Factory, The Rock and Swampy lake.

On plotting some of the hourly values of the diurnal variation given in Table 11 with respect to the horizontal force, it was seen that the resulting curve could be approximated by a straight line. It was accordingly assumed that the results for any hour could be represented by the linear expression, $d = d_o + y\ (\cdot 1200 - H)$, where d_o = the value of the variation when the value of H is ·1200 c.g.s., and y = change in variation for change of ·0001 c.g.s. Observation equations were formed for each hour and the unknowns deter-

mined by least squares. Values were determined for each ·01 c.g.s. from ·0600 c.g.s. to ·1400 c.g.s. for Group 1; from ·0600 c.g.s. to ·1100 c.g.s. for Group 3; the results for Group 2 were derived by taking the mean of each hour, since the range of force, including all the stations, was small, the limits being ·0852 c.g.s. and ·0912 c.g.s. and the mean ·0882 c.g.s. The results are represented graphically in Figures 23 to 28. From the smoothed curves were obtained the hourly values which are given in Tables 13, 14, and 15.

TABLE 13.—ADOPTED CORRECTIONS FOR DIURNAL VARIATION OF MAGNETIC DECLINATIONS AT FIELD STATIONS

(Group 1)

L.M.T. \ H	·0600	·0700	·0800	·0900	·1000	·1100	·1200	·1300	·1400
h.	′	′	′	′	′	′	′	′	′
1	+ 0·4	+ 0·2	0·0	− 0·2	− 0·4	− 0·8	− 1·0	− 1·5	− 1·3
2	− 1·6	− 1·4	− 0·9	− 0·9	− 0·6	− 0·6	− 0·4	− 0·2	+ 0·1
3	− 4·0	− 3·4	− 2·8	− 2·2	− 1·2	− 0·2	+ 0·6	+ 0·6	+ 1·8
4	− 0·8	− 5·6	− 5·0	− 4·1	− 3·3	− 2·0	− 0·8	− 1·2	+ 0·4
5	− 9·4	− 8·2	− 7·4	− 6·3	− 6·0	− 5·8	− 4·4	− 4·8	− 3·2
6	−12·2	−10·8	−10·4	− 8·0	− 9·0	− 8·4	− 7·8	− 7·8	− 6·6
7	−14·6	−13·4	−13·2	−12·4	−11·5	−10·8	−10·4	− 9·2	− 9·0
8	−15·6	−14·8	−14·4	−13·6	−12·4	−11·2	−10·1	− 9·0	− 8·1
9	−13·8	−12·4	−12·1	−11·0	−10·2	− 9·0	− 8·0	− 7·4	− 6·2
10	− 8·2	− 7·2	− 7·1	− 6·1	− 5·6	− 5·2	− 5·2	− 5·2	− 4·0
11	− 3·0	− 2·1	− 2·0	− 2·2	− 1·9	− 1·7	− 2·0	− 2·0	− 1·4
12	+ 2·2	+ 2·2	+ 2·0	+ 1·6	+ 2·0	+ 2·0	+ 1·6	+ 1·8	+ 2·0
13	+ 7·6	+ 6·7	+ 5·2	+ 5·4	+ 5·4	+ 5·3	+ 4·6	+ 4·2	+ 3·8
14	+ 9·8	+ 9·1	+ 8·2	+ 8·0	+ 7·5	+ 6·8	+ 6·3	+ 5·7	+ 4·4
15	+10·4	+ 9·7	+ 9·1	+ 8·8	+ 7·8	+ 7·2	+ 6·6	+ 6·0	+ 5·2
16	+ 9·4	+ 9·0	+ 8·3	+ 8·0	+ 7·6	+ 6·8	+ 6·4	+ 5·8	+ 5·6
17	+ 7·8	+ 7·5	+ 7·2	+ 6·8	+ 6·4	+ 6·0	+ 5·6	+ 5·2	+ 4·8
18	+ 6·4	+ 6·1	+ 6·0	+ 5·2	+ 5·3	+ 4·8	+ 4·4	+ 4·0	+ 3·8
19	+ 5·0	+ 4·7	+ 4·4	+ 3·9	+ 3·6	+ 3·0	+ 2·4	+ 2·0	+ 1·8
20	+ 3·8	+ 3·4	+ 3·2	+ 2·4	+ 1·8	+ 1·5	+ 1·0	+ 0·6	+ 0·0
21	+ 2·8	+ 2·2	+ 1·8	+ 1·2	+ 0·7	+ 0·3	− 0·3	− 0·8	− 1·4
22	+ 2·4	+ 1·4	+ 0·8	0·0	− 0·4	− 0·4	− 1·0	− 2·0	− 3·2
23	+ 1·8	+ 0·8	+ 0·2	− 0·3	− 1·0	− 1·6	− 2·0	− 2·4	− 4·7
24	+ 1·4	+ 0·5	0·0	− 0·4	− 1·0	− 2·0	− 2·8	− 2·2	− 4·8

TABLE 14.—ADOPTED CORRECTIONS FOR DIURNAL VARIATION OF MAGNETIC DECLINATION AT FIELD STATIONS

(GROUP 2)

L.M.T.	Correction	L.M.T.	Correction
h.	′	h.	′
1	+ 3·4	13	+ 5·2
2	+ 3·4	14	+ 7·4
3	+ 2·0	15	+ 8·5
4	− 1·8	16	+ 8·6
5	− 6·9	17	+ 8·0
6	−10·5	18	+ 7·0
7	−12·6	19	+ 6·3
8	−12·6	20	+ 5·4
9	−11·0	21	+ 4·6
10	− 7·3	22	+ 4·2
11	− 3·0	23	+ 4·0
12	+ 1·8	24	+ 3·8

TABLE 15.—ADOPTED CORRECTIONS FOR DIURNAL VARIATION OF MAGNETIC DECLINATION AT FIELD STATIONS

(GROUP 3)

H / L.M.T.	·0600	·0700	·0800	·0900	·1000	·1100
h.	′	′	′	′	′	′
5	−11·9	−10·4	− 8·9	− 7·3	− 5·8	− 4·3
6	−15·6	−13·8	−12·1	−10·3	− 8·6	− 6·8
7	−16·1	−14·7	−13·2	−11·8	−10·4	− 8·8
8	−15·0	−13·7	−12·4	−11·1	− 9·8	− 8·5
9	−10·8	− 9·7	− 8·7	− 7·6	− 6·6	− 5·6
10	− 2·2	− 2·4	− 2·6	− 2·8	− 3·1	− 3·3
11	+ 5·7	+ 4·2	+ 2·8	+ 1·3	− 0·2	− 1·2
12	+10·8	+ 8·8	+ 6·6	+ 4·8	+ 2·8	+ 0·8
13	+12·5	+10·5	+ 8·5	+ 6·5	+ 4·5	+ 2·8
14	+ 8·8	+ 8·1	+ 7·4	+ 6·7	+ 6·0	+ 5·3
15	+ 4·0	+ 4·5	+ 5·0	+ 5·4	+ 6·9	+ 6·4
16	+ 1·5	+ 2·4	+ 3·3	+ 4·2	+ 5·1	+ 6·0
17	+ 0·6	+ 1·4	+ 2·1	+ 2·8	+ 3·5	+ 4·4
18	− 0·4	+ 0·3	+ 0·9	+ 1·5	+ 2·1	+ 2·7
19	− 0·3	− 0·1	+ 0·2	+ 0·4	+ 0·7	+ 1·0
20	− 0·3	− 0·4	− 0·5	− 0·6	− 0·8	− 0·8

TABLE 16.—ADOPTED CORRECTIONS FOR DIURNAL VARIATION OF MAGNETIC DECLINATION AT FIELD STATIONS, SEPTEMBER AND OCTOBER, 1922, DERIVED FROM MEANOOK DATA

L.M.T.	Correction		L.M.T.	Correction	
	Sept.	Oct.		Sept.	Oct.
	′	′		′	′
1	− 1·9	− 1·9	13	+ 4·7	+ 3·1
2	− 1·3	− 3·5	14	+ 4·7	+ 2·7
3	− 2·5	− 6·3	15	+ 3·7	+ 1·9
4	− 5·5	− 5·6	16	+ 2·7	+ 1·1
5	− 7·5	− 3·9	17	+ 1·8	+ 0·1
6	− 8·5	− 4·2	18	+ 0·3	− 0·6
7	− 8·3	− 3·9	19	− 0·2	− 1·3
8	− 6·8	− 3·3	20	− 1·0	− 2·0
9	− 4·5	− 3·2	21	− 1·8	− 2·5
10	− 1·7	− 2·0	22	− 2·5	− 2·1
11	+ 1·0	+ 1·1	23	− 3·3	− 1·0
12	+ 3·5	+ 3·0	24	− 2·7	− 1·3

TABLE 17.—COMPARISON OF HOURLY VALUES OF DIURNAL VARIATION OF MAGNETIC DECLINATION FOR THE SAME HORIZONTAL FORCE

Force	·1290 c.g.s.		·0882 c.g.s.	
Source / L.M.T.	Table 13	Meanook	Table 13	Table 14
h.	′	′	′	′
1	+ 1·5	+ 0·7	+ 0·1	− 3·4
2	+ 0·2	+ 0·5	+ 0·9	− 3·4
3	− 0·6	+ 0·6	+ 2·4	− 2·0
4	+ 1·2	+ 1·1	+ 4·4	+ 1·8
5	+ 4·8	+ 3·0	+ 6·7	+ 6·9
6	+ 7·8	+ 5·8	+ 8·6	+10·5
7	+ 9·3	+ 7·3	+12·6	+12·6
8	+ 9·1	+ 7·9	+13·8	+12·6
9	+ 7·5	+ 7·0	+11·3	+11·0
10	+ 5·2	+ 4·8	+ 6·8	+ 7·3
11	+ 2·0	+ 2·6	+ 2·2	+ 3·0
12	− 1·8	− 1·6	− 1·7	− 1·8
13	− 4·2	− 4·1	− 5·4	− 5·2
14	− 5·8	− 5·3	− 8·0	− 7·4
15	− 6·1	− 5·4	− 8·9	− 8·5
16	− 5·9	− 4·8	− 8·1	− 8·6
17	− 5·2	− 3·8	− 6·9	− 8·0
18	− 4·0	− 2·8	− 5·4	− 7·0
19	− 2·0	− 1·6	− 4·0	− 6·3
20	− 0·6	− 0·4	− 2·6	− 5·4
21	+ 0·8	+ 0·4	− 1·4	− 4·6
22	+ 1·9	+ 0·4	− 0·2	− 4·2
23	+ 2·4	+ 0·7	0·0	− 4·0
24	+ 2·3	+ 0·6	+ 0·1	− 3·8

[1] A plus (+) sign indicates that the north end of the magnet is east of the mean position for the day.

The results in Table 13, derived from Group 1, were applied as corrections to the observations taken at stations along Peace, Slave and Athabaska rivers in 1922 and 1923. The corrections in Table 14, which were derived from Group 2, were applied to Mackenzie river stations all of which were occupied in 1923, and those in Table 15 were applied to stations in the vicinity of Hudson bay occupied in May, June, July, August and September, 1922 and 1923. The results in Table 16 were applied to observations taken at stations in the vicinity of Meanook in September and October, 1922.

These corrections are, of course, only *average* values. Theoretically, each month should be considered separately, inasmuch as the variation differs from month to month. This was impossible considering the available data. While the corrections may not be strictly applicable in all cases the errors introduced on this account, it is believed, will be small, especially in comparison with the errors due to disturbance effects which, under present conditions, cannot be eliminated.

Table 17 contains the hourly values of the diurnal variation (hourly value—mean of hourly values from 7h to 18h) derived from Table 13 for the force ·1290 c.g.s. This force corresponds to that at Meanook. The corresponding Meanook values are also tabulated and represent the average values for June, July and August for the two years. It also contains values obtained from Table 13 corresponding to the force ·0882 c.g.s. and the values from Table 14. The results derived from the tables for the force corresponding to that at Meanook are in good agreement with those obtained from the Meanook records especially in view of the fact that the former were determined from field observations. For the force ·0882 c.g.s. the results are in good agreement for the period 5h to 17h but for the remaining part of the day the results indicate a change in the diurnal variation which is peculiar, doubtless, to the locality. Another test of the reliability of the correction values may be obtained from a comparison between the mean values for the stations which are given in Table 11 and the mean adopted values for the corresponding stations as given in the summary of the results for all the stations. It is found that, of the twenty-three stations, only three showed differences exceeding 1′. The stations and amounts are as follows: Fort Smith, +2′·4 on June 20 and −1′·0 on June 22; McPherson, +1′·5; and Churchill, +1′·1.

INCLINATION OBSERVATIONS

Inclination was determined according to the usual method employed when using a dip circle. After levelling the instrument, re-magnetizing the needle and determining the magnetic meridian, the observation is carried on as follows:—

(1) With vertical circle east, face of needle east and A-end of needle up, bisect the upper end of the needle then the lower end and read the circle corresponding to each setting. Repeat the two settings.

(2) Turn instrument through 180° and repeat the observations with circle west and face of needle west, as in (1).

(3) Reverse the needle on the agate planes and, with circle west and face of needle east, observe as in (1).

(4) Turn instrument 180° in azimuth and with circle east observe as in (1).

(5) Reverse the polarity of the needle; the end marked B will now be up.

(6), (7), (8), (9). With B-end of needle up, repeat the observations as in (1), (2), (3) and (4).

The mean of all these readings gives the resulting dip.

It was the rule, however, to observe using the needles in pairs and in such a way that the mean time with each needle was approximately, if not exactly, the same. To do this operations (1) to (4) were carried out with the first needle then (1) to (9), or a complete determination, with the second needle, and finally (5) to (9) with the first needle.

During 1921 inclination observations were taken quite consistently both in the forenoon and afternoon, as in previous years,[1] at about the same times at each station. The adopted value for each station is, therefore, the mean of the forenoon and afternoon determinations. In cases where one observation, only, was obtained a small correction was applied on account of diurnal variation, the correction being obtained from stations occupied before and after the one in question. With regard to the observations of 1922 and 1923 there was not the same uniformity in the method as in previous years; observations were distributed over a greater period of the day, especially in 1922 though not to the same extent in 1923. Disturbance effects contributed to the difficulty of determining satisfactory correction values for this element. From an analysis of the results there is, however, evidence of a diurnal change of inclination. The maximum inclination occurs about 10h and decreases until a minimum is reached about 16h, the magnitude of the change being about, but not exceeding, 3′. The error introduced, however, in the mean value by simply taking the observed values without applying any correction will be small. The maximum error of any observation, if the results were referred, as in previous years, to the mean of observations taken in the forenoon and afternoon, will probably not exceed 1′·5. At most of the stations there was a fairly well distributed number of observations so that the errors on account of diurnal variation will be reduced, and the final result will probably differ very little from that obtained by applying corrections for diurnal variation.

HORIZONTAL INTENSITY OBSERVATIONS

The horizontal intensity was determined according to the usual method.[2] This involves two operations, oscillations and deflections. The purpose of observing oscillations is to ascertain the time it takes a suspended magnet to complete one vibration. The approximate time of one oscillation is first determined for the purpose of estimating the time of any particular transit. The program as arranged is to observe every fifth transit of the magnet over the centre line of the telescope from 0 to 45, then from n to $n+45$ where n is some multiple of 10; the selection of the number for the beginning of the second part is quite arbitrary, and very seldom exceeds 100. This furnishes ten determinations of n oscillations, from which the time of one oscillation is determined. Corrections for rate, torsion, temperature and induction are applied. The product of the magnetic moment, M, of the magnet and the horizontal component of the earth's intensity, H, is then determined from the fundamental equation:—

$$MH = \frac{\pi^2 K}{T^2}$$

where K = the moment of inertia of the magnet

T = time of one oscillation of the magnet after all corrections have been applied.

[1] Publications of the Dominion Observatory, Vol. V, No. 5, p. 243.

[2] For reference to the theory and methods of magnetic measurement see Publications of the Dominion Observatory, Vol. V, No. 5, p. 137; Land Magnetic Observations, 1905—10, p. 23, by L. A. Bauer, Carnegie Institution, Washington, D.C.; Directions for Magnetic Measurements, pp. 75-76, by Daniel L. Hazard, Government Printing Office, Washington, D.C., 1911.

Deflections involve the determination of the angle a magnet is turned out of the meridian by the intensity magnet, which is set at a known distance from the suspended magnet. As a rule angles were determined for three distances, though all observations with Tesdorpf magnetometer No. 1977 were taken with the magnet at two distances. From the deflections is determined the ratio of the horizontal force of the earth's magnetism to the magnetic moment of the deflecting magnet, the formula for computing this being:—

$$\frac{H}{M}=\frac{C}{\sin u}$$

where u = the angle of deflection

C = a constant for a constant temperature and a fixed deflection distance, and is equal to

$$\frac{2\left(1+\frac{P}{r^2}+\ldots\right)}{r^3\left(1+\frac{2\mu}{r^3}\right)}$$

where P is a constant depending upon the distribution of the magnetism in the intensity magnet; r is the deflection distance and μ the induction factor.

From the two equations, $MH=\frac{\pi^2K}{T^2}$ and $\frac{H}{M}=\frac{C}{\sin u}$, the value of H may be found.

The mean horizontal intensity result at each station in 1921 was obtained by taking the mean of the morning and afternoon observations. The observations were also taken at approximately the same times at all stations. When only one observation was obtained the observation was corrected for diurnal variation. In the case of observations taken in 1922 and 1923 no corrections were applied. The results showed that the horizontal force increases from morning to afternoon, the average observed range being about 26γ, the minimum value occurring about 10·5h and the maximum about 17h. As the corrections determined from the field observations are necessarily only approximate, and the magnitude comparatively small in comparison with disturbance effects, it was thought not worth while to apply corrections on account of diurnal variation.

DETERMINATION OF TOTAL INTENSITY BY LLOYD'S METHOD

Lloyd's method[1] for determining total intensity with a dip circle was employed at a number of stations during the season of 1922. The formula, $F=C\sqrt{\cos I' \operatorname{cosec} u \operatorname{cosec} u'}$ was used in the computation of results, where F is the total intensity, I' is the angle of dip with the loaded needle, $u'=I-I'$, u is the angle of deflection and C the instrumental constant determined at the base station. The value of the horizontal force is computed from the formula $H=F \sin I$, where I is the inclination and H the horizontal force.

The value of the inclination, I, may be obtained from the deflection observations. This value was not used, however, in the computation. The inclination was determined in every case from observations with the regular dip needles. Observations for total inten-

[1] For reference to the method the following publications, among others, may be mentioned: The Admiralty Manual of Scientific Enquiry, London, 1886, pp. 115, 116; Directions for Magnetic Measurements, by Daniel L. Hazard, Government Printing Office, Washington, D.C., 1911, pp. 21, 22 and 81-85.

sity were carried out in practically the same manner as at the base station when determining the instrumental constant, and in the following order:—

(1) Dip with needles No. 1 and No. 2, and with B-end of needle down.

(2) Dip with loaded needle with circle east and face of needle east, circle west and face of needle west, circle west and face of needle east, and finally circle east and face of needle west.

(3) Deflections with circle east, face of needle east and microscope direct and reversed, circle west, face of needle west and microscope reversed and direct.

(4) Turn suspended magnet about on its bearings and observe as in (3).

(5) Dip with loaded needle as in (2).

(6) With A-end of dip needles No. 1 and No. 2 down, observe as in (1), though in the reverse order.

SUMMARY OF MAGNETIC RESULTS

The custom has prevailed during recent years, in the publication of the magnetic results of the Dominion Observatory, of restricting the magnetic data to include mean values only. The results of 1921 were compiled in accordance with the usual procedure. With regard to the results of the years 1922 and 1923 it was found that discrepancies among the individual values, especially of declination, were much more in evidence after all corrections were applied than among corresponding values obtained in previous years. This was, however, not very surprising in view of the fact that results were obtained in regions of comparatively high magnetic latitude, even extending into those of maximum auroral frequency, where probably there would result a corresponding magnetic disturbance effect. Furthermore, the same uniformity in the methods of observing was not followed as in 1921 and preceding years. In order, therefore, to better demonstrate this phase of the work, as well as to furnish an idea of the accuracy of the results, the decision was reached to present the data somewhat more in detail. Even though uniformity in the publication of the results is sacrificed it was decided to give the data obtained in 1921 as originally intended.

The observations for the period 1921-1923 are grouped according to years. The stations for each year are arranged in order of increasing west longitude. For each station there are given the values of the latitude and longitude, the date, the mean value of the three elements, declination, inclination and horizontal intensity, as well as the instrument number and the observer.

The results for 1922 and 1923 include columns in which are entered local mean times to the nearest 0·1h, followed by a value of the element. Where, for example, four values of time precede a value of declination the inference is that the value given is the mean of observations taken at the times indicated. In some cases there is given the time of beginning and time of ending of what may be either a continuous set of readings at uniform intervals, or a number of sets taken in the ordinary way and distributed fairly uniformly over the interval, followed by a bracketted number. This number indicates either the actual number of sets entering into the result, or the weight to be assigned to the result in deriving a mean value for the station. Inclination values are, at most stations, grouped, but in a slightly different manner. Corresponding to each value representing the time is given one value of inclination. Where such a value is followed by two numbers in the

column headed "needle" the indication is that the value is the mean of two, determined with the respective needles. As in declination results, the number of values of time preceding a horizontal intensity result indicates the number of sets entering into the result.

A mean value for each element at all stations is given in the summary. The results from which the means are derived are weighted in all cases with the exception of the horizontal intensity. It will be noted that certain values of this element are given in italics, indicating that they were derived from total intensity observations by Lloyd's method, and further, were not taken into consideration when deriving the mean. The mean value of the horizontal intensity was, therefore, obtained from values determined with the magnetometer.

The total intensity observations were taken mainly to test the accuracy of the results determined by Lloyd's method under actual field conditions of observing. The results are not entirely satisfactory inasmuch as the program of observing was not arranged so as to eliminate possible disturbance effects. This would have necessitated simultaneous observations with the two instruments. Lloyd's method, however, is supposed under ordinary conditions of observing to yield results which are not equal in accuracy to those obtained with a magnetometer. On the other hand as the magnetic pole is approached, accurate observations with a magnetometer become more difficult. An analysis of the results in the summary reveals discrepancies which are in excess of the combined effect due to diurnal change and error of observation with a magnetometer, yet not large in comparison with possible disturbance effects. The conclusion is reached, however, that the magnetometer gives results, at least so far as the present investigation is concerned, which are superior in accuracy to those obtained with the dip circle by Lloyd's method.

SELECTION AND DESCRIPTIONS OF STATIONS

The usual consideration was given to the selection and description of stations. One of the main things to be considered in the selection of a station is the probable suitability for future observations. The site must also be free from artificial disturbance. Having made the selection the description should be sufficiently complete in order that its recovery at a future date may be readily made. When possible the point is connected by linear measurements to some well-defined and permanent marks, and bearings of some prominent objects, referred to the meridian, are determined. As an additional aid in relocating the station a mark of some kind is left in the ground to indicate the precise point of observation. Frequently a wooden peg is used but it is desirable, when possible, to have material of a more permanent nature such as a brick, a stone or a concrete block.

The general form adopted for the descriptions is: name of station, province in which it is located, year occupied and the general description including details of linear and angular measurements and marking of the station.

In order to obtain the desired number of magnetic stations along the water routes followed during the seasons of 1922 and 1923, many places were selected which were not in the vicinity of villages or towns. On this account they could not be designated according to the usual custom. Nor was it always convenient to select a station at a point which could be readily associated with some natural feature such as a river, or creek, tributary to the main waterway. Fortunately, there were available maps showing the

results of the operations of the Topographical Surveys Branch of the Interior Department. Along Peace river, with the aid of these maps, it was comparatively easy to locate survey lines, such as base lines and lines marking the boundaries of townships at their intersection with the river. This organization has, also, quite recently completed a survey of part if not all, of Slave, Mackenzie and Athabaska rivers. Maps were available for the Slave and part of the Mackenzie at the time the magnetic work was being done along the rivers. Stations were selected in the vicinity of permanent survey monuments and designated so as to correspond to the marking of the monuments. Thus, a station occupied in the vicinity of survey monument which is marked "T 22" is designated "T.S. Monument T 22." Other stations chosen near these survey marks are similarly designated.

In localities where no surveys have been made an effort was always made to select some point that had some distinguishing feature, or was well known locally, so that its recovery would be comparatively easy.

The stations are arranged alphabetically.

MAGNETIC OBSERVATIONS, 1921

Station	Lat.	Long.	Date	Declination	Inclination	Hor. Int.	Instrument Mag'r.	Instrument D.C.	Obs'r.
	° ′	° ′		West ° ′	° ′	γ			
Louisburg	45 54·8	59 57·9	Sept. 1, 5	26 27·2	73 59·1	15608	20	20	F
Louisburg (Lighthouse Reserve)	45 54·2	59 57·9	" 3	26 24·8	74 03·2	15532	20	20	F
Sydney	46 08·8	60 11·6	Aug. 20–22	25 59·4	74 00·2	15602	20	20	F
Sydney (C.I. station)	46 08·8	60 11·6	" 22	25 59·2	.....	15586	20	20	F
Ingonish, South Bay	46 38·8	60 24·4	" 27–29	25 55·8	74 08·4	15605	20	20	F
Dingwall	46 55·0	60 28·5	" 24–26	26 51·4	74 30·2	15245	20	20	F
Grand Narrows	45 57·0	60 47·4	Sept. 6, 7	25 42·7	73 54·4	15742	20	20	F
Inverness	46 14·5	61 16·7	" 12	26 14·5	74 12·0	15724	20	20	F
Mulgrave, A	45 36·3	61 23·3	" 9, 10	24 50·7	73 37·1	16038	20	20	F
Mulgrave, C	45 36·3	61 23·3	" 8, 9	24 50·1	73 36·9	16040	20	20	F
Port Hood	46 01·0	61 31·7	" 14	25 09·7	74 03·8	15644	20	20	F
Grindstone, Magdalen Islands	47 22·4	61 51·1	" 20–23	26 29·4	75 04·2	14768	20	20	F
Amherst, Magdalen Islands	47 14·2	61 51·1	" 23, 24	26 51·4	75 02·3	14791	20	20	F
Souris	46 21·6	62 14·0	" 26, 27	24 35·0	74 25·4	15444	20	20	F
Pictou	45 40·9	62 44·0	" 16, 17	23 54·4	76 12·5	15682	20	20	F
Charlottetown	46 14·0	63 07·4	" 28–30	24 28·2	74 43·0	15213	20	20	F
Borden	46 15·0	63 40·5	Oct. 5, 6	24 04·7	74 58·9	14951	20	20	F
Summerside	46 24·4	63 46·8	" 1	23 47·2	74 58·3	14940	20	20	F
Tignish	46 56·4	64 02·2	" 3	24 41·6	75 30·8	14476	20	20	F
Cap des Rosiers	48 51·6	64 12·0	" 18–20	26 14·7	76 09·6	13920	20	20	F
Grand River	48 24·1	64 29·1	" 13	26 10·4	76 03·7	13978	20	20	F
Gaspe Basin	48 49·6	64 30·0	" 14, 15	26 02·8	76 10·7	13918	20	20	F
Magdalen River	49 15·3	65 19·8	" 22–25	27 00·8	76 33·4	13676	20	20	F
New Carlisle	48 00·5	65 20·5	" 11	25 11·5	75 58·0	14110	20	20	F
Mont Louis	49 14·0	65 44·0	" 26, 27	25 56·9	76 42·8	13559	20	20	F
New Richmond	48 10·3	65 52·0	" 9, 10	25 48·8	76 15·8	13888	20	20	F
Cape Chat	49 06·7	66 41·8	" 28, 29	25 24·1	76 51·4	13399	20	20	F
Matapedia	47 58·5	66 57·0	" 7, 8	23 50·2	76 18·4	13870	20	20	F
Matane	48 51·7	67 33·4	" 30, 31	25 08·2	76 46·8	13546	20	20	F
Megantic	45 35·7	70 52·7	Sept. 12	17 51·8	75 30·3	14799	1977	145	M
Lyster	46 22·5	71 36·0	" 18–21	18 17·2	75 54·8	14505	1977	145	M
Sherbrooke, B	45 25·5	71 56·8	" 29–Oct. 1	15 34·0	75 14·2	15425	1977	145	M
Victoriaville	46 04·3	71 58·0	Sept. 26–28	16 57·8	76 03·8	14334	1977	145	M
Stanstead	45 02·4	72 06·4	Oct. 3, 5	15 58·2	74 58·8	15311	1977	145	M
Richmond	45 40·5	72 08·0	Sept. 6–9	19 03·5	74 56·8	15513	1977	145	M
Sutton	45 06·5	72 35·3	Oct. 8, 9	16 42·5	74 48·5	15599	1977	145	M
St. Johns	45 19·1	73 15·2	Sept. 2, 3	15 55·7	75 53·0	14611	1977	145	M
Lacolle	45 06·1	73 20·4	Aug. 25, 26	15 31·6	75 47·5	14554	1977	145	M
Huntingdon	45 05·6	74 10·3	" 29–31	13 35·8	75 53·8	14723	1977	145	M
Ste. Agathe des Monts	46 04·8	74 17·8	Oct. 13, 14	12 47·7	76 40·2	13695	1977	145	M
Morrisburg	44 54·4	75 09·6	Aug. 22–24	13 00·9	75 30·1	15213	1977	145	M
Prescott	44 43·4	75 30·0	" 15–20	10 56·4	76 14·7	14338	1977	145	M
Mont Laurier	46 33·8	75 30·4	Oct. 17–19	10 30·9	76 32·9	14222	1977	145	M
Ottawa	45 23·6	75 43·0	June 13–16	13 49·6	75 38·3	14848	20	20	F
Ottawa	45 23·6	75 43·0	Aug. 5–8	13 50·5	75 38·4	14831	20	20	F
Tweed	44 30·1	77 18·6	Oct. 25–27	12 27·4	75 32·4	14878	1977	145	M
Coe Hill	44 51·3	77 50·2	" 28–30	13 07·4	75 56·2	14650	1977	145	M
Bancroft	45 04·7	77 52·4	Nov. 1– 3	9 45·7	76 16·5	14366	1977	145	M

MAGNETIC OBSERVATIONS, 1922

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	West ° ′	h.	° ′		h. h.	γ			
Ottawa	45 23·6	75 43·0	April 25	8·6 to 16·8 (4)	13 56·7	10·8	75 39·4	1, 2	.....	.....	20	20	F
			" 26	.....	.....	15·9	37·7	5, 6	.....	.....	....	20	F
			" 26	8·7 to 16·5 (5)	53·6	10·1	39·8	1	.....	.....	20	20	F
			" 26	.....	.....	15·5	35·1	2	.....	.....	....	20	F
			" 27	11·1 to 16·3 (8)	52·1	.....	.....	.....	12·1 14·8	14834	20	....	F
			" 28	9·8 to 14·1 (8)	54·2	.....	.....	.....	10·7 11·7	14814	20	....	F
			" 28	.....	.....	.....	.....	.....	14·6 15·7	14835	20	....	F
			" 29	8·2 8·3	55·2	.....	.....	.....	9·3 10·1	14812	20	....	F
				Mean	13 53·9	.....	75 38·2	.....	.....	14824			
Ottawa	45 23·6	75 43·0	Oct. 17	13·6 14·4 15·4	13 57·8	14·9	75 42·2	5, 6	14·0	14813	20	20	F
			" 18	8·1 to 16·0 (6)	56·9	9·5	40·8	6, 1	10·3 11·7	14796	20	20	F
			" 18	.....	.....	15·5	39·8	1, 2	14·2 15·0	14814	20	20	F
			" 19	8·1 to 13·7 (5)	57·3	10·4	38·9	2, 5	10·6 11·7	14792	20	20	F
			" 19	.....	.....	.....	.....	.....	13·9	14804	20	....	F
				Mean	13 57·2	.....	75 40·4	.....	.....	14803			
Kettle Rapids	56 24·0	94 33·0	May 31	17·9 20·1 20·8	East 7 00·5	.....	.....	.....	.....	.....	19	....	M
			June 1	5·7 6·4 8·5 9·2	05·6	10·6	82 58·5	6	.....	.....	19	19	M
			" 1	10·2 11·2 12·2 14·4	01·2	11·8	83 01·5	2	.....	.....	19	19	M
			" 1	15·6 16·6 17·6 18·5	00·4	14·2	82 59·4	3	.....	.....	19	19	M
			" 1	.....	.....	16·2	58·8	4	17·7	07773	19	19	M
			" 3	.....	.....	.....	.....	.....	19·4	07816	19	19	M
			" 4	.....	.....	.....	.....	.....	13·3 14·5	07788			
				Mean	7 02·0	.....	82 59·6	.....	.....	07791			
Mile 295, H. B. R.	56 07·4	95 24·0	June 5	16·8 17·0 17·7 17·9	10 29·1	.....	.....	.....	.....	.....	19	....	M
			" 6	6·2 6·3 10·0 10·2	23·3	8·4	82 46·4	2, 6	14·3 15·5	07958	19	19	M

			"	6	13·8 15·9	23·0	.....	.....	.....	.....	.....	19	....	M
					Mean.....	10 25·6	.....	82 46·4	.....	.....	07958			
Mile 279 (Landing River), H. B. R.....	56 01·7	95 45·0	June	8	11·4 11·6 13·9	10 44·3	14·0	82 43·8	3	18·4	08065	19	19	M
			"	8	18·0 20·9	46·3	14·5	43·0	4	.....	.....	19	19	M
			"	9	7·1	43·9	.....	.....	.....	7·5	07926	19	....	M
					Mean.....	10 44·9	.....	82 43·4	.....	.....	07996			
Mile 254, H. B. R.....	55 55·1	96 18·0	May	27	7·0 8·5 9·3	12 10·1	7·9	82 08·2	2, 6	10·2 11·1	08570	19	19	M
			"	27	11·6 15·5 17·3	11·6	.....	.....	.....	16·5	08636	19	....	M
			"	28	9·2 16·5 17·6	10·7	10·1	10·8	3, 4	11·1 15·6	08574	19	19	M
					Mean.....	12 10·8	.....	82 09·5	.....	.....	08585			
Mile 226 (Armstrong Lake), H. B. R.....	55 41·6	96 54·6	June	11	19·6	13 14·0	20·3	82 10·5	3, 4	.....	.....	19	19	M
			"	12	8·8 9·0 10·7 10·9	15·8	.....	.....	.....	9·8 10·3	08554	19	19	M
					Mean.....	13 15·4	.....	82 10·5	.....	.....	08554			
Mile 200, H. B. R.....	55 26·8	97 22·0	May	24	5·5 6·5 7·5 9·4	14 04·3	8·4	81 55·9	2	10·9	08916	19	19	M
			"	24	10·0 11·5 12·5 13·5	13 59·1	9·5	52·7	6	14·2	08911	19	19	M
			"	24	15·4 16·3 17·5 18·5	14 01·3	16·1	50·5	3	18·5	08926	19	19	M
			"	24	19·7	13 58·0	17·1	50·3	4	.....	.....	19	19	M
					Mean.....	14 01·3	.....	81 52·4	.....	.....	08918			
Mile 200, H. B. R.....	55 26·8	97 22·0	June	13	17·0 19·8	14 01·2	19·0	81 47·8	2, 3	.....	.....	19	19	M
			"	14	.....	.....	8·2	51·6	6, 4	9·9 10·6	08910	19	19	M
					Mean.....	14 01·2	.....	81 49·7	.....	.....	08910			
Mile 150, H. B. R.....	55 02·2	98 24·5	May	21	16·2 19·2	14 27·2	17·9	81 20·2	3, 4	.....	.....	19	19	M
			"	22	6·3 6·8 7·4	36·6	8·1	35·8	6, 2	10·5 10·9	09202	19	19	M
			"	22	9·7 11·6	28·8	.....	.....	.....	.....	.....	19	....	M
					Mean.....	14 31·7	.....	81 28·0	.....	.....	09202			

MAGNETIC OBSERVATIONS, 1922 (*continued*)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	East ° ′	h.	° ′		h. h.	γ			
Mile 150, H. B. R.....	55 02·2	98 24·5	June 15	9·6 11·0 13·2 16·0	14 29·0	10·3	81 36·0	3, 6	13·7 14·1	09206	19	19	M
			" 15	.....	.....	15·4	32·7	2, 4	.....	.....	....	19	M
				Mean.....	14 29·0	.....	81 34·4	.....	.....	09206			
Mile 100, H. B. R.....	54 35·9	99 20·0	May 19	7·7 8·3 13·4 14·4	14 48·2	9·5	80 48·0	3	14·4 17·5	10098	19	19	M
			" 19	15·4 16·4 18·0 19·6	48·4	15·9	43·8	6	.....	.....	19	19	M
			" 19	.....	.....	16·8	45·8	6	.....	.....	19	19	M
			" 20	5·2 5·8 6·8 7·8	49·6	.....	.....	.....	6·1 10·5	10017	19	....	M
			" 20	8·4 9·6 11·4	51·0	.....	.....	.....	.....	.....	19	....	M
				Mean.....	14 49·2	.....	80 45·9	.....	.....	10058			
Mile 100, H. B. R.....	54 35·9	99 20·0	June 17	9·4 11·2	14 47·4	7·1	80 47·6	4	10·2 10·9	10027	19	19	M
			" 17	.....	.....	9·0	49·8	3	.....	.....	....	19	M
			" 17	.....	.....	13·5	46·6	4, 2	.....	.....	....	19	M
				Mean.....	14 47·4	.....	80 47·6	.....	.....	10027			
Nueltin Lake Narrows.....	60 10·4	99 44·2	Aug. 17	10·6 12·8 13·4	18 05·6	11·5	84 18 0	3, 6	17·1 18·1	06189	19	19	M
			" 17	16·3 18·7	17 57·3	19·9	18·6	2, 4	.....	.....	19	19	M
			" 18	7·8 8·6 9·2	18 05·8	.....	.....	.....	.....	.....	19	....	M
				Mean.....	18 03·6	.....	84 18·3	.....	.....	06189			
Nueltin Lake.....	59 51·6	100 05·2	Aug. 13	6·7 7·6 8·6 9·6	22 18·4	.....	.....	.....	.....	.....	19	....	M
			" 13	10·6 11·5 12·5 13·7	15·4	.....	.....	.....	.....	.....	19	....	M
			" 13	14·6 15·6 16·6 17·6	21 56·0	.....	.....	.....	.....	.....	19	....	M
			" 13	18·6 19·6	43·6	.....	.....	.....	.....	.....	19	....	M
			" 14	13·5 14·2 16·4	40·0	15·4	84 39·0	4, 2	17·5	05779	19	19	M
			" 19	16·4	47·4	19·7	39·4	6, 3	17·4 18·5	05827	19	19	M
				Mean.....	22 00·8	.....	84 39·2	.....	.....	05811			

Mile 42, H. B. R.	54 13·6	100 30·0	June	18	18·5 18·7	16 36·3	19·5	80 28·8	2, 4	.....	.....	19	19	M
			"	19	7·5 9·1 9·8	37·2	.....	.....	.....	7·9 8·6	10330	19	....	M
					Mean.....	16 36·8	.....	80 28·8	.....	.....	10330			
Husky Portage	59 50·5	100 44·0	Aug.	29	7·5 8·2 9·6 10·1	13 53·5	8·8	83 59·4	4	18·9	06669	19	19	M
			"	29	11·5 13·0 13·5 14·2	45·0	10·8	50·7	2	.....	.....	19	19	M
			"	29	15·7 16·5 17·5 18·3	14 03·2	16·5	42·0	3	.....	.....	19	19	M
			"	29	.....	.....	17·5	46·2	6	.....	.....	....	19	M
			"	30	7·6 9·8	13 47·7	.....	.....	.....	8·5 9·5	06580	19	....	M
					Mean.....	13 53·0	.....	83 49·6	.....	.....	06610			
The Pas	53 49·9	101 14·0	Oct.	19	13·2 13·9 14·9 16·4	17 52·2	17·1	80 04·0	6, 4	15·4 16·2	10826	19	19	M
			"	20	8·7 10·4 12·1	47·3	9·7	06·6	2, 3	10·8 11·6	10744	19	19	M
			"	22	7·1 to 15·0 (7)	53·3	.....	.....	.....	.....	.....	19	....	M
					Mean.....	17 51·7	.....	80 05·3	.....	.....	10785			
Fort Hall Lake	59 28·2	101 17·7	Aug.	3	11·8 13·0 13·1 14·8	21 14·9	16·4	83 40·0	2, 4	18·0 18·9	06780	19	19	M
			"	3	15·0 17·4 20·0	12·8	.....	.....	.....	.....	.....	19	....	M
					Mean.....	21 14·0	.....	83 40·0	.....	.....	06780			
Brochet Lake	58 32·9	101 21·2	Sept.	8	6·8 to 9·8 (4)	19 41·8	14·2	82 47·4	3, 2	10·7	07896	19	19	M
			"	8	10·7 to 13·8 (4)	17·2	.....	.....	.....	16·7	07903	19	....	M
			"	8	14·5 to 18·1 (4)	15·7	.....	.....	.....	17·6	07945	19	....	M
					Mean.....	19 24·9	.....	82 47·4	.....	.....	07915			
Brochet Post	57 52·8	101 37·5	July	19	10·0 to 13·6 (7)	20 26·2	.....	.....	.....	.....	.....	19	....	M
			"	19	14·2 to 20·0 (8)	26·6	.....	.....	.....	.....	.....	19	....	M
					Mean.....	20 26·4	.....	.....	.....	.....	.....			
			Sept.	11	14·0 14·1 15·5	20 13·7	11·4	82 43·4	6, 2	14·6 15·2	08016	19	19	M
			"	12	8·6 8·9 10·5	13·4	.....	.....	.....	.....	.....	19	....	M
					Mean.....	20 13·6	.....	82 43·4	.....	.....	08016			

MAGNETIC OBSERVATIONS, 1922 (*continued*)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	East ° ′	h.	° ′		h. h.	γ			
Cochrane River	59 02·4	101 45·0	Sept. 4	11·0 12·4 13·0	25 59·7	13·9	83 40·2	6,4	15·2 15·8	06972	19	19	M
			" 4	14·4 16·1	53·9						19		M
				Mean	25 57·4		83 40·2			06972			
Beaver Lake	54 27·0	102 09·3	Oct. 3	13·9 15·4 17·2	18 51·8	14·6	80 23·7	3,4	16·6	10441	19	19	M
			" 4	12·8 14·2 16·7	48·4	13·6	27·0	6,3	16·3 16·6	10386	19	19	M
				Mean	18 50·1		80 25·4			10404			
Cumberland House	53 57·7	102 18·0	Oct. 11	14·0 to 16·9 (4)	18 57·0				15·7 16·5	10554	19		M
			" 12	7·2 to 8·5 (4)	56·2	15·5	80 18·9	2,4	15·5 16·3	10566	19	19	M
			" 12	10·0 13·6 13·8 15·1	53·0						19		M
			" 13	7·8 7·9	58·8	8·5	19·2	3,6			19	19	M
				Mean	18 55·9		80 19·0			10560			
Reindeer Lake	56 59·9	102 23·3	Sept. 16	13·0 to 18·2 (6)	21 46·0	14·7	81 57·0	3,4	17·0 17·7	08806	19	19	M
			" 17	10·1 to 13·8 (6)	46·8	11·3	56·0	2,4			19	19	M
				Mean	21 46·4		81 56·5			08806			
Sturgeon-weir River	54 55·1	102 34·0	June 29	7·2 7·4 9·3	20 01·0	8·2	80 38·2	2,6	9·9 11·0	10266	19	19	M
			" 29	11·4 15·8 16·0	19 52·4	14·8	31·0	3,4			19	19	M
				Mean	19 56·7		80 34·6			10266			
Pelican Narrows	55 07·9	102 53·8	July 2	9·5 11·1 13·7 18·7	20 28·9	10·3	80 43·4	2,3	16·5	10213	19	19	M
			" 2			14·3	42·8	6,4	18·1	10180	19	19	M
			" 3	4·7 5·3	35·4						19	..	M
				Mean	20 31·1		80 43·1			10196			

Reindeer River	55 55·7	102 55·7	July 9	19·1 19·3 20·7 20·8	19 27·0	.....	.....	.....	.....	.....	19	....	M
			" 9	4·6 4·9	30·4	.....	.....	.....	.....	.....	19	....	M
				Mean.....	19 28·1								
			Sept. 26	9·4 9·5 11·0 12·3	19 33·4	11·4	81 27·8	4,6	10·0	.....	09296	19	19	M
			" 26	12·6 13·0	32·2	.....	.....	.....	10·6	.....	09295	19	....	M
				Mean.....	19 33·0	.....	81 27·8	.....	.....		09296			
South Deer Lake	56 19·8	103 10·0	July 12	16·0 16·1 17·2	19 23·7	.....	.....	.....	17·7	18·6	09098	19	....	M
			Sept. 21	15·4 15·6 16·8	19 26·6	.....	.....	.....	.....	.....	.....	19	....	M
			" 23	16·3	24·4	16·2	81 40·6	3,6	16·7	17·4	09088	19	19	M
			" 24	.....	.....	9·7	41·6	2,3	.....		.....	....	19	M
				Mean.....	19 26·0	.....	81 41·1	.....	.....		09088			
Frog Portage	55 23·9	103 29·3	Sept. 28	10·4 10·6 12·4 12·5	21 00·0	11·3	80 48·6	2,6	14·0	14·6	10060	19	19	M
			" 28	12·8 13·2 13·6 14·9	02·3	.....	.....	.....	.....	.....	.....	19	....	M
				Mean.....	21 01·2	.....	80 48·6	.....	.....		10060			
Rosetown	51 33·8	107 59·7	Oct. 10	14·4 15·6 16·6 17·2	22 19·7	16·2	77 00·5	5,6	14·8	.....	13920	20	20	F
			" 11	7·8 to 11·5 (5)	20·0	9·3	01·5	1,2	10·3	11·2	13909	20	20	F
			" 11	12·0 to 16·6 (5)	21·0	15·0	00·8	1,5	14·1	.....	13931	20	20	F
				Mean.....	22 20·3	.....	77 00·9	.....	.....		13917			
Kerrobert	51 55·4	109 08·4	Oct. 9	7·8 8·1 9·0 10·0	23 26·8	9·5	77 07·9	5,6	10·3	11·1	13774	20	20	F
			" 9	11·5 12·0 13·3 13·8	26·0	16·0	07·4	1,2	14·0	14·6	13767	20	20	F
			" 9	15·0 15·5 16·4 17·0	26·9	.....	.....	.....	.....		.....	20	....	F
				Mean.....	23 26·6	.....	77 07·6	.....	.....		13770			
Cheecham	56 17·3	110 50·1	Sept. 12	13·6 15·1 16·2	28 22·6	15·8	80 00·2	5,6	14·0	14·8	10794	20	20	F
			" 13	7·7 to 11·9 (5)	23·5	10·3	00·6	6,1	8·2	9·3	10798	20	20	F
			" 13	12·8 to 16·9 (5)	22·5	14·1	79 59·0	1,2	11·1	16·0	10786	20	20	F
				Mean.....	28 22·9	.....	79 59·9	.....	.....		10793			

MAGNETIC OBSERVATIONS, 1922 (*continued*)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	East ° ′	h.	° ′		h. h.	γ			
Pickford	55 55·3	110 54·3	Sept. 10	7·8 8·8 10·6	27 39·3	9·8	79 57·2	1, 2	13·3	11128	20	145	F
			" 10	12·3 14·0 15·6 16·4	37·6	14·8	54·9	1, 2	15·3	11120	20	145	F
			" 11	7·5 to 11·0 (5)	37·6	9·6	56·6	1, 2	8·4	11116	20	20	F
			" 11	12·3 13·4 14·3 14·9	36·5	13·9	56·2	5, 6	10·4	11088	20	20	F
				Mean	27 37·6	.....	79 56·2	.....	.....	11113			
Chipewyan	58 42·7	111 08·8	Aug. 16	7·5 to 17·0 (10)	27 49·7	9·5	81 04·6	1, 2	8·0 10·3	09558	20	20	F
			" 16	.....	.....	14·5	06·2	2, 5	13·4 15·4	09582	20	20	F
			" 17	6·8 to 12·4 (6)	49·2	.....	.....	.....	8·3 10·8	09561	20	....	F
			" 17	12·8 to 22·8 (10)	49·9	.....	.....	.....	14·6 16·3	09567	20	....	F
			" 18	0·7 to 7·6 (4)	50·5	9·0	04·2	5, 6	.....	.....	20	20	F
			" 18	8·1 to 11·1 (4)	49·4	14·0	06·6	1, 2	14·0	09538	20	145	F
			" 18	12·1 to 18·6 (4)	51·3	15·2	06·6	6, 1	.....	.....	20	20	F
				Mean	27 49·9	.....	81 05·6	.....	.....	09567			
Chipewyan[1]	58 42·7	111 08·8	Aug. 19	8·9	27 51·4	.....	.....	.....	.....	.....	20	....	F
			" 19	9·2	50·0	.....	.....	.....	.....	.....	20	....	F
			" 19	9·9	47·8	.....	.....	.....	.....	.....	20	....	F
Chipewyan, A[2]	58 42·7	111 08·8	Aug. 19	8·6	49·4	.....	.....	.....	.....	.....	20	....	F
			" 19	9·7	45·8	.....	.....	.....	.....	.....	20	....	F
Chipewyan, B[3]	58 42·7	111 08·8	" 19	9·5	45·3	.....	.....	.....	.....	.....	20	....	F
Long Island	58 07·1	111 21·3	" 31	15·6 to 19·1 (4)	28 24·8	17·5	81 13·0	5, 6	16·0 16·7	09518	20	20	F
			Sept. 1	14·1 to 18·0 (4)	25·2	16·4	11·4	1, 2	14·5 15·3	09530	20	20	F
			" 2	6·0 to 10·5 (6)	20·1	9·2	14·0	1, 6	8·1 10·2	09508	20	20	F
			" 2	10·9 to 14·8 (5)	19·9	13·2	13·9	2, 5	.....	.....	20	20	F
				Mean	28 22·1	.....	81 13·1	.....	.....	09519			

[1] Tested for local attraction.
[2] Station A is 73 feet from main station on line bearing N. 90° 23′ West.
[3] Station B is 75 feet from main station on line bearing N. 55° 22′ West.

T. S. Monument 4E.....	59 12·6	111 22·9	July	15	7·6 8·6 9·5	34 17·3	10·3	81 40·2	1, 2	10·3	.....	08898	20	145	F
			"	15	10·9 12·5 13·7	17·6	14·4	41·3	2, 6	8·1	.....	08903	20	20	F
			"	15	14·7 15·6 16·6	17·0	.....	.....	.....	12·9	.....	08890	20	....	F
					Mean.....	34 17·3	.....	81 40·8	.....	.....		08896			
McMurray.....	56 43·9	111 23·2	Sept.	4	16·3 17·5 18·6	28 57·2	18·0	79 58·3	5, 6	16·6	.....	10820	20	20	F
			"	5	5·8 to 8·8 (5)	29 01·2	9·4	57·8	6, 1	8·4	10·1	10784	20	20	F
			"	5	9·8 to 13·0 (5)	28 59·1	11·0	59·1	1, 2	13·3	15·1	10807	20	20	F
			"	5	13·8 to 22·9 (7)	57·2	14·4	59·0	2, 5	16·6	.....	10818	20	20	F
			"	6	0·7 2·1	57·2	.....	.....	.....	.....		.....	20	....	F
					Mean.....	28 58·5	.....	79 58·6	.....	.....		10803			
Poplar Point.....	57 53·9	111 25·4	Aug.	28	7·5 to 12·4 (6)	28 38·8	9·6	80 49·5	1, 2	8·3	10·5	09910	20	20	F
			"	28	13·3 to 17·9 (5)	39·9	15·9	47·3	5, 6	13·6	16·6	09932	20	20	F
					Mean.....	28 39·3	.....	80 48·4	.....	.....		09921			
T. S. Monument 18E.....	59 31·5	111 25·8	July	17	13·0 13·4 15·4	29 02·3	.....	.....	.....	.....		.....	20	....	F
			"	18	9·8 10·8 15·0 15·9	28 59·9	16·9	81 56·1	1, 2	16·9	.....	08724	20	145	F
			"	18	17·7 18·7 19·2 19·7	57·2	.....	.....	.....	15·4	18·2	08728	20	....	F
					Mean.....	28 59·6	.....	81 56·1	.....	.....		08728			
Coronation.....	52 06·5	111 26·8	Oct.	5	13·4 14·9	23 58·4	.....	.....	.....	14·3	14·6	14322	20	....	F
			"	6	7·3 7·6 8·0 8·7	55·3	9·3	76 34·4	1, 2	10·7	10·9	14276	20	20	F
			"	6	9·7 11·3 12·0 13·3	57·2	15·4	35·4	5, 6	13·6	14·3	14326	20	20	F
			"	6	14·6 15·8 16·0 16·4	56·7	.....	.....	.....	.....		.....	20	....	F
					Mean.....	23 56·7	.....	76 34·9	.....	.....		14308			
T. S. Monument A4.....	58 15·4	111 28·3	Aug.	29	12·7 to 18·2 (6)	28 47·4	15·6	81 16·7	5, 6	13·3	14·1	09442	20	20	F
			"	30	6·7 to 11·0 (6)	45·2	9·6	22·2	1, 2	8·6	16·3	09448	20	20	F
			"	30	12·3 to 17·2 (6)	47·5	15·6	19·3	2, 5	.....		.....	20	20	F
					Mean.....	28 46·7	.....	81 19·4	.....	.....		09445			
Fitzgerald.....	59 51·9	111 35·2	July	20	5·9 to 17·2 (12)	31 04·8	8·1	81 56·0	1, 2	7·1	9·3	08625	20	20	F
			"	20	.....	.....	10·2	58·2	2, 5	12·1	13·0	08658	20	20	F
			"	20	.....	.....	14·1	54·2	5 6	15·1	.....	08688	20	20	F
			"	20	.....	.....	16·1	54·0	6, 1	.....		.....	....	20	F

MAGNETIC OBSERVATIONS, 1922 (*continued*)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	° ′	h.	° ′		h. h.	γ			
Fitzgerald	59 51·9	111 35·2	July 21	7·6 to 19·6 (13)	02·4	.....	.....	.....	14·4 17·9	08668	20	....	F
			" 22	2·6 to 8·6 (7)	00·3	.....	.....	.....	7·7	08666	20	....	F
				Mean	31 02·8	.....	81 55·6	.....	.....	08657			
Philomena	55 11·1	111 36·9	Sept. 19	12·2 13·9 14·5 15·9	27 44·6	15·4	78 44·2	5, 6	13·3 14·2	12088	20	20	F
			" 20	6·4 7·4 8·8 10·0	45·8	9·4	46·6	1, 2	10·4 11·2	12072	20	20	F
			" 21	8·1 9·0 10·1	45·0	16·4	46·4	1, 6	.....	.....	20	20	F
			" 21	11·4 15·8 16·8	44·3	.....	.....	.....	.....	.....	20	....	F
				Mean	27 45·0	.....	78 45·7	.....	.....	12080			
McKay	57 11·1	111 37·5	Aug. 24	9·5 to 12·4 (4)	30 03·2	10·0	79 49·3	1, 2	10·8	10990	20	20	F
			" 24	13·3 to 18·7 (5)	03·1	15·3	49·2	2, 5	13·9	11029	20	20	F
			" 24	.....	.....	17·0	47·6	5, 6	16·1	11030	20	20	F
			" 25	6·8 to 9·9 (4)	04·1	9·3	48·2	6, 1	8·4	11031	20	20	F
			" 25	10·7 to 12·3 (3)	03·5	.....	.....	.....	.....	.....	20	....	F
				Mean	30 03·5	.....	79 48·6	.....	.....	11020			
Chenal des Quatre Fourches	58 53·4	111 38·2	July 13	7·6 to 12·6 (6)	33 21·3	9·2	81 28·8	1, 5	10·1	09304	20	20	F
			" 13	14·0 to 19·6 (7)	17·9	13·3	29·0	1, 2	13·3	09302	20	145	F
			" 13	.....	.....	.....	.....	.....	14·4	09293	20	....	F
				Mean	33 19·5	.....	81 28·9	.....	.....	09298			
Old Fort	57 24·6	111 38·4	Aug. 26	12·8 to 17·2 (5)	28 19·7	15·9	79 49·6	5, 6	13·3 14·1	11140	20	20	F
			" 27	6·8 to 12·1 (7)	18·7	9·6	51·5	1, 2	8·2 10·3	11134	20	20	F
				Mean	28 19·3	.....	79 50·6	.....	.....	11137			

Fort Smith	60 00·6	111 52·0	July	25	7·9 to 11·1	(5)	32 15·4	9·9	81 56·4	1,2	8·4	10·7	08644	20	20	F
			"	25	12·6 to 17·3	(6)	12·6	13·4	56·6	1,2	13·4	.....	08641	20	145	F
			"	25	.....		.....	16·2	54·1	2,5	14·5	16·9	08663	20	20	F
					Mean		32 13·9	.....	81 55·7	.....	.....		08654			
Lac la Biche	54 46·9	111 57·2	Sept.	15	10·8 to 15·3	(5)	27 21·1	14·6	78 27·9	5,6	11·4	13·7	12338	20	20	F
			"	16	7·6 to 11·6	(6)	20·8	9·5	28·3	1,2	10·4	14·3	12358	20	20	F
			"	16	12·8 to 17·1	(5)	20·4	15·6	28·4	1,2	.....		.....	20	20	F
			"	16	.....		.....	15·6	27·4	5,6	.....		.....	....	20	F
					Mean		27 20·8	.....	78 28·0	.....	.....		12348			
Peace Point	59 07·3	112 25·4	July	10	12·4 to 19·6	(8)	32 21·5	14·2	81 38·5	1,2	13·1	15·9	08988	20	20	F
			"	10	.....		.....	18·4	36·8	1,2	18·4	.....	*09012*	....	145	F
			"	11	6·7 to 11·5	(6)	23·7	10·2	38·4	5,6	7·9	11·9	08986	20	20	F
			"	11	12·5 to 17·5	(6)	20·9	.....	.....	.....	.....		.....	20	....	F
					Mean		32 22·0	.....	81 37·9	.....	.....		08987			
T. S. Monument T 22	60 22·1	112 40·6	July	27	13·9 to 17·6	(5)	33 02·0	15·9	81 46·0	5,6	14·3	16·6	08892	20	20	F
			"	28	6·9 to 8·2	(4)	01·4	.....	.....	.....	.....		.....	20	....	F
					Mean		33 01·7	.....	81 46·0	.....	.....		08892			
Boyle	54 35·8	112 48·0	Sept.	23	8·3 to 11·5	(4)	27 40·6	9·8	78 11·4	1,2	10·7	11·5	12564	20	20	F
			"	23	13·6 to 17·2	(4)	38·6	15·8	08·7	5,6	14·0	14·7	12594	20	20	F
			"	23	.....		.....	16·8	07·6	6,1	.....		.....	....	20	F
			"	24	7·9 to 10·8	(6)	39·8	.....	.....	.....	.....		.....	20	....	F
			"	24	11·6 to 15·3	(6)	38·7	.....	.....	.....	.....		.....	20	....	F
			"	25	.....		.....	9·4	09·8	.....	.....		.....	....	20	F
					Mean		27 39·4	.....	78 09·4	.....	.....		12579			
Jackfish River	59 04·4	112 53·8	July	6	.....		.....	19·4	80 53·3	1,2	19·4	.....	*09763*	....	145	F
			"	7	17·6 to 20·8	(4)	34 25·0	.....	.....	.....	.....		.....	20	....	F
			"	8	5·9 to 20·8	(15)	27·8	8·4	51·8	1,2	7·3	12·6	09754	20	20	F
			"	8	.....		.....	10·6	52·9	2,5	13·8	16·0	09764	20	20	F
			"	8	.....		.....	14·6	54·6	5,6	18·2	.....	09768	20	20	F
			"	8	.....		.....	16·7	54·3	6,1	.....		.....	....	20	F
			"	9	3·9 to 8·2	(9)	28·0	.....	.....	.....	.....		.....	20	....	F
					Mean		34 27·5	.....	80 53·4	.....	.....		09761			

MAGNETIC OBSERVATIONS, 1922 (*continued*)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	East ° ′	h.	° ′		h. h.	γ			
Pointe Ennuyeuse	60 47·0	113 02·8	July 29	6·7 to 15·5 (7)	33 21·0	9·8	82 23·8	1, 2	9·8	*08144*	20	145	F
			" 29	.....	.....	.....	.....	.....	7·9 11·9	08233	20	....	F
			" 30	7·5 to 18·5 (12)	21·8	10·0	18·9	1, 2	13·9	08289	20	20	F
			" 31	5·5 to 6·5 (3)	16·9	.....	.....	.....	.....	.....	20	....	F
				Mean	33 20·9	.....	82 21·4	.....	.....	08252			
Thorhild	54 09·6	113 09·6	Sept. 28	15·4 16·7	27 14·8	17·1	77 50·5	5, 6	15·8 16·9	12992	20	20	F
			" 29	7·4 7·8 8·8	15·6	9·1	49·2	1, 2	9·8 10·3	12984	20	20	F
			" 29	9·5 10·7	13·6	.....	.....	.....	.....	.....	20	....	F
				Mean	27 14·8	.....	77 49·8	.....	.....	12988			
Old Fort	61 12·7	113 11·2	July 31	18·2 19·7	39 40·8	.....	.....	.....	.....	.....	20	....	F
			Aug. 1	6·7 to 11·6 (6)	50·7	9·9	82 15·6	1, 2	8·0 10·5	08326	20	20	F
			" 1	12·7 to 17·5 (6)	46·9	14·0	13·3	5, 6	13·0 14·9	08375	20	20	F
			" 1	.....	.....	19·0	10·4	1, 2	19·0	*08439*	....	145	F
				Mean	39 47·7	.....	82 13·1	.....	.....	08350			
Twenty-ninth Base Line	58 46·6	113 19·9	July 5	15·9 to 19·3 (4)	32 25·0	17·1	80 40·1	5, 6	16·2 18·8	10044	20	20	F
			" 6	6·6 to 8·3 (3)	29·6	7·6	41·3	1, 2	7·6	*09977*	20	145	F
				Mean	32 27·0	.....	80 40·7	.....	.....	10044			
Bon Accord	53 49·8	113 24·9	Sept. 26	16·3 17·6	27 47·7	17·3	77 23·2	5, 6	16·6	13432	20	20	F
			" 27	7·5 8·0 8·7 9·6	46·2	9·2	24·4	1, 2	9·9 11·2	13404	20	20	F
			" 27	11·5 13·2 14·4	47·2	.....	.....	.....	13·5	13404	20	....	F
				Mean	27 46·9	.....	77 23·8	.....	.....	13411			

Fort Resolution, A.....	61 10·1	113 40·5	Aug.	2	12·8 to 15·4 (4)	38 32·9	14·1	82 01·0	1, 2	13·1	15·8	08584	20	20	F
			"	2	16·2 to 20·4 (4)	36·7	18·6	81 55·8	1, 2	18·6	.....	*08660*	20	145	F
			"	3	6·7 to 10·5 (5)	38·1	9·6	82 01·9	5, 6	7·9	10·3	08562	20	20	F
			"	3	11·9 to 14·8 (5)	32·8	.....	.....	.....	.....		.....	20	....	F
					Mean.....	38 35·2	.....	81 59·6	.....	.....		08573			
Fort Resolution, B.....	61 10·2	113 40·5	Aug.	3	16·1 to 20·4 (5)	38 56·0	18·7	82 02·4	2, 5	17·9	.....	08587	20	20	F
			"	4	3·8 to 9·2 (6)	58·2	9·6	01·0	1, 6	8·2	.....	08587	20	20	F
			"	4	10·2 to 14·0 (6)	52·4	.....	.....	.....	14·0	.....	08616	20	20	F
			"	4	14·4 to 20·0 (6)	53·2	.....	.....	.....	15·9	.....	08586	20	....	F
					Mean.....	38 54·9	.....	82 01·7	.....	.....		08594			
Lacombe, A.....	52 27·6	113 45·0	Oct.	3	8·0 8·3 9·4 10·9	25 38·0	8·9	76 24·8	1, 2	9·8	10·6	14308	20	20	F
			"	3	12·8 14·6 15·6 16·1	37·9	15·2	26·0	5, 6	13·5	14·3	14346	20	20	F
					Mean.....	25 38·0	.....	76 25·4	.....	.....		14327			
Fifth Meridian.....	58 39·9	114 00·0	July	3	18·0 19·0 20·8	31 31·5	.....	.....	.....	18·5	.....	10221	20	20	F
			"	4	6·4 to 21·0 (15)	32·6	10·8	80 24·2	1, 2	7·8	11·5	10216	20	20	F
			"	4	.....	.....	14·0	28·4	1, 2	14·0	.....	*10188*	....	145	F
			"	4	.....	.....	.....	.....	.....	15·2	.....	10204	20	....	F
			"	5	3·3 to 5·8 (5)	34·4	.....	.....	.....	.....		.....	20	....	F
					Mean.....	31 32·8	.....	80 26·3	.....	.....		10214			
Little Red River Post.....	58 24·6	114 44·9	July	1	7·3 9·5 10·4 10·7	32 34·8	9·0	80 13·0	1, 2	7·4	10·0	10490	20	20	F
			"	1	15·5 17·3 18·5	28·8	15·1	10·9	5, 6	17·9	.....	10647	20	20	F
			"	2	7·1 to 10·1 (5)	32·1	9·7	10·8	1, 6	7·6	10·5	10554	20	20	F
			"	2	11·0 to 15·8 (5)	31·2	14·3	08·1	2, 5	15·1	.....	10660	20	20	F
					Mean.....	32 31·9	.....	80 10·7	.....	.....		10566			
Vermilion Chutes.....	58 21·5	114 56·2	June	27	19·8 20·8	31 11·0	19·1	80 07·0	1, 2	18·6	19·1	*10644*	20	145	F
			"	28	5·3 5·5	15·0	.....	.....	.....	.....		.....	20	....	F
					Mean.....	31 13·0	.....	80 07·0	.....	.....		.....			

MAGNETIC OBSERVATIONS, 1922 (*continued*)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	East ° ′	h.	° ′		h. h.	γ			
Wabiskaw River	58 21·5	115 18·8	June 26	13·6 to 19·7 (5)	32 16·3	16·4	80 13·0	1,2	16·4	*10432*	20	145	F
			" 26	.....	.....	.....	.....	.....	14·6 18·2	10436	20	....	F
			" 27	5·8 to 10·9 (6)	19·3	8·6	13·4	1,2	7·6 9·7	10426	20	20	F
				Mean	32 17·9	.....	80 13·2	.....	.....	10431			
Fort Vermilion	58 24·2	116 00·6	June 22	7·1 to 17·3 (11)	34 26·0	9·0	80 03·0	1,2	.....	.....	20	20	F
			" 22	.....	.....	12·4	01·6	2,5	7·9 10·0	10700	20	20	F
			" 22	.....	.....	15·4	01·0	5,6	14·5	10743	20	20	F
			" 23	5·5 to 12·3 (7)	28·3	.....	.....	.....	.....	.....	20	....	F
			" 24	6·3 to 21·3 (29)	25·7	13·7	03·0	6,1	10·6 14·3	10734	20	20	F
			" 24	.....	.....	.....	.....	.....	18·6	10750	20	20	F
			" 25	3·2 to 9·8 (13)	24·8	.....	.....	.....	.....	.....	20	....	F
				Mean	34 25·9	.....	80 02·2	.....	.....	10727			
Prairie Point	58 15·6	116 28·6	June 19	16·9 17·8 18·6 19·7	34 03·9	.....	.....	.....	18·2	11021	20	....	F
			" 20	13·2 15·4 16·2	04·0	15·8	79 41·0	1,2	13·8	11003	20	20	F
			" 20	17·2 18·7 19·6	02·5	18·0	39·2	1,2	18·0	*11050*	20	145	F
			" 21	5·3 6·2 7·2 7·8	04·2	.....	.....	.....	.....	.....	20	....	F
				Mean	34 03·7	.....	79 40·1	.....	.....	11012			
Twenty-seventh Base Line	58 04·8	116 38·4	June 18	6·7 to 18·7 (10)	34 25·1	9·1	79 30·0	5,6	17·2	11236	20	20	F
			" 19	6·1 7·2 8·8 9·5	28·1	8·1	25·0	1,2	6·8	11212	20	145	F
				Mean	34 26·0	.....	79 27·5	.....	.....	11224			
Carcajou Point	57 47·2	117 01·8	June 14	8·0 to 12·3 (6)	32 21·6	9·9	79 16·7	1,5	14·7	11426	20	20	F
			" 14	13·0 to 17·6 (5)	21·8	17·1	17·1	2,6	.....	.....	20	20	F
			" 15	6·7 to 11·5 (6)	21·1	.....	.....	.....	7·6	11450	20	....	F
			" 15	12·5 to 17·1 (5)	19·8	9·8	14·6	1,2	9·8	*11456*	20	145	F
			" 15	.....	.....	.....	.....	.....	11·6	11422	20	20	F
			" 15	.....	.....	13·4	15·5	1,2	13·4	*11437*	....	145	F

Carcajou Point	57 47·2	117 01·8	June	15	.....	.....	.....	.....	.....	14·0	.....	11422	20	....	F
					Mean	32 21·1	.....	79 16·0	.....	.....		11430			
Twenty-fifth Base Line	57 23·4	117 07·7	June	12	7·4 to 11·3 (5)	30 17·2	9·8	79 04·6	1, 2	8·2	.....	11714	20	20	F
			"	12	12·5 to 17·2 (5)	17·2	16·0	03·4	5, 6	12·0	14·7	11718	20	20	F
					Mean	30 17·2	.....	79 04·0	.....	.....		11717			
Whitemud River	56 40·1	117 10·2	June	7	18·1 19·6 20·7 21·1	30 48·3	.....	.....	.....	.....		.....	20	....	F
			"	8	5·5 to 9·8 (5)	47·0	8·0	78 26·5	1	7·3	.....	12299	20	20	F
			"	8	11·0 to 19·2 (8)	47·5	10·4	29·4	1, 2	9·6	11·3	12265	20	20	F
			"	8	.....	.....	15·6	26·8	5, 6	13·8	16·3	12295	20	20	F
			"	8	.....	.....	19·1	27·4	5	18·8	.....	12289	20	20	F
					Mean	30 47·5	.....	78 27·7	.....	.....		12285			
Brown's Landing	56 58·6	117 14·7	June	9	15·5 to 20·8 (5)	32 24·3	17·5	78 32·0	1, 2	17·5	.....	*12236*	20	145	F
			"	10	3·3 to 8·5 (5)	24·6	7·8	34·4	1, 2	7·8	.....	*12186*	20	145	F
			"	10	9·3 to 13·4 (5)	25·9	9·7	38·2	1, 6	11·3	.....	12124	20	20	F
			"	10	14·0 to 19·3 (5)	24·3	15·8	33·2	2, 5	14·6	.....	12160	20	20	F
					Mean	32 24·8	.....	78 34·4	.....	.....		12142			
Peace River	56 13·8	117 17·5	June	2	7·8 to 15·2 (7)	31 09·7	10·1	78 09·9	1, 2	8·2	10·2	12618	20	145	F
			"	3	7·6 to 13·5 (7)	11·2	9·3	10·0	1, 6	14·6	16·2	12618	20	20	F
			"	3	14·0 to 18·9 (7)	10·0	15·2	07·6	2, 5	.....		.....	20	20	F
			"	5	7·5 to 14·5 (7)	09·2	.....	.....	.....	.....		.....	20	....	F
					Mean	31 10·0	.....	78 09·2	.....	.....		12618			
Griffin Creek	56 00·0	117 46·8	May	31	15·6 to 20·3 (5)	31 07·4	18·0	77 37·8	1, 2	15·9	18·7	13062	20	20	F
			June	1	6·0 to 9·2 (5)	05·9	8·1	38·0	1, 2	8·1	.....	*13117*	20	145	F
					Mean	31 06·6	.....	77 37·9	.....	.....		13062			
Dunvegan	55 55·5	118 35·2	May	29	19·2 to 21·0 (3)	30 17·8	.....	.....	.....	.....		.....	20	....	F
			"	30	4·0 to 8·8 (6)	17·5	7·6	78 05·5	1, 2	6·7	8·6	12720	20	20	F
			"	30	9·4 to 13·6 (6)	18·5	9·9	08·0	2, 5	11·7	13·6	12714	20	20	F
			"	30	14·7 to 20·4 (6)	19·6	14·3	07·8	5, 6	15·6	18·2	12715	20	20	F
			"	30	.....	.....	17·4	06·4	6, 1	.....		.....	....	20	F
					Mean	30 18·4	.....	78 06·9	.....	.....		12716			

MAGNETIC OBSERVATIONS, 1922 (*concluded*)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	East ° ′	h.	° ′		h. h.	γ			
Range 6, Township 82.....	56 09·2	118 56·5	May 28	15·1 to 20·8 (9)	30 08·3	17·9	78 15·2	1,2	15·8 16·5	12522	20	20	F
			" 29	5·5 to 8·8 (5)	08·6	7·9	15·7	5,6	7·1 8·7	12535	20	20	F
				Mean.....	30 08·4	.....	78 15·4	.....	.....	12528			
Clear River.....	56 15·5	119 19·6	May 27	4·8 to 12·2 (8)	31 12·8	7·0	77 43·8	5,6	8·1	12973	20	20	F
			" 27	13·1 to 21·0 (8)	12·1	7·0	45·0	1,2	11·3	12952	20	145	F
			" 27	.....	.....	10·3	46·4	1,2	14·1	12999	20	20	F
			" 27	.....	.....	14·8	45·4	1,2	15·7	12975	....	145	F
				Mean.....	31 12·4	.....	77 45·2	.....	.....	12975			
Boundary.....	56 08·5	120 00·0	May 24	13·4 to 20·1 (6)	32 46·8	16·5	77 26·8	2,5	14·0 15·6	13304	20	20	F
			" 25	5·3 to 19·8 (17)	46·7	10·6	26·0	5,6	7·6 9·4	13301	20	20	F
			" 26	5·5 to 9·0 (6)	49·9	.....	.....	.....	.....	.....	20	....	F
				Mean.....	32 47·4	.....	77 26·4	.....	.....	13302			
Fort St. John.....	56 12·5	120 49·0	May 21	13·5 14·5 15·6 17·5	31 10·9	.....	.....	.....	14·0 15·3	13270	20	....	F
			" 21	.....	.....	16·7	77 20·5	1,2	16·8	*13313*	....	145	F
			" 22	3·6 to 16·9 (10)	11·5	10·4	20·0	1,2	5·0 9·2	13259	20	20	F
			" 22	.....	.....	10·4	21·1	1,2	12·9 13·6	13256	20	145	F
			" 23	5·0 to 18·0 (10)	11·0	.....	.....	.....	12·1 13·6	13256	20	....	F
				Mean.....	31 11·2	.....	77 20·5	.....	.....	13260			

MAGNETIC OBSERVATIONS, 1923

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	West ° ′	h.	° ′		h. h.	γ			
Ottawa	45 23·6	75 43·0	April 27	7·9 to 13·8 (6)	14 02·8	10·5	75 38·0	1,2	11·3 11·8	14798	20	20	F
			" 27			15·9	38·0	5,6	14·3 14·9	14816	20	20	F
			" 30	7·8 to 13·3 (6)	13 59·0	10·0	40·1	1,2	10·8 11·5	14775	20	20	F
			" 30			16·1	38·4	5,6	14·5 15·2	14813	20	20	F
			May 1	7·9 to 13·5 (6)	14 01·0	10·2	40·0	1,2	11·0 12·2	14788	20	20	F
			" 1			15·6	36·8	5,6	13·9 14·5	14823	20	20	F
Ottawa	45 23·6	75 43·0	" 2	7·8 to 14·1 (6)	13 57·2						20		F
			" 3	7·7 to 14·6 (6)	14 00·0						20		F
				Mean	14 00·0		75 38·6			14802			
Ottawa	45 23·6	75 43·0	Oct. 5	8·2 8·8 13·1 13·4	14 03·0	10·1	75 38·2	1,2	10·9 11·5	14792	20	20	F
			" 5			15·0	37·6	2,5	13·4 14·2	14793	20	20	F
			" 6	8·2 12·5	02·1						20		F
			" 8	8·0 10·1 12·7	04·5	10·6	39·4	5,6	11·2 11·7	14777	20	20	F
			" 8			14·8	36·8	6,1	13·5 14·0	14794	20	20	F
			" 9	7·9 12·6 13·0	00·8						20		F
				Mean	14 02·7		75 38·0			14789			
					East								
York Factory	57 00·6	92 18·0	Aug. 20	6·7 to 18·0 (11)	3 05·0						19		M
			" 21	9·9 to 17·5 (4)	04·5	16·8	83 19·8	2,6	10·4 11·0	07252	19	19	M
			" 21						13·9 14·5	07276	19		M
			" 27	9·8 to 14·3 (2)	01·6	10·4	22·4	4,3	11·1 11·6	07243	19	19	M
			" 27			16·0	18·0	2,3	14·7 15·2	07316	19	19	M
				Mean	3 04·5		83 20·1			07272			
Port Nelson	57 03·1	92 35·9	Aug. 23	16·3 16·8 18·7 19·2	4 28·5						19		M
			" 24	8·2 9·8 11·6	28·2	8·8	83 10·1	2,3	10·2 11·3	07436	19	19	M
			" 24	14·0 16·0	30·8	16·7	09·5	4,6	14·5 15·5	07485	19	19	M
				Mean	4 28·9		83 09·8			07460			

MAGNETIC OBSERVATIONS, 1923 (*continued*)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	East ° ′	h.	° ′		h. h.	γ			
Hayes River	56 36·7	92 38·8	Aug. 30	8·9 9·7 10·7 11·5	3 34·6	10·8	83 10·4	4, 3	16·4 17·3	07472	19	19	M
			" 30	12·7 to 16·8 (5)	31·9	14·3	10·2	6, 2	19·0	07474	19	19	M
				Mean	3 33·1	.....	83 10·3	.....	.....	07473			
Shamattawa River	56 22·5	92 51·0	Sept. 2	13·8 to 18·6 (6)	4 17·2	.....	.....	.....	16·2 17·1	07413	19	....	M
			" 3	8·5 9·8 10·8	15·7	11·5	83 16·7	4, 6	9·4 10·3	07382	19	19	M
			" 3	12·0 12·6	21·0	13·4	15·2	2, 3	.....	.....	19	19	M
			" 4	.....	.....	11·5	15·7	2	9·8 10·4	07386	19	19	M
				Mean	4 17·5	.....	83 15·9	.....	.....	07394			
Fox River	56 03·2	93 17·1	Sept. 7	9·0 10·3 14·0 15·3	6 42·0	11·4	82 35·4	4, 3	9·5 10·4	08060	19	19	M
			" 7	16·8 17·4 18·8 19·8	43·2	14·6	36·6	2, 6	15·7 16·2	08090	19	19	M
			" 8	16·2 16·9 17·6 18·8	43·2	.....	.....	.....	.....	.....	19	....	M
				Mean	6 42·8	.....	82 36·0	.....	.....	08075			
The Rock	55 39·8	93 30·8	Sept. 12	8·2 to 21·4 (12)	6 07·1	.....	.....	.....	16·7	07836	19	....	M
			" 13	6·5 to 17·3 (4)	04·5	11·4	82 49·1	4, 6	9·8 10·3	07822	19	19	M
			" 13	.....	.....	14·4	46·8	3, 2	16·0 16·8	07835	19	19	M
				Mean	6 06·4	.....	82 48·0	.....	.....	07830			
Hayes River (First rapids north of Swampy Lake).	55 23·2	93 53·1	Sept. 18	14·7 14·9	5 26·8	10·2	82 20·5	2, 6	15·5 16·0	08406	19	19	M
			" 19	8·2 8·4 11·1 11·3	25·9	.....	.....	.....	.....	.....	19	....	M
				Mean	5 26·2	.....	82 20·5	.....	.....	08406			
Swampy Lake	55 15·4	94 07·8	Sept. 20	6·5 to 19·8 (14)	8 57·2	.....	.....	.....	10·2 11·1	08729	19	....	M
			" 21	5·8 9·4	54·4	8·0	82 05·6	3, 4	9·8 10·3	08733	19	19	M
			" 21	.....	.....	11·2	07·4	3, 2	.....	.....	....	19	M
				Mean	8 56·8	.....	82 06·5	.....	.....	08731			

Churchill	58 45·7	94 13·2	Aug.	9	16·0	7 11·2	17·9	84 22·4	3,2	16·5	17·1	06118	19	19	M
			"	10	7·0 to 19·8 (12)	16·5							19		M
			"	11	8·5 to 14·2 (4)	13·4	10·6	28·1	4,6	8·6	9·4	06059	19	19	M
			"	11			14·8	24·6	3,4					19	M
					Mean	7 15·5		84 25·0				06088			
Seal River	59 05·0	94 48·3	July	31	9·9 11·7 13·1	8 15·6	16·9	84 24·2	4,2	10·6	11·4	06089	19	19	M
			"	31	17·7 18·5 20·4	12·9	19·6	23·6	3,6	14·0	14·6	06125	19	19	M
			Aug.	1	6·2 6·7	10·6	8·5	25·8	2,3	7·2	7·8	06099	19	19	M
					Mean	8 13·3		84 24·5				06104			
Oxford House	54 57·8	95 15·6	Sept.	26	11·2 11·6	3 24·9							19		M
			"	27	14·4 16·9	28·1				15·7	16·4	08440	19		M
			"	28	7·1 8·9 13·8	18·2	11·2	82 31·0	2,6	9·6	10·4	08222	19	19	M
			"	28	15·9 17·2	24·8	14·4	30·0	3,4	16·3	16·8	08271	19	19	M
					Mean	3 23·4		82 30·5				08311			
Great Island	58 53·4	96 19·9	July	25	11·5 13·7 14·5 15·5	11 50·4	17·8	84 23·9	6	16·1		06104	19	19	M
			"	25	17·1 18·3 18·8 20·7	50·3	20·1	26·6	2	16·7		06111	19	19	M
			"	26	7·6 10·5 11·8	53·1	9·9	25·0	3,4	8·0		06095	19	19	M
			"	26			11·2	25·4		8·6		06077	19	19	M
					Mean	11 51·1		84 25·2				06097			
Shethnanei Lake	58 50·2	97 35·3	July	22	11·3 11·6 13·6	14 24·3	17·3	83 57·5	6,2	15·0	16·1	06539	19	19	M
			"	23	8·7 10·2 11·8	27·3	9·5	84 02·9	4,3	10·9	11·5	06527	19	19	M
					Mean	14 25·8		84 00·2				06533			
Thicket Portage	55 18·5	97 39·8	Oct.	11	7·7 10·2	18 52·2	14·3	82 04·0	3,4	9·0	9·9	08690	19	19	M
			"	11	13·4 15·0	50·4				15·4		08691	19	19	M
					Mean	18 51·3		82 04·0				08690			
Norway House	53 59·1	97 49·8	Oct.	4	15·3 16·4 17·6	12 53·0				16·1	16·7	09782	19		M
			"	5	6·6 7·6 8·4 10·4	53·6	11·1	81 01·8	3,6	9·6	10·0	09802	19	19	M
			"	5	11·6 12·8 13·9 16·8	53·8	14·6	00·9	2,4				19	19	M
					Mean	12 53·5		81 01·4				09792			

MAGNETIC OBSERVATIONS, 1923 (*continued*)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	East ° ′	h.	° ′		h. h.	γ			
Todoule Lake	58 28·3	98 06·3	July 18	6·8 7·0 9·8 10·0	16 05·9	11·0	83 55·1	6,3	7·9 8·6	06658	19	19	M
			" 18	13·1 14·3	15 56·6	15·5	53·3	2,4	13·4 14·0	06688	19	19	M
				Mean.....	16 02·8	.....	83 54·2	.....	.....	06673			
Missi Falls	57 22·1	98 09·1	July 9	13·7 to 20·6 (7)	13 52·1	19·4	82 50·3	4,3	16·0 16·7	07663	19	19	M
			" 10	6·0 to 9·0 (3)	14 12·4	.....	.....	.....	.....	.....	19	....	M
			" 10	9·2 to 13·0 (4)	05·7	.....	.....	.....	.....	.....	19	....	M
			" 10	13·2 to 16·9 (4)	03·2	.....	.....	.....	.....	.....	19	....	M
			" 10	17·1 to 20·4 (3)	13 54·6	.....	.....	.....	.....	.....	19	....	M
			" 11	.....	.....	9·9	58·9	6,2	6·5 7·2	07592	19	19	M
			" 11	.....	.....	.....	.....	.....	8·6 9·2	07651	19	....	M
				Mean.....	14 00·1	.....	82 54·6	.....	.....	07635			
Chipewyan Lake	57 56·8	98 30·3	July 14	19·2 19·8 20·2	15 35·9	.....	.....	.....	.....	.....	19	....	M
			" 15	8·6 10·0 11·7 13·7	45·9	17·0	83 17·7	6,4	10·8 11·4	07282	19	19	M
			" 15	16·2 17·3 18·7	38·7	19·5	18·5	3,2	14·2 14·7	07299	19	19	M
			" 15	20·2 21·4	40·3	.....	.....	.....	.....	.....	19	....	M
				Mean.....	15 41·6	.....	83 18·1	.....	.....	07290			
Southern Indian Lake	56 57·4	98 44·5	July 5	9·6 9·8 11·5 11·7	14 55·1	16·2	82 37·7	2,6	10·4 11·2	08007	19	19	M
			" 5	13·2 14·6 14·7	53·6	16·2	37·9	3,4	13·6 14·2	08019	19	19	M
				Mean.....	14 54·5	.....	82 37·8	.....	.....	08013			
Nepishkas Portage	56 29·9	99 57·6	July 2	8·3 14·6 16·2 18·0	16 09·4	13·2	82 00·8	2,3	16·7 17·6	08780	19	19	M
			" 2	20·8 21·3	08·7	20·0	81 58·2	6,4	.....	.....	19	19	M
			" 3	6·5 7·8	10·7	.....	.....	.....	7·0 7·5	08779	19	....	M
				Mean.....	16 09·6	.....	81 59·5	.....	.....	08780			

Churchill River	55 45·8	100 28·6	June 26	15·8 to 21·2 (6)	17 30·4	19·6	81 33·1	2,6	16·5 17·4	09182	19	19	M
			" 27	6·3 6·5 8·2 9·9	34·4	7·2	36·5	3,4	8·6 9·8	09170	19	19	M
				Mean	17 32·0	.....	81 34·8	.....	.....	09176			
Kississing River	55 27·4	100 55·5	June 13	10·9 12·9 14·7 16·6	18 11·4	13·9	81 22·3	4,2	.....	.....	19	19	M
			" 14	5·5 7·9	11·5	8·6	25·1	6,3	5·9 6·8	09338	19	19	M
				Mean	18 11·4	.....	81 23·7	.....	.....	09338			
Pukatawagan	55 44·5	101 18·2	June 16	16·2 19·8 20·8	18 38·1	.....	.....	.....	16·8 17·6	09338	19	....	M
			" 17	12·7 13·5	38·3	16·1	81 26·0	3	.....	.....	19	19	M
			" 18	10·7 12·4	39·6	15·5	26·6	6,4	11·2 12·0	09294	19	19	M
			" 20	11·4 to 19·2 (9)	39·4	10·9	26·4	.....	.....	.....	19	19	M
				Mean	18 39·0	.....	81 26·4	.....	.....	09316			
Kississing Lake	55 09·7	101 25·4	June 10	5·2 to 9·2 (4)	18 34·3	.....	.....	.....	9·9 10·8	09700	19	....	M
			" 10	10·2 to 18·1 (7)	34·3	.....	.....	.....	14·3 15·3	09726	19	....	M
			" 11	8·9 to 10·8 (1)	32·0	10·0	81 06·3	2,3	.....	.....	19	19	M
			" 11	.....	.....	11·3	08·5	6,4	.....	.....	....	19	M
				Mean	18 34·1	.....	81 07·4	.....	.....	09713			
Baker's Narrows	54 40·7	101 39·6	June 6	7·9 8·0 13·7 13·9	20 12·4	9·7	80 39·9	2,6	10·8 14·3	10114	19	19	M
			" 6	18·8	10·1	16·3	37·7	3,4	19·3 20·1	10136	19	19	M
			" 7	6·2 6·3	12·0	.....	.....	.....	.....	.....	19	....	M
				Mean	20 11·9	.....	80 38·8	.....	.....	10125			
Sturgeon Landing	54 16·5	101 49·1	June. 1	16·4	19 12·2	.....	.....	.....	.....	.....	19	....	M
			" 2	8·9 13·0 15·3 16·9	11·8	16·2	80 24·2	6,4	9·8 10·7	10448	19	19	M
			" 2	.....	.....	.....	.....	.....	14·1 14·6	10455	19	....	M
			" 3	8·8 10·7 13·7 14·1	12·6	9·7	24·0	.....	.....	.....	19	19	M
				Mean	19 12·2	.....	80 24·1	.....	.....	10452			
Cumberland House	53 57·7	102 15·1	May 28	9·7 14·9 16·9	18 54·8	13·8	80 18·2	2,6	15·6 16·4	10572	19	19	M
			" 29	5·5 9·4 14·7 17·1	56·0	.....	.....	.....	6·0 8·7	10511	19	....	M
			" 29	.....	.....	.....	.....	.....	15·4	10596	19	....	M
			" 30	15·6 16·8	56·9	9·5	23·0	3,4	16·3	10555	19	19	M
			" 30	.....	.....	15·0	17·3	2,3	.....	.....	....	19	M
				Mean	18 55·8	.....	80 19·5	.....	.....	10553			

MAGNETIC OBSERVATIONS, 1923 (*continued*)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	East ° ′	h.	° ′		h. h.	γ			
McMurray	56 43·9	111 22·1	June 10	4·6 to 10·4 (6)	28 53·7	19·1	79 58·0	5,6	15·8 16·4	10810	20	20	F
			" 10	10·6 to 16·4 (6)	55·5	.....	.....	.....	.....	.....	20	....	F
			" 10	16·6 to 20·8 (3)	55·6	.....	.....	.....	.....	.....	20	....	F
			" 11	7·5	52·5	10·3	58·6	1,2	7·8 8·4	10810			
				Mean.....	28 54·7	.....	79 58·3	.....	.....	10810			
Fort Smith	60 00·6	111 52·4	June 18	13·2 14·7 16·3	32 03·8	10·4	81 56·6	1,2	13·6 14·4	08618	20	20	F
			" 18	.....	.....	15·8	54·9	5,6	.....	.....	....	20	F
			" 19	8·1 to 21·0 (10)	01·3	9·2	57·5	1,2	10·1 11·3	08614	20	20	F
			" 20	5·9 to 20·7 (10)	04·2	.....	.....	.....	.....	.....	20	....	F
			" 22	7·2 to 22·8 (15)	01·3	.....	.....	.....	.....	.....	20	....	F
			" 23	2·1 to 9·3 (7)	00·1	.....	.....	.....	.....	.....	20	....	F
				Mean.....	32 01·9	.....	81 56·3	.....	.....	08616			
Hay River	60 51·8	115 43·7	Sept. 6	11·6 14·6 16·0 17·1	35 59·8	16·7	81 22·2	5,6	10·3 15·6	09148	20	20	F
			" 7	7·5 to 11·0 (5)	57·4	9·7	22·6	1,2	10·6 13·6	09148	20	20	F
			" 7	12·5 to 18·2 (6)	36 00·1	15·4	22·0	2,5	.....	.....	20	20	F
			" 8	7·4 to 14·1 (5)	35 55·6	10·0	24·2	5,6	.....	.....	20	20	F
				Mean.....	35 58·2	.....	81 22·8	.....	.....	09148			
Hay River (Vale Point)	60 51·8	115 43·7	Sept. 12	12·5 12·9 14·6 15·5	36 00·2	16·0	81 22·6	5,6	13·0 14·3	09164	20	20	F
			" 12	16·4 16·9 18·5	02·7	.....	.....	.....	....	.....	20	....	F
				Mean.....	36 01·3	.....	81 22·6	.....	.....	09164			
Brabant Harbour	61 04·2	116 34·6	June 28	10·0 12·0 13·2 16·8	38 01·6	18·4	81 19·8	5,6	13·6 14·4	09236	20	20	F
			" 29	7·1 8·2 9·0 10·2	03·4	9·7	21·6	1,2	10·5 11·2	09232	20	20	F
			" 29	11·4 to 18·8 (6)	03·6	.....	.....	.....	.....	.....	20	....	F
				Mean.....	38 03·0	.....	81 20·7	.....	.....	09234			

Providence	61 21·4	117 39·0	July	2	17·0 19·3 21·1	37 44·1	.....	.....	.....	20·2	.....	09475	20	....	F
			"	3	8·1 9·7 10·8 11·6	44·2	10·2	81 07·2	1,2	8·4	10·2	09468	20	20	F
			"	3	13·6 to 19·2 (6)	46·0	16·0	04·6	5,6	14·9	.....	09452	20	20	F
					Mean	37 45·0	.....	81 05·9	.....	.....		09466			
Trout River	61 19·2	119 50·8	July	5	7·5 to 13·6 (8)	37 34·1	9·8	80 38·1	1,2	10·9	11·3	09862	20	20	F
			"	5	15·1 to 20·5 (6)	38·5	16·4	38·7	5,6	14·1	14·8	09880	20	20	F
					Mean	37 36·0	.....	80 38·4	.....	.....		09871			
Simpson, A	61 52·2	121 20·0	July	7	10·5 to 21·4 (9)	38 15·3	16·7	80 46·0	5,6	12·7	.....	09750	20	20	F
			"	7	.....	.....	.....	.....	.....	14·5	16·0	09751	20	....	F
			"	8	7·6 to 14·6 (7)	16·8	10·0	46·2	1,2	10·4	.....	09753	20	20	F
			"	9	8·1 8·5 9·9 10·6	14·6	.....	.....	.....	.....		.....	20	....	F
					Mean	38 15·7	.....	80 46·1	.....	.....		09751			
Simpson, B[1]	61 52·3	121 21·0	July	9	.....	.....	17·5	80 36·6	2,5	16·6	.....	09795	20	20	F
			"	10	1·8 to 3·8 (1)	38 25·2	.....	.....	.....	.....		.....	20	....	F
			"	10	9·2 to 13·8 (2)	19·4	.....	.....	.....	.....		.....	20	....	F
			"	10	14·0 to 18·7 (2)	15·6	.....	.....	.....	.....		.....	20	....	F
					Mean	39 19·0	.....	80 36·6	.....	.....		09795			
North Nahanni River	62 17·5	123 21·4	July	12	7·7 8·3 9·0 10·0	38 55·4	9·6	80 26·5	1,2	10·4	10·9	10009	20	20	F
			"	12	11·2 11·8 13·0 13·7	39 00·9	16·6	24·5	5,6	14·8	15·3	10019	20	20	F
			"	12	14·5 16·0 17·2 18·4	00·6	.....	.....	.....	.....		.....	20	....	F
					Mean	38 59·0	.....	80 25·5	.....	.....		10014			
Wrigley, A	63 16·3	123 36·0	July	14	7·2 to 12·9 (7)	40 10·5	16·8	80 59·6	1,2	11·1	13·8	09435	20	20	F
			"	14	13·5 to 20·9 (7)	15·3	.....	.....	.....	14·9	.....	09435	20	....	F
			"	16	6·9 to 15·5 (10)	12·9	9·0	81 01·3	5,6	10·9	.....	09426	20	20	F
			"	17	9·2	15·9	.....	.....	.....	.....		.....	20	....	F
					Mean	40 13·0	.....	81 00·4	.....	.....		09433			
Wrigley, B	63 16·3	123 36·0	July	16	16·6 to 22·4 (6)	40 19·5	19·9	81 00·0	1,5	16·9	17·5	09458	20	20	F
			"	17	2·6 to 5·1 (6)	16·8	.....	.....	.....	.....		.....	20	....	F
			"	17	5·6 to 8·2 (6)	12·1	.....	.....	.....	.....		.....	20	....	F
					Mean	40 16·1	.....	81 00·0	.....	.....		09458			

[1]Magnetic storm.

MAGNETIC OBSERVATIONS, 1923 (*continued*)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	East ° ′	h.	° ′		h. h.	γ			
Birch Island	64 11·2	124 23·4	July 18	7·9 to 13·0 (6)	41 18·5	8·9	81 15·5	1, 2	10·5	09118	20	20	F
			" 18	13·6 to 18·4 (6)	14·6	10·1	14·5	5, 6	14·0	09137	20	20	F
				Mean	41 16·6	.....	81 15·0	.....	.....	09128			
Norman	64 54·3	125 34·6	July 20	8·7 to 22·7 (14)	41 29·6	.....	.....	.....	.....	.....	20	....	F
			" 21	3·7 to 8·4 (4)	28·1	10·0	81 25·0	1, 2	11·0 11·6	08889	20	20	F
			" 21	8·7 to 19·1 (6)	28·3	16·2	28·0	5, 6	13·6 15·3	08873	20	20	F
			" 21	.....	.....	17·8	27·1	1, 2	.....	.....	....	20	F
				Mean	41 29·0	.....	81 26·7	.....	.....	08881			
T. S. Monument 56N	65 31·4	127 39·3	July 23	13·5 15·2 17·1 20·4	40 41·8	16·6	81 08·0	1, 2	14·0 14·8	09189	20	20	F
			" 24	7·6 8·2 8·9	40·1	9·5	10·4	5, 6	10·3 10·9	09185	20	20	F
			" 24	10·0 11·2 12·3	47·8	.....	.....	.....	.....	.....	20	....	F
				Mean	40 43·1	.....	81 09·2	.....	.....	09187			
Good Hope, A	66 15·5	128 38·3	July 27	8·2 to 16·7 (8)	41 41·4	10·2	81 39·5	1, 2	10·1 11·8	08682	20	20	F
			" 27	17·8 18·9 20·6	41·5	16·2	34·9	5, 6	13·8 14·5	08692	20	20	F
			" 28	8·0	41·9	.....	.....	.....	.....	.....	20	....	F
			" 30	20·3 21·0 21·5	37·7	.....	.....	.....	.....	.....	20	....	F
				Mean	41 40·7	.....	81 37·2	.....	.....	08687			
Good Hope, B	66 15·2	128 38·3	July 28	8·6 to 13·0 (5)	41 42·9	9·4	81 39·0	1, 2	10·3 10·9	08655	20	20	F
			" 28	14·0 to 18·6 (5)	34·9	15·0	37·0	5, 6	14·3 15·0	08706	20	20	F
			" 30	4·5 to 9·0 (10)	38·0	.....	.....	.....	.....	.....	20	....	F
			" 30	9·5 to 15·0 (10)	39·7	.....	.....	.....	.....	.....	20	....	F
			" 30	16·0 to 22·2 (10)	38·2	.....	.....	.....	.....	.....	20	....	F
			" 31	3·0 3·2 4·2 4·5	39·6	.....	.....	.....	.....	.....	20	....	F
				Mean	41 38·8	.....	81 38·0	.....	.....	08680			

Sans Sault Rapids.....	65 44·8	128 47·6	July	25	7·7 8·5 9·6	41 27·5	10·3	81 11·0	1,2	11·4	.....	09222	20	20	F
			"	25	11·0 13·2 14·3	27·0	16·1	08·4	5,6	13·9	.....	09243	20	20	F
			"	25	15·6 17·2 18·6	32·3	.....	.....	.....	.....		.....	20	20	F
					Mean.....	41 28·9	.....	81 09·7	.....	.....		09232			
T. S. Monument O 44.....	66 43·8	129 51·1	Aug.	1	8·4 9·5 10·8	41 59·3	10·1	81 40·5	1,2	11·2	.....	08596	20	20	F
			"	1	13·4 14·2 15·0	55·9	16·3	38·0	1,2	14·6	.....	08594	20	20	F
			"	1	17·1 18·9 20·2	54·8	16·3	40·8	5,6	.....		.....	20	20	F
					Mean.....	41 56·7	.....	81 39·8	.....	.....		08595			
T. S. Monument O 69.....	67 28·2	131 14·8	Aug.	4	8·4 to 12·2 (5)	41 41·4	9·9	81 51·6	5,6	10·7	11·9	08373	20	20	F
			"	4	13·2 to 16·7 (5)	39·3	15·8	50·8	1,2	13·6	14·6	08413	20	20	F
					Mean.....	41 40·4	.....	81 51·2	.....	.....		08393			
Arctic Red River.....	67 26·7	133 44·2	Aug.	6	11·2 to 16·2 (6)	44 59·3	16·7	81 46·6	1,2	11·4	.....	08530	20	20	F
			"	6	17·2 to 21·2 (5)	56·8	.....	.....	.....	14·5	.....	08591	20	....	F
			"	7	7·2 to 10·2 (4)	58·2	9·8	44·2	5,6	10·6	.....	08554	20	20	F
			"	7	11·2 to 15·2 (5)	54·6	14·7	42·4	1,2	13·6	.....	08562	20	20	F
			"	7	16·2 to 20·2 (5)	57·4	.....	.....	.....	.....		.....	20	....	F
					Mean.....	44 57·3	.....	81 44·3	.....	.....		08559			
Middle Peel River.....	67 39·2	134 36·1	Aug.	11	18·1 19·7	45 05·1	.....	.....	.....	.....		.....	20	....	F
			"	12	7·6 8·4 9·8 10·7	00·8	10·2	81 22·8	1,2	11·3	.....	08760	20	20	F
			"	12	13·0 14·0 15·3 16·1	44 58·1	14·6	28·8	5,6	13·6	.....	08744	20	20	F
					Mean.....	45 00·6	.....	81 25·8	.....	.....		08752			
McPherson.....	67 26·4	134 52·6	Aug.	9	8·5 to 14·1 (6)	44 10·9	10·4	81 08·7	1,2	11·2	13·8	09122	20	20	F
			"	9	15·6 to 20·9 (6)	07·2	16·6	10·1	5,6	14·5	15·2	09118	20	20	F
			"	10	2·5 to 12·5 (10)	11·2	.....	.....	.....	.....		.....	20	....	F
			"	10	14·0 to 21·0 (7)	10·5	.....	.....	.....	.....		.....	20	....	F
					Mean.....	44 10·1	.....	81 09·4	.....	.....		09120			

MAGNETIC OBSERVATIONS, 1923 (*concluded*)

Station	Lat.	Long.	Date	Declination		Inclination			Hor. Int.		Mag'r.	D.C.	Obs'r.
				L.M.T.	Value	L.M.T.	Value	Needle	L.M.T.	Value			
	° ′	° ′		h. h. h. h.	East ° ′	h.	° ′		h. h.	γ			
Aklavik	68 13·5	134 59·7	Aug. 16	.....	.....	15·7	81 30·0	1, 2	13·8 14·7	08600	20	20	F
			" 17	5·5 to 21·6 (5)	44 19·3	10·0	36·9	2, 5	10·8 11·5	08576	20	20	F
			" 17	.....	.....	15·5	36·1	5, 6	13·7 14·7	08575	20	20	F
			" 18	7·3 to 18·6 (9)	21·0	9·1	36·3	6, 1	10·0 10·9	08586	20	20	F
			" 20	3·0 to 20·5 (16)	22·0	.....	.....	.....	.....	.....	20	....	F
			" 21	2·8 to 22·1 (15)	22·0	.....	.....	.....	.....	.....	20	....	F
			" 22	2·9 to 17·5 (10)	20·0	.....	.....	.....	.....	.....	20	...	F
				Mean	44 21·2	.....	81 34·8	.....	.....	08584			

MAGNETIC STATIONS AND DESCRIPTIONS

Aklavik, N.W.T., 1923.—The station is on the bank of Peel river to the northwest of the group of buildings comprising the settlement. It is 85 feet northwesterly, measured along a survey line, and 8 feet northeasterly from the iron post at the northerly corner of the lot reserved as a hospital site, the property of the Anglican Mission. Observations were taken over a stake 3½ inches in diameter, set flush with the ground and embedded in cement. The chimney on the Hudson's Bay Company's store bears 155° 32′·5.

Amherst, Magdalen Islands, Que., 1921.—The station is in an open field at the back of Shea's hotel, being 6 feet east and 189 feet north of the northeast corner of the back part of the hotel, 160 feet from the fence along the south side of the field and 80 feet southerly from the edge of the bank along the water's edge. Observations were taken over a stone 2 by 2 inches set flush with the ground. The following true bearings were determined: spire of Catholic church, 259° 30′·8; top of lighthouse on wharf, 299° 01′·6; northerly extremity of Entry island, 61° 43′·4; top of rock at southerly extremity of Entry island, 73° 06′·3.

Arctic Red River, N.W.T., 1923.—The station is on the Hudson's Bay Company's property, almost in line with the northeast corner of the pier marking the D. O. astronomical station and the west side of a dwelling-house. It is 98·5 feet northwest of the northwest corner of the store, 128·5 feet north of the northwest corner of a dwelling-house, 51·5 feet north of the northeast corner of the astronomical pier, 76·3 feet northeast from the northeast corner of the dwelling-house for visiting Indians, and 34·4 feet northwest of the flagstaff. Observations were taken over a concrete block 7 by 7 inches set flush with the ground. The following true bearings were determined: tree on hill across Arctic Red river, 242° 12′·6; tip of cross on Mission building, 303° 14′·4; lobstick, 32° 04′·6.

Baker's Narrows, Athapapuskow lake, Sask., 1923.—The station is at Baker's narrows, on the east side of, and on the most northeasterly point of land at the north end of the narrows. Observations were taken over a cross-mark chiseled in the solid rock of the point. The station is on the summit of the rock that measures 16 by 11 feet, and is 37·5 feet westerly from a brass plug in the rock at the water's edge. This plug bears the inscription "239 T, 1919."

Bancroft, Ont., 1921.—The station is on the exhibition grounds about one-half mile westerly from the C.N.R. depot. It is inside the race track, west of a grove of trees and south of the exhibition buildings; 129·5 feet southerly from the south side of the main building and in line with the westerly side produced; 41 feet southerly and 43·8 feet westerly from the southwesterly corner of a small building, and 41·5 feet northeasterly from a telephone pole at a large rock. The point is marked by a cedar stake 2 by 3 inches and driven flush with the ground. The following true bearings were determined, north gable of white house, 208° 29′·8; north gable of white house, 178° 33′·3; north gable of white house, 162° 16′·8; south gable of judge's box on grand-stand, 311° 26′·3.

Beaver Lake, Sask., 1922.—The station is on the southwesterly shore of Beaver lake on the northerly side of the first limestone point from the southeasterly entrance to the lake. The point is on the top of a limestone plateau immediately behind the fire-ranger's cabin and just south of the path connecting the cabin with the remainder of the settlement. Observations were taken over a cross-mark chiseled in the rock which was covered with a mound of stones.

Birch Island, N.W.T., 1923.—The station is on the east side of Mackenzie river, opposite Birch island, and on the northerly side of a small creek which is about one mile below T. S. Monument "S 101." It is about 520 feet easterly from the river and 30 feet southerly from the edge of the gravel bank along the creek. A lobstick on the edge of the woods to the north bears 341° 12′·7.

Boundary, Alta. and B.C., 1922.—The station is on the boundary line between Alberta and British Columbia, on the north side of Peace river. It is 148 feet north of the upper part of the bank along the river and 203 feet south of the Interprovincial monument. Observations were taken over a drill hole in the top of a sandstone block 4 by 4 inches set flush with the ground.

Bon Accord, Alta., 1922.—The station is south of the village and about a quarter of a mile southeasterly from the A. & G. W. Railway depot. It is on the easterly edge of a cleared space used for athletic purposes, being 355 feet east of the east side of the street and 322 feet south of the north side of the field. Observations were taken over the intersection of two grooves in the end of a brick set flush with the ground. The following true bearings were determined: insulator on north end of section house, 291° 39′·4; ornament on north end of depot, 318° 38′·7; east gable of United Grain Growers' elevator, 320° 07°·4; cross on front of English church, 11° 02′·1.

Borden, P.E.I., 1921.—The station is about a quarter of a mile southeasterly from the C.G.R. depot, in a field belonging to Mr. McInnis, the field being the second northerly from the one in which a lighthouse is located. The point is 42 feet northerly from the fence along the south side of the field and 10 feet from the edge of the bank along the shore; it is marked by a small hole in the top of a stone 4 by 4 inches projecting slightly above the surface. The following true bearings were determined: pole on C.G.R. water-tank, 304° 03′·3; top of lighthouse farthest from the shore, 95° 33′·1; pole on water-tank on breakwater, 219° 09′·1.

Boyle, Alta., 1922.—The station is on the school grounds, 112 feet northerly and 94 feet westerly from the northwesterly corner of the school building, 161·5 feet from the front of the grounds and 138 feet north of the north side of the road allowance along the south side. The point is marked by a stake set flush with the ground. The following true bearings were determined: south gable of Mrs. Boyle's house, 261° 33′·5; right edge of chimney on depot, 334° 03′·0; northeasterly corner of school building, 95° 25′·0; southwesterly corner of school building, 109° 01′·0.

Brabant Harbour (Wrigley Harbour), N.W.T., 1923.—The station is on Brabant island (Wrigley island) and near the point of land on the northeast corner of the island. It is on a slight ridge about 275 feet from the stony portion of the point and 108 feet westerly from the nearer of two lobsticks near the water's edge on the east side of the island. Observations were taken over a concrete block 6½ by 7 inches set flush with the ground. A lobstick on a distant island bears 80° 29′·7.

Brochet Lake, Man., 1922.—The station is on the northerly bank of Cochrane river at the beginning of the 53-chain portage to Brochet lake. The point is on the portage path to the west of the open ground on the top of the river bank; it is about 30 yards from the water's edge and southeasterly from two large jack pine trees between which the path runs. The station is 17·5 feet from the westerly and 14·5 feet from the easterly

tree. Observations were taken over the centre of a cross chiseled in the top of a grey granite boulder 2 feet square and projecting 8 inches above the ground.

Brochet Post, Man., 1922.—The C. I. station of 1908 was not available owing to the close proximity of a large sheet-iron warehouse. The station of 1922 is on a rocky island across a narrow channel and opposite the Hudson's Bay Company's post, near the northerly end of the island on the level ground about 50 yards from the water's edge. Observations were taken over the centre of a cross-mark chiseled in the top of a granite rock which was covered with a mound of stones. The southwesterly corner of Revillon Freres' store bears 281° 12′·0.

Browns Landing, Alta., 1922.—The station is on the west bank of Peace river in an open space around what is known as Brown's Landing. It is 6 feet from the edge of the river bank, 45 feet north of the boat landing and 175 feet north of a small creek. Observations were taken over a small hole in the top of a stone set flush with the ground. A temporary reference mark was used.

Cap des Rosiers, Que., 1921.—The station is on the lighthouse reserve in a field west of the lighthouse. It is 141·6 feet easterly from a boundary stone at the northwest corner of the field, 29 feet southerly from the fence on the northerly side of the field and 31 feet from the southerly fence. Observations were taken over a copper bolt set flush with the ground. The following true bearings were determined: spire of Catholic church, 334° 04′·1; spire on lighthouse, 80° 24′·0; vertical edge of cliff at water's edge on cape Gaspe, 164° 23′·1.

Cape Chat, Que., 1921.—The station is on an uncultivated strip of land near the westerly side of an open field adjoining the westerly side of the village and belonging to Mr. Oliver Roy; about 450 feet from the Catholic church, 16 feet from the westerly boundary fence and 132 feet from the northerly boundary fence around the field. Observations were taken over a hole in the top of a cement block 4 by 4 inches set flush with the ground. The following true bearings were determined; rod on tower of school, 298° 53′·5; tip of ornament on northeast corner of church tower, 311° 29′·0; spire of church seen in the distance, 69° 55′·3.

Carcajou Point, Alta., 1922.—The station is on the south bank of Peace river, about three miles above Carcajou point on property belonging to Mr. C. M. Robarts. It is 105·5 feet northerly and 112 feet westerly from the northwesterly corner of Mr. Robart's house. Observations were taken over a willow stake 4 by 4 inches and projecting 6 inches above the surface. The following true bearings were determined: poplar tree across the river, 358° 53′·6; northeast corner of Mr. Robart's dwelling-house, 158° 53′·6.

Charlottetown, P.E.I., 1921.—The station is a relocation of the C. I. station of 1908. The observations were made over the middle one of three stones marking the meridian line established by the British Admiralty in Victoria park. The stone is 13 by 14 inches and projects 18 inches above the surface. West of, and in line with the stone marking the south end of the meridian are two additional stones. The point of observation was over the east end of a groove about 2 inches long in the southwest quarter of the stone. The following true bearings were determined: middle of north meridian stone 0° 16′·4; church spire seen between two chimneys, 49° 56′·3; church spire, 54° 50′·6; tip of ornament on tower of city hospital, 70° 09′·4.

Cheecham, Alta., 1922.—The station is on the west side of the A. & G. W. Railway tracks and is reached by measuring from the semaphore at the north end of the siding a distance of 175 feet along the main line, south, and at this distance turning to the right from the direction of the railway tangent to the south, the angle 98° 06′·0, thence measuring along this direction a distance of 489 feet to the station. Gable of cabin on east side of tracks bears 71° 47′·2.

Chenal des Quatre Fourches, Alta., 1922.—The station is on the west bank of Chenal des Quatre Fourches near its junction with Peace river. It is north of the T. S. Monument and approximately on the extension of the line joining the centre of a post marked "B 6 1922," and the middle of a pit, being 37·2 feet from the former. Observations were taken over a stake 3 by 3 inches and projecting 6 inches above the surface.

Chipewyan, Alta., 1922.—The station is probably near the M. S. station of 1910, in the open space between the Hudson's Bay Company's property and the lake. It is 310 feet southwesterly from the flagstaff at the corner of the Hudson's Bay Company's store, 173 feet south and 80 feet west of the southwest corner of the lot where the manager of the Hudson's Bay Company's post lives, and 22·5 feet east of the east side extended of this house. Observations were taken over a drill hole in the top of a stone about 4 by 8 inches set flush with the ground. The following true bearings were determined: cross on dome of Mission school, 267° 25′·1; cross on spire of Catholic church, 269° 37′·3; wooden cross on hill, 283° 41′·2; spire of English church, 304° 38′·5; Hudson's Bay Company's flagstaff, 67° 27′·3; lobstick on island, 163° 16′·2.

Chipewyan Lake, Man., 1923.—The station is on the southerly bank of Seal river just at the entrance to Chipewyan lake at a point where there is a sand cut bank, the bank being about 15 feet high. The station is 16 feet westerly from the edge of the bluff at the edge of the river. Observations were taken over a squared spruce stump 4½ by 4 inches and projecting 1·7 feet above ground. A brass screw marks the precise point. The letters "DOMS" were carved on the northeast side of the stump which was painted red.

Churchill, Man., 1923.—The station is near the M. S. station of 1912. It is on Cockle's point, 26 feet southwesterly from the highest part of the beach to the northeast in line with a large boulder in the water to the northeast of the station. It is 104 feet southwesterly from an arrowhead chiseled in the base of the rocky hill and is 95·2 feet southerly from another arrowhead cut in a low rock at high tide mark. These two marks are 54·0 feet apart. Observations were taken over a cross-mark chiseled in the top of a flat granite rock. The base of the southwest standard on the frame of the beacon on Battery point bears 26° 12′·1.

Churchill River, Man., 1923.—The station is at the bend where the Churchill turns to the north on the way to Granville lake, on the southwest corner of the big island which lies slightly to the northeast of the rocky point on the left bank of the river at the turn. The point is on the top of the rocky cliff on the side of the point to the northwest of the bay in the southwest part of the island. It is 200 feet north of the high-water mark on the point and 8·5 feet west from the edge of the cliff on the west side of the point. This cliff is about 30 feet high and is composed of grey granite. Observations were taken over a cross-mark chiseled in the rock. Several trees nearby are trimmed and some have been removed to allow a clear view of the water.

Clear River, Alta., 1922.—The station is on the third island below Clear river and about 15 miles therefrom, and the second below what is locally known as Rosalie island. It is in an open space near the middle of the south side of the island and about 30 feet north of the edge of the bank along the river. Observations were taken over a hole in the top of a concrete block 6 by 6 inches and projecting 2 inches above the surface.

Cochrane River, Man., 1922.—The station is on the north bank of Cochrane river at the beginning of the first portage leading to Fort Hall. This portage leads over a steep bluff at the river and descends a very steep hill at the lake to the north. The station is on level ground about midway between the bank of the river and the base of the bluff and is about 100 yards westerly from the portage path. Observations were taken over the centre of a cross-mark chiseled in the top of a red granite rock 4 by 5 inches and projecting 2 inches above ground.

Coe Hill, Ont., 1921.—The station is on the Mining Company's property about three-quarters of a mile south from the C.N.R. depot. To reach the station proceed south from the depot along the road which runs to the lake, take the first turn to the right and follow this road into the rocky grounds of the Mining Company. The station is on the rocky summit of a hill to the right of the road and to the northwest of Mr. Ferguson's house, 37·5 feet westerly from a large upturned stump, 87·5 feet easterly from a large granite boulder and 48·5 feet southerly from a maple tree. The point is marked by a stake 2 inches in diameter and projecting 6 inches above the surface. The following true bearings were determined: east gable of Mr. Ferguson's house, 126° 18′·5; west gable of white house in valley, 90° 31′·0; north gable of white house across lake, 87° 05′·0; west gable of white house in valley, 81° 32′·0.

Coronation, Alta., 1922.—The station is north of the town on the agricultural grounds, being 312 feet west and 228 feet north of the southeast corner; 43·3 feet southeasterly from the southerly corner of an enclosure covered with small poplar trees and almost in line with the southwesterly side of the same. Observations were taken over a stake 4 by 4 inches set flush with the ground. The following true bearings were determined: flagstaff on school, 173° 10′·2; tip of town water-tank, 181° 49′·0; spire of Catholic church, 212° 24′·0; pole on judge's stand inside race course, 347° 08′·0.

Cumberland House, Sask., 1922.—The C. I. station of 1908 was reoccupied. It is on the Hudson's Bay Company's reserve, on an open knoll facing Cumberland lake to the north and is between a grove of spruce trees and the lake. The station is 352 feet northwesterly from the northwesterly corner of the Hudson's Bay Company's store and 14 feet northeasterly from the southwesterly side produced, is 79 feet northwesterly from the northwesterly corner of a stone powder-house and 126 feet southwesterly from the southwesterly side produced. Observations were taken over a cross-mark chiseled in the top of a flat granite rock almost flush with the ground. The northwesterly gable of the ice-house bears 119° 25′·8.

Dingwall, N.S., 1921.—The station is on the south side of the harbour on property belonging to Mr. O'Brien. From the station St. Paul's island may be seen in line with the east end of the channel connecting the harbour with the open water outside. The point is about 625 feet east of Mr. O'Brien's fish stage, 45 feet east of a drainage ditch, about 35 feet from the shore line and about 25 feet north of the edge of a clump of spruce trees. Observations were taken over a hole in the top of a cement block 7 by 7 inches and

projecting 2 inches above the ground. The following true bearings were determined: ornament (upper angle) over small window in north end of Mr. MacDonald's house, 217° 02′·5; south gable of Mr. O'Brien's house, 246° 09′·2; storm-signal post, 277° 40′·0.

Dunvegan, Alta., 1922.—The station is about one-half mile east of the ferry crossing on the north bank of Peace river and on lot 4 of the Dunvegan Settlement Survey. It is about 9 feet from the edge of the bank, at the upper level, along the river, 428 feet east of a post on the west side of lot 4 and 84 feet south and 73 feet east of the southeast corner of Mr. Duncan McDonald's house. Observations were taken over a hole in the top of a concrete block 6 by 6 inches set flush with the ground.

Fifth Meridian, Alta., 1922.—The station is on the north side of Peace river, approximately on the centre line of the clearing marking the Fifth meridian; 10 feet from the bank of the river and 53·7 feet south of the centre of witness mound. A birch stake 2 by 2 inches and projecting 12 inches above the surface marks the station.

Fitzgerald, Alta., 1922.—The station is on the grounds of the R.C.M.P., about 500 feet southerly from the most westerly of their houses and about the same distance northeasterly from the Hudson's Bay Company's store. It is near the southwest corner of a small field, being 27 feet north of the bank along the river, 22 feet east of the fence along the west side of the field and 43·5 feet northeast of a tree at the end of the fence along the west side of the field. Observations were taken over a drill hole in the top of a stone about 6 by 7 inches set flush with the ground. The following true bearings were determined: flagstaff on Hudson's Bay Company's store, 217° 39′·9; flagstaff seen over store, 218° 10′·4; flagstaff in front of house on R.C.M.P. grounds, 350° 48′·4; flagstaff large cross on rocky point, 74° 49′·4.

Fort Hall Lake, Man., 1922.—The station is on the southerly end of the long portage into Cashmere lake, on the summit of a hill about 30 feet high rising from the water's edge and to the west of the beginning of the portage path. Observations were taken over a cross-mark chiseled in the top of a red granite boulder 2 feet by 2·5 feet by one foot high. This is the only red granite boulder in the vicinity.

Fort St. John, B.C., 1922.—The station is on the Hudson's Bay Company's property and about 350 feet west of the most westerly one of the group of houses comprising the post. It is 35·3 feet east of a fence and 283 feet easterly from the most southerly of two iron posts marking the westerly limit of the Hudson's Bay Company's property. Observations were taken over the top of a concrete block 6 by 6 inches set flush with the ground. The following true bearings were determined: upper window in end of house across Peace river, 133° 12′·3; southerly one of two iron posts on west side of Hudson's Bay Company's property, 298° 53′·5; northerly post, 316° 35′·3.

Fort Smith, N.W.T., 1923.—The station is a relocation of the D. O. station of 1922, and an approximate relocation of the M. S. station of 1910. It is 111 feet northwesterly from the corner of the Hudson's Bay Company's warehouse and 133 feet northeasterly from the corner of the house used by employees of the company and about 45 feet south of the edge of the bank; further, it is 14·5 feet east of the east line of the house and 61 feet west of the west line of the warehouse. Observations were taken over a concrete block 4 by 4 inches set flush with the ground. The following true bearings were determined: northeast corner of Hudson's Bay Company's warehouse, 134° 21′·9; west edge of flagstaff in grounds of Hudson's Bay Company, 184° 13′·4; west edge of chimney on Hudson's

Bay Company's cook house, 197° 33′·8; cross in cemetery, 265° 31′·4; bottom of chimney on house near cemetery, 279° 31′·4; bottom of flagstaff, 280° 21′·4.

Fort Vermilion, Alta., 1922.—The station is in a small open space on the south side of the island opposite Fort Vermilion. It is west of the ferry landing, almost in line with the south edge of the cable tower and 194·5 feet west of the southwest corner of the same. Observations were taken over a birch stake 4 by 4 inches and projecting above the surface. The following true bearings were determined: flagstaff on office of Hudson's Bay Company, 118° 47′·9; north gable of dwelling-house of Hudson's Bay Company's post manager, 128° 07′·9; cross on tower of Catholic church, 172° 49′·2.

Fox River, Man., 1923.—The station is about 200 yards easterly from the junction of Hayes and Fox rivers, on the north side of the Hayes. It is to the west of the spruce trees at the summit of the bank and in a grove of poplar, 11 feet northwesterly from the edge of the bluff. The point is marked by a spruce stake 2·5 inches in diameter and projecting one foot above the ground.

Frog Portage, Sask., 1922.—The station is an approximate relocation of the C. I. station of 1908. It is on the south bank of Churchill river, east of Frog rapids and east of the portage path; it is 26·2 feet northeasterly from the northeast corner of a large grey granite boulder, the most easterly one east of the portage path, and about 15 yards southerly from the bank of the river. Observations were taken over the point of an arrowhead chiseled in the top of a grey granite triangular-shaped rock, measuring 9 inches to a side, projecting 4 inches above the ground.

Gaspe Basin, Que., 1921.—The station is in an open field belonging to Mr. B. F. Patterson, on the hillside northeast of Mr. Patterson's house and northwest of the Methodist church. It is about 575 feet north of the main road along the shore, 140 feet west of the fence on the east side of the property and 78 feet west of the fence around a small cultivated field. From the station the road running over the hill south of the pulp mill across the harbour may be seen between two smokestacks on the mill. Observations were taken over a small hole in the top of a cement block 5 by 5 inches and projecting slightly above the ground. The following true bearings were determined: top of dome on centre of house near mill, 97° 17′·1; bottom of flagstaff in front of house near mill, 97° 18′·8.

Good Hope, A, N.W.T., 1923.—The station is near the monument marking the northwest corner of lot 7 of Good Hope Settlement Survey, this lot being the property of the Hudson's Bay Company. It is 13·5 feet southeasterly from a stake at the corner of the lot, 64 feet west of a row of posts intended for a fence line and 91 feet northwesterly from the northwesterly corner of the Hudson's Bay Company's storehouse. Observations were taken over a concrete block 7 by 7 inches set flush with the ground. The following true bearings were determined: cross on spire of Catholic church, 201° 57′·0; cross on tower of Catholic Mission building, 205° 15′·0.

Good Hope, B, N.W.T., 1923.—The station is on the property of the Catholic Mission about one-quarter of a mile south of station A and on the westerly pier of the observatory building used by Mr. Bibby of the Meteorological Service for magnetic observations during the seasons 1921-1922. A distant reference mark used for balloon ascension observations and seen through the door of the building and over a post a short distance from the building bears 87° 24′·0.

Grand Narrows, N.S., 1921.—The station is on property belonging to Senator M. J. O'Brien, in the first field on the west side of the road leading from the C.G.R. depot southerly along the shore and is about 1,200 feet south of McNeil's hotel. The point is near the northwest corner of the field, being 35 feet south of the fence along the north end of the field and 9 feet east of a tree at the edge of the bank along the shore. Observations were taken over a hole in the top of a stone 2 by 2 inches set flush with the ground. The spire of the Catholic church in Iona bears 332° 57′·4.

Grand River, Que., 1921.—The station is about one-half mile southwest of the railway depot. It is on property belonging to the Banque Nationale and near the rear of the lot on which the bank building stands, being 57 feet east of the west fence, 46·5 feet south of the north fence and 38 feet west of the east fence. The point is marked by a stake 2 inches in diameter set flush with the ground. The following true bearings were determined: bottom of large cross in field near lighthouse, 227° 25′·9; top of cross on tower of convent, 266° 26′·7; bottom of pole on manse, 276° 42′·9; white vertical strip on northwest corner of main part of manse, 280° 03′·9.

Great Island, Seal River, Man., 1923.—The station is on the east side of a small round island which lies one-quarter of a mile to the southeast of Great island and is the only island in this direction. This small island is in a bay in the south bank of the river at the junction of the two branches, one branch running from the west and one from the north, both running easterly when united. The island is rocky and is covered with a mound of sand grown over with moss and sparsely wooded. Observations were taken over a cross-mark chiseled in the top of a triangular-shaped granite boulder 3 by 2·5 feet and projecting one foot above the surface. The rock is 22 feet westerly from the edge of the bank.

Griffin Creek, Alta., 1922.—The station is about 3 miles below Griffin creek, also about the same distance below the intersection of the 21st base line and Peace river, near the south side and near the west end of the first island below Griffin creek. It is about 75 feet north of the edge of the willows along the shore and about 135 feet northeasterly from the edge of the gravel exposure. Observations were taken over a small hole in the top of a flat stone about 12 by 12 inches set flush with the ground.

Grindstone, Magdalen Islands, Que., 1921.—The station is near the edge of the bank along the shore, in an open field belonging to Mr. McLean, the field being the third west of the one in which are located the buildings of the Eastern Canada Fisheries, Limited. The point is 365 feet west of the east side of the field and slightly south of the line joining the inner extremities of two inlets; it is 25 feet west of the edge of the easterly one and 46 feet east of the edge of the westerly one and is 19 feet northerly from the edge of a third. Observations were taken over a drill hole in the top of a stone the diagonals of which are 2 and 3 inches, set flush with the ground. The following true bearings were determined: Geodetic Survey of Canada pier on hill, 290° 45′·8; spire of English church, 303° 10′·8; spire of Catholic church in House Harbour, 51° 02′·9; southerly extremity of Alright island, 73° 52′·4; northerly extremity of Entry island, 124° 20′·9.

Hay River, N.W.T., 1923.—The station is north of the village in an open space along the bank of Hay river. It is 65·4 feet northerly from a fence along the northerly side of a garden which is adjacent to and north of the lot on which is located the Catholic church, 49·8 feet westerly from the iron post at a survey monument and 60 feet northeasterly

from a concrete block approximately 16 by 17 inches. Observations were taken over a hole in the top of a concrete block 9 by 10 inches set flush with the ground. The following true bearings were determined: spire of Catholic church, 131° 20′·4; northerly gable of bell-tower on Anglican Mission school, 134° 34′·2; flagstaff on residence of Anglican Mission, 138° 17′·6; chimney on house, 144° 36′·6.

Hay River (Vale Point), N.W.T., 1923.—The station is on an island, on the part known as Vale Point, across the river from Hay River. It is 107 feet easterly from the northeasterly corner of the tower supporting the north range-light and about 49 feet from the edge of a growth of trees along the shore. Observations were taken over a hole in the top of a concrete block 7 by 8 inches set flush with the ground. The following true bearings were determined: magnetic station at Hay River, 127° 29′·0; spire of Catholic church, 127° 56′·0; north gable of bell tower on Mission school, 129° 58′·3; base of flagstaff in front of Hudson's Bay Company's store, 132° 45′·0.

Hayes River, Man., 1923.—The station is on the easterly bank of Hayes river, about 9 miles southerly from the junction of Hayes and Pennycutaway rivers and about 17 miles northerly from the junction of Hayes and Shamattawa rivers. The station is at the edge of the bush at high ice-mark and is about 100 yards from the water's edge (low water). There are shoals and gravel bars exposed in the river at low water and the westerly bank is composed of a very high clay bank. The station is marked by a tamarack stake 2 by 2·5 inches painted yellow and projecting 6 inches above ground. A small lobstick is at the station.

Hayes River (First rapids north of Swampy lake), Man., 1923.—The station is south of the first large rapids north of Swampy lake. It is on the southeast bank of the river where the river turns to the north. The station is on the top of the bank in a grove of spruce, pine, poplar and birch, and is 17 feet from the edge of the bluff in an easterly direction. A cutting was made to the water and a lobstick was made. The point is marked by a cartridge shell in the top of a birch stake 3 inches in diameter projecting 6 inches above the ground and painted yellow.

Huntingdon, Que., 1921.—The station is in the Exhibition grounds southeast of and on the opposite side of Chateauguay river from the town. It is near the southwesterly corner of the grounds in line with the westerly side of the band stand and is also in line with the southerly side of the most northerly of two cattle sheds; it is 94·5 feet south of the southwest corner of the band stand, 188 feet west of the southwest corner of the cattle shed, 149 feet north of the south side of the grounds and 173·2 feet east of the sheds along the west side of the grounds. Observations were taken over a cedar stake driven flush with the ground. The following true bearings were determined: spire of Methodist church, 258° 36′·8; tip of spire on Anglican church, 273° 50′·8; tip of cross on Catholic church, 331° 07′·8; tip of ornament on red brick house, 35° 14′·8.

Husky Portage, Man., 1922.—The C. I. station of 1908 was reoccupied. It is near the southerly end of the portage to Putahow lake on the northeast bank of the river on the top of a sandy hill which rises about 30 feet above the water's edge and east of the portage path. The station is 20·8 feet southerly from a large grey granite boulder projecting 3 feet above ground and is 10·2 feet northerly from the edge of the bluff. Observations were were taken over the centre of a cross-mark chiseled in the top of a grey granite rock about 6 by 12 inches and projecting 3 inches above the surface.

Ingonish, South Bay, N.S., 1921.—The station is in a pasture field which is adjacent to the north side of the harbour and the west side of the road leading to the wharf. The field is owned by Mr. Peters. The station is opposite and in front of a dwelling-house owned by Mr. Jerry Curtis; it is 90 feet south of the north fence, 37 feet east of the west fence, 56 feet north of the south fence and about 375 feet west of the fence on the east side of the field. Observations were taken over a small hole in the top of a cement block 5 by 5 inches set flush with the ground. The following true bearings were determined: west gable of fish stage, 149° 49′·9; top of lighthouse near wharf, 149° 54′·4; southeast corner of Mr. Young's house, 260° 45′·4; northwest corner of Peters' hotel, 24° 05′·1; vertical edge of rock on Middle Head point, 62° 50′·9; top of rocky prominence near shore line on cape Smoke, 109° 55′·9.

Inverness, N.S., 1921.—The station is in an open field lying between the railway tracks and the shore. From the station the north tower of the Catholic church appears over the middle of the town hall, also slightly to the right of the north chimney on the depot. It is 900 feet west of the west limit of the railway right-of-way. Observations were taken over a drill hole in the top of a stone 4 by 4 inches set flush with the ground. The following true bearings were determined: lighthouse on Margaree island, 15° 15′·9; spire on north tower of Presbyterian church, 104° 48′·2; tip of south tower of Presbyterian church, 105° 37′·8; cross on middle of front of Catholic church, 115° 45′·7.

Jackfish River, Alta., 1922.—The station is on the north side of Jackfish river and on the west side of Peace river. It is south of a group of buildings comprising the trading post of Pierce and Boisvert, being 155 feet south and 19 feet west of the southwest corner of a building used as a dwelling-house and store. Observations were taken over a stake 3 by 3 inches set so as to project 3 inches above the surface.

Kerrobert, Sask., 1922.—The station is about three-eighths of a mile southerly from the C.P.R. depot. It is on the extension of a street, which is approximately midway between the high school and the standpipe, and almost in line with the row of telephone poles along the southwesterly side of the street; it is about 1,260 feet southeasterly from the southeasterly side, extended, of the public school building, and about 960 feet from the first street southeasterly from the public school and 174 feet northwesterly from a street line. Observations were taken over the intersection of two grooves in the end of a brick set flush with the ground. The following true bearings were determined: cross on Catholic church, 309° 32′·2; left edge of chimney on high school, 330° 17′·8; flagstaff on public school, 354° 19′·2; pole on C.P.R. water-tank, 5° 46′·2; chimney on house near railway crossing, 101° 12′·9.

Kettle Rapids, Man., 1922.—The station is on the south bank of Nelson river about one-quarter of a mile west from the railway bridge over the rapids. It is on the first point of land jutting into the rapids and forming the western arm of a small bay. Observations were taken over the centre of a cross-mark chiseled in the top of a flat granite rock flush with the ground. The northwest corner of a building formerly used as a hospital bears 97° 36′·1.

Kississing (or Cold) Lake, Man., 1923.—The station is on the easterly side of the first island to the north of the narrows between the small and the large parts of Kississing lake. These narrows are called "Gis-chi-wa-pow" (Greatest narrows). The station is

47 feet west from the water's edge. Observations were taken over a cross-mark chiseled in the top of a large flat grey granite rock flush with the ground.

Kississing (or Cold) River, Man., 1923.—The station is south of the falls and north of the beginning of the portage path at the last portage on the way to Churchill river. It is on the top of the rock forming the east bank of the river, the rock being about 7 feet in height, and is about half-way between the beginning of the portage path and the falls. The point is 12 feet easterly from the edge of the rock at the water. Observations were taken over a cross-mark cut in the rock and covered with a mound of stones.

Lac la Biche, Alta., 1922.—The station is near the street passing along the southerly side of The Inn, and on the shore of lac la Biche. It is 60 feet westerly and 25 feet southerly from the southwesterly corner of the fence around the hotel grounds. Observations were taken over the intersection of two grooves in the top of a brick set flush with the ground. The following true bearings were determined: pipe on chimney of house near lake shore, 66° 35′·1; northwesterly corner of hotel, 98° 24′·8; southeasterly corner of hotel, 116° 08′·1.

Lacolle, Que., 1921.—The station is in a field belonging to Mr. Masters, at the northeast angle formed by the intersection of the Burlington and the Montreal-New York roads, the field being about 200 yards west of the D. & H. Ry. tracks and about 400 yards north of the C.N.R. tracks. It is on a knoll about 60 yards north of the Burlington road. This knoll is rocky and partially overgrown with hawthorn bushes. The point is in line with the summits of two rocks in a north-south direction, being 8·3 feet south of the northerly rock and 8·5 feet north of the southerly one; it is also 16·5 feet from the summit of the most westerly outcrop. Observations were taken over a stake set flush with the ground. The following true bearings were determined: south gable of white house across D. & H. railway tracks, 36° 33′·9; tip of semaphore at extreme left of C.N.R. tracks, 137° 39′·9; right edge of chimney on C.N.R. depot, 232° 55′·9; tip of pole on tank of cheese factory, 256° 43′·9; tip of pole on Lacolle house, 332° 00′·9.

Lacombe, A., Alta., 1922.—The station is a relocation of the station of 1911, which was reoccupied in 1919. It is on the agricultural grounds to the southwest of the town, 138 feet north of the south fence, 460 feet west of the fence along the east side of the grounds, 160 feet east of the southeast corner of an exhibit building and 240 feet south of the southeast corner of the grandstand. It is in line with the east end of the grandstand and also in line with the south end of the exhibit building. A stake 1 by 1 inch set flush with the ground marks the point. The following true bearings were determined: flagstaff on school, 38° 49′·8; tip of spire on St. Andrew's church, 45° 20′·7; pole on bank of Montreal, 58° 48′·3.

Little Red River Post, Alta., 1922.—The station is near the mouth of Mikkwa river on property belonging to the Hudson's Bay Company and is southeast of the post buildings. The precise point is 20 feet east and 95 feet south of the southeast corner of the Hudson's Bay Company's store and warehouse and is marked by a stake 2 by 2 inches projecting 2 inches above the surface. The following true bearings were determined: window in east side of house across Peace river, 303° 59′·3; southwest corner of Hudson's Bay Company's house, 351° 21′·0; northeast corner of house, 354° 43′·3.

Long Island, Athabaska river, Alta., 1923.—The station is on the east bank of Athabaska river in a clearing almost opposite the north end of what is locally known as Long

island. It is approximately two miles north of the 27th base line. The precise point is 12 feet from the edge of the bank, 30 feet west and 144 feet south of the southwest corner of a log cabin. Observations were taken over a stake 4 by 4 inches projecting 3 inches above the surface.

Louisburg, N.S., 1921.—The station is on the northerly slope of Slattery head, about one mile south of the S. & L. R. depot and about one-quarter of a mile southwesterly from the wharf. It is near two small excavations, being 22·4 feet from the southwesterly corner of one and 55·0 feet from the southeasterly corner of the other, 186 feet easterly from the easterly line of a bridge over the narrows between the harbour and a small bay and about 60 feet from the water's edge. Observations were taken over a small hole in the top of a stone 4 by 5 inches set flush with the ground and embedded in cement. The following true bearings were determined: spire of Presbyterian church, 23° 04′·5; cross on English church, 27° 42′·3; spire of Methodist church, 34° 48′·8.

Louisburg (Lighthouse Reserve), N.S., 1921.—The station is 240·5 feet northwesterly from the westerly corner of the fog alarm building and in line with the southwesterly side. Observations were taken over a hole in the top of a stone 4 by 5 inches projecting 2 inches above the surface and embedded in cement. The following true bearings were determined: north corner of fog alarm building, 142° 04′·9; easterly extremity of Middle Oaks island, 188° 44′·7; lighthouse on west side of harbour, 256° 13′·0; spire of Catholic church across harbour, 273° 17′·8.

Lyster, Que., 1921.—The station is about one mile from the C.N.R. depot and on the opposite, or south, side of Bécancour river. It is in a pasture field which is adjacent to the west side of the Richmond road; it is 616·5 feet west of the fence along the road, 92·5 feet north of the south fence of the field and 15·5 feet south of the bank of the river. The point is marked by a stake 2 inches in diameter and driven flush with the ground. The following true bearings were determined: tip of spire of Catholic church, 79° 57′·2; base of pole on white house with metal roof, 40° 29′·2; base of pole on water tank, 306° 25′·2; base of cross on school, 287° 46′·2; base of lightning-rod on farm house, 124° 14′·2.

Magdalen River, Que., 1921.—The station is northwesterly from the group of houses comprising the village, on a ridge lying between Magdalen river and St. Lawrence river. It is about 1,190 feet westerly from the westerly fence around a field in which is located an old saw-mill, 180 feet easterly from the grassy extremity of the ridge and near the westerly side of the roadway leading to the edge of Magdalen river. Observations were taken over a hole in the top of a cement block 7 by 7 inches projecting 3 inches above the ground. The top of the post is marked "D. O. 1921." The following true bearings were determined: weather-vane on lighthouse, 336° 03′·6; top of cross on point near lighthouse, 341° 53′·1; vertical edge of rock near village, 90° 30′·6.

Matapedia, Que., 1921.—The station of 1920 and previous years was reoccupied. It is on the north bank of Restigouche river on property belonging to the Fishing club; it is 497 feet south and 9 feet east of the southeast corner of the Restigouche hotel and 39·5 feet easterly from the base of a large elm tree. A line joining the station and the cross on the tower of the Catholic church passes about 1½ feet south of this tree. The point is marked by a cement block 5 by 5 inches set flush with the ground. The following true bearings were determined: north gable of house on west bank of Restigouche river,

195° 41′·3; tip of cross on tower of Catholic church, 281° 16′·5; southwest corner of Restigouche hotel, 343° 49′·1; northeast corner of Restigouche hotel, 353° 13′·1.

Matane, Que., 1921.—The station is about 350 feet north and 450 feet west of the railway depot in an open field which is reached by a private road passing along the north side of the Imperial Oil Company's property. It is near the upper edge of a steep incline just west of a clump of trees and 17·5 feet south of the north boundary fence. Observations were taken over a cement block 4 by 4 inches set flush with the ground. The following true bearings were determined: spire of Catholic church, 60° 20′·8; tip of post office tower, 87° 29′·1; cross on top of dome of brick building, 90° 56′·6.

McKay, Alta., 1922.—The station is near the upper edge of the slope along Athabaska river, 282 feet southeasterly from the southeasterly corner of the Hudson's Bay Company's store and 8·5 feet northerly and 89 feet easterly from the northeasterly corner of a small log house. Observations were taken over a stake 4 by 4 inches projecting 12 inches above ground. The following true bearings were determined: window in north side of house across river, 160° 31′·5; northeast corner of Hudson's Bay Company's store, 9° 57′·4; south gable of Hudson's Bay Company's dwelling-house, 13° 34′·1; flagstaff seen almost over north gable of house, 15° 38′·9.

McMurray, Alta., 1923.—The station is a relocation of the D. O. station of 1922. It is on property belonging to the Hudson's Bay Company, near the junction of Athabaska and Clearwater rivers. It is 178 feet west of the fence along the east side of the property, 26 feet north and 49 feet east of the northeast corner of a garden, 469 feet north and 160 feet east of the northeast corner of a dwelling-house for the post manager of the Hudson's Bay Company, and 241 feet east of the bank along the east side of Athabaska river. Observations were taken over a sandstone rock about 4 by 6 inches set in a depression about 2 feet in diameter and projecting 3 inches above the ground. The following true bearings were determined: flagstaff on street and near east end of town, 131° 36′·7; north gable of Union Bank building, 147° 45′·0; southeast corner of Hudson's Bay Company's house, 231° 05′·2; northwest corner of house, 235° 49′·2; base of flagstaff near house, 242° 32′·7; gable of house across river, 289° 08′·0.

McPherson, N.W.T., 1923.—The station is near the southwest corner of the Hudson's Bay Company's property and near the edge of the bank, at the upper level, on the east side of Peel river. It is 91 feet west and 56 feet south of the southwest corner of Hudson's Bay Company's warehouse and 112 feet north and 28 feet west of the northwest corner of the Anglican Mission dwelling-house. Observations were taken over a stake 4 inches in diameter projecting 6 inches above the surface. The following true bearings were determined: northwest corner of Hudson's Bay Company's store, 35° 23′·6; southeast corner of warehouse, 81° 43′·6; townsite survey post at southwest corner of cemetery, 185° 22′·6.

Megantic, Que., 1921.—The station is near the D. O. station of 1907, in the village of Agnes across Chaudiere river from Megantic. It is near the southwesterly corner of a field on the westerly side of the road, the field being the property of a lumber company and containing two mills. The point is 58·5 feet westerly from the D. O. station of 1907, which was found to be in a vegetable garden; it is 72 feet westerly from the east fence and 45 feet northerly from the south fence of the field and about 100 feet from the southeasterly corner of the nearer saw-mill. Observations were taken over a cedar stake 2 by 4 inches driven flush with the ground. The following true bearings were determined:

pole on ventilator of red barn, 81° 18′·7; centre of cross on Catholic school, 272° 06′·7; tip of spire of Catholic church, 327° 11′·7; base of pole on school in Megantic, 329° 56′·7; base of pole on C.P.R. water tank, 348° 38′·7.

Middle Peel River, N.W.T., 1923.—The station is at the first forks of the river above T. S. Monument O 111 on a bank at the southeast angle formed by the bend in the river. It is 30 feet east of the upper edge of the bank on the west and 8 feet south of the bank on the north.

Mile 42, H.B.R., Man., 1922.—The station is on the northwesterly side of the track and about 150 yards from it, in front of the hut used by the fire rangers and between a grove of trees and the lake. The point is 22 feet from the water's edge and is 6 feet easterly from the trail leading to the boat landing. Observations were taken over the centre of the top of a fir stake 2 by 3 inches projecting 4 inches above ground.

Mile 100, H.B.R., Man., 1922.—The station is in a clearing in the woods northeasterly from mile 100. To reach the station proceed northeasterly along the track from the milepost, which is at a trestle, and midway between the 7th and 8th telephone poles from the pole holding the mile-board, turn to the north and proceed along a trail which enters the woods at this point. At a distance of 175 paces from the track a line cut through the woods and running northeasterly and southwesterly is reached. Proceed southwesterly along this line 42 paces to the station. The point is 22 feet from the edge of the woods in a clearing which contains the partial remains of two log stables and a cabin. Observations were taken over the centre of the top of a tamarack stake 3 inches square projecting 1 foot above the surface. This stake is 1·7 feet northerly from a stake marked "T. P."

Mile 149, H.B.R., Man., 1922.—The station is at a siding between mile 149 and mile 150, in a clearing on the northwesterly side of the track containing two log cabins used during construction. The point is in line with the easterly side of the cabin nearer the track and 69 feet northerly from its northeast corner and is 48 feet easterly from the northeast corner of the cabin nearer the back of the clearing. Observations were taken over the centre of the top of a fir stake 2 inches square projecting 6 inches above the ground.

Mile 200, H.B.R., Man., 1922.—The station is about one-quarter of a mile southeasterly from the siding at mile 200, on the south side of the track. The point is about 100 yards from the track along a trail leading to Trout lake, at a fork in the trail about 50 yards south from a cabin which is on the east side of the trail and formerly used by fishermen. Observations were taken over the centre of the top of a fir stake 2 inches square projecting 6 inches above the ground.

Mile 226, H.B.R. (Armstrong Lake), Man., 1922.—The station is on the northeasterly side of Armstrong lake and northwesterly from the track. It is north of a small bay and is about 250 yards from the track along a walk made of poles leading to two cabins. The point is about 50 feet north from the edge of the small bay, 59·5 feet northeasterly from the easterly corner and in line with the southeasterly side of the cabin nearer the lake, 7 feet from the edge of the walk measured along the same line and is about 150 feet southeasterly from the cabin to the northwest. Observations were taken over the centre of the top of a fir stake 2·5 inches square driven flush with the ground.

Mile 254, H.B.R., Man., 1922.—The station is in the centre of a clearing in the jack pine on a sandy ridge to the north of the track and is about 100 paces northerly from the second switch, travelling northeast. The point is marked by a spruce stake 3 inches in diameter projecting 9 inches above the ground and surrounded by a heap of stones.

Mile 279, H.B.R. (Landing River), Man., 1922.—The station is on a knoll on the south bank of Landing river and northwesterly from the track. The point is 71·5 feet westerly from the southwesterly corner of a cabin formerly occupied by railroad engineers. Immediately opposite the knoll and on the south side of the tracks are three cabins tenanted by Mr. Hawkins, a trader. The station is marked by a fir stake 2·5 inches square driven flush with the ground.

Mile 295, H.B.R., Man., 1922.—The station is westerly from the bridge that crosses a creek at about mile 295·5. There is a pump-house at this creek. The station is about 85 paces northwesterly from the track on the summit of a clay bank about 90 paces long at the top. This clay ridge is the only suitable place for observing as it is surrounded by muskeg. The point is marked by a copper rivet in the top of a spruce stake 1·5 inches square projecting 8 inches above the ground.

Missi Falls, Man., 1923.—The station is at the westerly end of the portage at Missi falls on Churchill river and is 26 feet from the edge of the bank at the landing. Observations were taken over the squared stump of a birch tree 3 by 4 inches, projecting 2 feet above the surface, the precise point being marked by a 32-cartridge shell in the top of the stump. The stump was painted red and in the northeast side were carved the letters "DOMS."

Mont Laurier, Que., 1921.—The station is about one mile from the C.P.R. depot on the opposite side of Lievre river, in a field owned by Mr. Alex and on the top of a hill on which are a large wooden cross and a band stand. The two structures can be seen from any part of the town. The point is 43·8 feet west and 1·4 feet south of the northwest corner of the band-stand and 41·8 feet northeast of the base of the cross. The point is marked by a cedar stake 2 by 2 inches driven flush with the ground. The following true bearings were determined: tip of cross on Catholic church, 159° 48′·5, east gable of red brick house, 202° 40′·5; tip of cross on school, 141° 04′·0; tip of ornament on red brick building north of river, 99° 24′·5.

Mont Louis, Que., 1921.—The station is on the grounds around the dwelling-house occupied by Mr. Allan G. Cameron who is in charge of the Seigniory. It is 149 feet north and 35 feet west of the northeast corner of a dwelling-house, 40·5 feet south of the north fence and 190 feet west of the east fence around the property. Observations were taken over the intersection of two grooves in the top of a slate stone set flush with the ground and embedded in cement. The following true bearings were determined: spire of Catholic church, 95° 17′·9; rod on tower of school, 101° 32′·9.

Morrisburg, Ont., 1921.—The station is in the exhibition grounds about one-half mile north of the main street of the town. It is about midway between the east and the west inside fences of the race course, 79·5 feet north and 62·2 feet west of the northwest corner of the poultry building and 145 feet north of the south side of the grounds. Observations were taken over a cedar stake 2 inches in diameter driven flush with the ground. The following true bearings were determined: east gable of white house, 266° 19′·6; left edge

of chimney on C.N.R. freight shed, 315° 03′·6; spire of Presbyterian church, 155° 04′·6; base of pole on high school, 163° 16′·6; tip of cross on Anglican church, 197° 19′·6.

Mulgrave, A., N.S., 1921.—The station is approximately a relocation of the station of 1907. It is about 180 feet northerly from station C occupied in 1912 and estimated at that time to be much nearer to station A. It is approximately on the centre line of the street, extended, which passes the south side of the Seaside hotel and is 850 feet from the front of the same. Observations were taken over a hole in the top of a stone 3 by 4 inches projecting 2 inches above the ground. The following true bearings were determined: spire of Catholic church, 6° 46′·5; spire of church in Hawkesbury, 62° 30′·7; spire of Presbyterian church, 71° 42′·8; spire of Methodist church, 83° 38′·2.

Mulgrave, C, N.S., 1921.—The station occupied in 1912 as an auxiliary station was reoccupied. It is on property belonging to Mr. Isaacson and near the northeast corner; 18·5 feet south of the north fence and 91 feet west of the east fence. Observations were taken over a stone 2 by 2 inches set flush with the ground. The following true bearings were determined: spire of Catholic church, 5° 03′·8; spire of Methodist church, 58° 30′·1; spire of church in Hawkesbury, 61° 13′·6; spire of English church, 99° 17′·9.

Nepishkas Portage, Man., 1923.—The station is on the westerly end of the portage and southerly from the top of the falls, on Churchill river. The point is on the landing place, 9 feet northerly from the edge of the landing and 16 feet easterly from the water's edge.

New Carlisle, Que., 1921.—The station is in the grounds around the public school. It is 2·5 feet west and 291 feet north of the northwest corner of the school building, 85 feet east of the fence on the west side of the grounds and 49 feet south of the north fence. Observations were taken over the intersection of two grooves in the top of a brick set flush with the ground. The following true bearings were determined: northeast corner of school, 155° 28′·4; northwest corner of school, 168° 33′·6; vertical strip (centre) of gothic window on north side of house, 169° 55′·4.

New Richmond, Que., 1921.—The station is about 500 feet northerly from the railway depot, on property belonging to Mr. Peter Cyr and on the summit of a ridge in the second field westerly from the railway right-of-way. The point is 21 feet from the easterly fence around the field and is marked by a stake 2 inches in diameter set flush with the ground. The following true bearings were determined: gable of gothic window on depot, 171° 46′·9; chimney on house near shore, 185° 33′·9; pole on front of store, 196° 12′·9.

Norman, N.W.T., 1923.—The station is on lot 9 of the Settlement Survey, the lot being adjacent to and on the west side of the R.C.M.P. grounds. It is 8 feet west and 187 feet south of the iron post at the northwest corner of lot 10 and the northeast corner of lot 9, 64 feet south and 18 feet west of the southwest corner of a dwelling-house occupied by members of the police staff. Observations were taken over a hole in a concrete block 7 by 8 inches set flush with the ground. The following true bearings were determined: spire of Catholic church, 93° 12′·1; cross on Catholic Mission dwelling-house, 102° 28′·9; chimney on house to north of the Hudson's Bay Company's buildings, 112° 19′·9; Hudson's Bay Company's flagstaff, 117° 05′·9; Lamson's flagstaff, 129° 00′·6.

North Nahanni River, N.W.T., 1923.—The station is on the northerly side of Mackenzie river and slightly down stream from a point opposite the mouth of North Nahanni river. It is on the upper edge of a portion of rocky shore line extending about one-quarter

of a mile, and is 36·5 feet westerly from the post at T. S. Monument S 35. Observations were taken over a hole in the top of a concrete post 6 by 7 inches projecting about 3 inches above the surface. A tree on the top of a conspicuous conical-shaped peak of a distant range of mountains and seen over the westerly end of the nearer range bears 252° 18′·0.

Norway House, Man., 1923.—The station is in close proximity to the C. I. station of 1908. It is on the rocky point south of and across the bay from the Hudson's Bay Company's post, and is on the summit of a rocky mound to the east of the intersection of the paths across the point. Observations were taken over the centre of a cross-mark chiseled in the rock. The following true bearings were determined: apex of Belanger monument, 15° 51′·5; north upper corner of main entrance to Hudson's Bay Company's post, 19° 55′·9; east upper corner of store, 35° 46′·8; north gable of house across narrows, 230° 56′·6, centre of flagpole at base, 16° 12′·7.

Nueltin Lake, Man., 1922.—The station is on a point in Nueltin lake across the bay from the mouth of Willow river. The location on this point is where Inspector D. E. Simons of Revillon Freres established a trading post in 1922. The station is directly behind the post and about 100 yards from the edge of the bluff. Observations were taken over the centre of a cross-mark chiseled in the top of a grey granite rock 7 inches square projecting 1·5 inches above the ground. The station is surrounded by a fence 8 feet square and 2 feet high.

Nueltin Lake Narrows, N.W.T., 1922.—The station is in the barren grounds on the narrows connecting the southern expansion of Nueltin lake with the northern part and is about 3 miles from the southern entrance to the narrows. This entrance is not plainly marked at a distance but is about one-half mile northeasterly from the large sand cut-bank on a point at the northwestern corner of the southern part of the lake. This bank is the only one in this part of the lake. The station is at a very swift part of the narrows just before it opens to the northern part of the lake, this location being specially marked by two huge granite boulders on the northerly bank, one rectangular and the other irregular in shape. The station is 40·5 feet southerly from the southerly part of the irregular boulder and 20 feet northerly from the edge of the bank of the narrows. Observations were taken over the centre of a cross-mark chiseled in the top of a grey granite rock, triangular in shape and 3 feet to a side, and covered with a mound of stones.

Old Fort, Athabaska River, Alta., 1922.—The station is on the site locally known as Old Fort. It is on elevated land about 150 feet north of a creek, and on the east side of Athabaska river, 22 feet east of the edge of the bank along the river and 31·5 feet northeasterly from a lone poplar tree on the upper edge of the bank. Observations were taken over a stake 4 by 4 inches projecting 12 inches above the surface.

Old Fort, Slave River, N.W.T., 1922.—The station is opposite Old Fort, on the east bank of Slave river and about one-quarter of a mile below a channel. It is 48·5 feet southerly from the post of the T. S. Monument R 13 and 10 feet from the edge of the bank along the river. A stake 3 by 3 inches projecting 12 inches above the surface marks the point.

Ottawa, Ont., 1923.—Observations were taken as usual on the south pier of the observing hut which is on the grounds of the Dominion Observatory.

Oxford House, Man., 1923.—The station is on the Hudson's Bay Company's land and westerly from their enclosure. It is in line with the Hudson's Bay Company's flag-

pole and the northeast corner of a lean-to at the warehouse; it is also in line with the north side of the picket fence around a grave and 25 feet easterly from its northeast corner, and is 121·5 feet westerly from the first post to the north of the gate in the fence of the enclosure. The point is marked by a cartridge shell in the top of a stake 3 by 4 inches projecting 4 inches above the ground. The following true bearings were determined: north gable of Rev. Atkinson's house, 175° 29′·6; west gable of warehouse at landing, 26° 22′·1; north gable of Sullivan's house, 230° 41′·3; east gable of forestry hut, 269° 38′·3.

Peace Point, Alta., 1922.—The station is in an open space east of the enclosure which is in front of the steamer landing. It is 36·5 feet north and 39·6 feet east of the southeast corner of the enclosure, the corner being 108·5 feet east of a flagstaff, which is on the line of the south fence. Observations were taken over a stake 3 by 3 inches projecting 4 inches above the surface.

Peace River, Alta., 1922.—The station is about three-quarters of a mile south of the Dominion Observatory latitude and longitude station, on the R.C.M.P. grounds. It is just north of the enclosure in which are located the administration buildings. It is 44·8 feet north of the fence along the north side of the enclosure, and 115 feet east of the fence along the west side of the property. The point is marked by the intersection of two grooves in the end of a brick set flush with the ground. The following true bearings were determined: tip of ventilator on barn, 159° 23′·3; west gable of the office building, 168° 56′·3, southwest corner of the roof of verandah of nearest house, 188° 03′·8.

Pelican Narrows, Sask., 1922.—The station is an approximate relocation of the C. I. station of 1908. It is to the southeast of the Hudson's Bay Company's store, on a hill locally known as Treaty Hill. The point is on the westerly part of the summit, about 7 paces northeasterly from where the flagpole formerly stood, and just south of the path over the hill. Observations were taken over the centre of a cross-mark chiseled in the top of a flat granite rock about 7 inches each way. The south edge of the cross on the Catholic church bears 272° 07′·1.

Philomena, Alta., 1922.—The station is on partially cleared ground north of the A. & G.W.R. tracks. The station is determined by measuring west from the semaphore at the east end of the siding a distance of 342·5 feet, thence turning to the right from the direction of the railway tangent to the west, the angle 72° 51′·0 and measuring along this direction from the middle of the main line a distance of 496 feet to the station. Observations were taken over a stake 4 inches in diameter projecting 6 inches above the ground.

Pickford, Alta., 1922.—The station is on a sandy ridge on the west side of the A. & G.W.R. tracks. It is in sec. 8, tp. 80, rge. 6 W. of the 4th mer., 126 feet north of the south side of the section and 295 feet west of the middle of the main line of the railway. Observations were taken over a stake 4 by 4 inches projecting 4 inches above the ground.

Pictou, N.S., 1921.—The station is north of the town in an open field belonging to Mr. Adamson. It is 85·6 feet west of the west side of Palmerston street and 36 feet south of the south side of Louisa street, and is approximately a relocation of the D. O. station of 1907. The point is not marked. The following true bearings were determined: window in side of white barn across the bay, 121° 32′·2; left corner of tower on school, 135° 11′·8; spire of English church, 174° 18′·5.

Point Ennuyeuse, N.W.T., 1922.—The station is on the north side of Slave river almost opposite the portage across Ennuyeuse point and across the river from T. S. Monument R 3. It is near the westerly end of a portion of the rocky shore line which is only a few hundred yards in extent. To the west of the station and along the shore line are a few boulders and some gravel. The station is about 12 feet north of the edge of the bank and is marked by a drill hole in the top of a sandstone rock 6 by 8 inches projecting 4 inches above the ground. The land around the open space on which the station is located is overgrown with poplar and willow.

Poplar Point, Alta., 1922.—The station is southeasterly from the group of houses on the point, 15 feet northeasterly from the bank along the river, and 68·5 feet southerly from the southerly corner of the most easterly house of the group. Observations were taken over the intersection of two grooves in the top of a triangular-shaped stone projecting about 3 inches above the ground, the edges of the stone at the top being about 6 inches in length. The following true bearings were determined: gable of log cabin near river, 305° 47′·9; gable of Hudson's Bay Company's store, 309° 17′·8; gable of house across river, 300° 18′·4.

Port Hood, N.S., 1921.—The station is about one mile north of the railway on the MacPherson estate. It is in an open field at the rear of Mr. D. J. McKay's lot in line with the south end of the convent which is on the west, or opposite, side of the main road. The point is 126 feet north of the south side of the field, 304 feet east of the east side of the road and 154 feet east of the rear end of Mr. McKay's lot. Observations were taken over a drill hole in a small stone set flush with the ground. The following true bearings were determined: spire of Methodist church, 175° 32′·0; pole on tower of academy, 182° 14′·6; east gable of Catholic church, 229° 46′·0; top of cross on convent, 254° 01′·9.

Port Nelson, Man., 1923.—The station is to the west of the group of buildings comprising the town, and northwesterly from the beginning of the bridge to the island, on a sandy patch to the north of the railway grade. The station is 95·0 feet southerly from the edge of the ditch and 198·5 feet northerly from a telegraph pole on the south side of the grade and in line with this pole and the centre of the third span, from the mainland, of the bridge. The point is marked by a fir stake 3 inches square projecting 4 inches above the ground. The following true bearings were determined: upper southwest corner of bridge at island, 146° 07′·6; upper northeast corner of bridge at island, 102° 52′·0; west edge at roof of large smokestack on building, 65° 12′·2; base of R.C.M.P. flagstaff, 40° 40′·6; upper northwest corner of pier to west of island, 188° 34′·4.

Prairie Point, Alta., 1922.—The station is near the NE. cor. of SE. ¼ sec. 6, tp. 107, rge. 15, W. 5th mer., on property belonging to Mr. Sheridan Lawrence. It is south of the ranch buildings, 23·8 feet almost due south from the post marking the middle of the east side of sec. 6, 6·0 feet northerly from the bank along the river and 38·8 feet southerly from the wire fence along the side of a cultivated field. A birch stake 2 by 2 inches projecting 3 inches above the surface marks the point.

Prescott, Ont., 1921.—The station is in the exhibition grounds to the north of the town. It is in a depression between the grandstand and the main exhibit building, 39 feet north and 96·8 feet west of the northwest corner of the grandstand. Observations were taken over a stake 2 inches in diameter driven flush with the ground. The following

true bearings were determined: spire of Anglican church, 160° 49′·0; right edge of town water-tank, 169° 06′·0; pole on top of C.N.R. water-tank, 190° 30′·5; east gable of vault across road, 217° 34′·0; spire of church in Ogdensburg, 134° 56′·0; cross on separate school, 151° 42′·0.

Providence, N.W.T., 1923.—The station is an approximate relocation of the M. S. station of 1910, on the north bank of Mackenzie river. It is on vacant land between the Hudson's Bay Company's property and the Catholic Mission property. It is 20 feet north and 139 feet west of the southwest corner of the fence around the Hudson's Bay Company's property, and 3 feet south and 150 feet east of the southeast corner of the Mission property. Observations were taken over a stake set flush with the ground. The following true bearings were determined: top of spire on Catholic church, 306° 45′·6; Hudson's Bay Company's flagstaff, 146° 56′·0; Mission flagstaff, 291° 38′·6; tip of spire on Mission school, 298° 40′·6.

Pukatawagan, Man., 1923.—The station is on property of Revillon Freres, on a peninsula which is an island at high water, and to the north of the buildings. The station is on the summit of the peninsula, about 25 feet above the lake. Observations were taken over a cross-mark cut in the top of a grey granite rock, flat on top and measuring 7 by 9 inches. This rock is just east of a path over the summit.

Rge. 6, Tp. 82, Sec. 30, Alta., 1922.—The station is near the southwest corner of sec. 30, tp. 82, rge. 6, W. 6th mer., in an open space on the left bank of Peace river, and about 1,200 feet southerly from the intersection of the bank of the river and the line between rge. 6 and rge. 7. The station is just above a rocky point, about 22 feet from the edge of the bank along the river, and is marked by a stone 4 by 6 inches projecting 4 inches above the surface. A temporary reference mark was used.

Reindeer Lake (Opapaskawseck Island), Sask., 1922.—The station is on the east side of Opapaskawseck island which is about midway between Where-the-Beaver-are and Halfway islands. This island is on the west side of the york-boat channel to Halfway island and is composed of granite partially overgrown with jack pine and aspen. The station is south of a large bay on the east side of the island and is about 50 yards from the water's edge to the east. Observations were taken over the centre of a cross-mark chiseled in the solid granite and covered with a mound of stones.

Reindeer River, Sask., 1922.—The station is on the northerly end of a rocky island in the middle of Reindeer river. The island is the second south of the big bend in the river southeast of Steep Hill portage, and is the first in the middle of the river going south after turning this bend. The station is on solid rock, 67 feet southerly from the northerly end and 40 feet easterly from the westerly side of the island. Observations were taken over the centre of a cross-mark chiseled in the rock which was covered with a mound of stones.

Resolution, A, N.W.T., 1922.—The station is approximately a relocation of the M. S. station of 1910. It is in a small field belonging to the Hudson's Bay Company and lying to the west of the buildings comprising the post, and on a waste piece of land extending diagonally across the south end of the field. It is 36 feet east of the east side produced, of the Catholic church, 244 feet north of the south fence which is in line with the Fort Resolution Trading Company's store, 67·3 feet from the fence along the westerly side of the field and 45·8 feet southwesterly from a log building. The point is marked by a

stake 3 by 3 inches set flush with the ground. The following true bearings were determined: northwest corner of Hudson's Bay Company's dwelling-house for post manager, 140° 19′·9; west gable of store house, 152° 12′·9; Hudson's Bay Company's flagstaff, 164° 36′·0; cross on tower of Catholic church, 229° 28′·0; gable of house occupied by Lamson's post manager, 344° 45′·5.

Resolution, B, N.W.T., 1922.—The station is about 450 feet northeasterly from station A, in an open space to the north of a garden around the house occupied by the Hudson's Bay Company's post manager. It is 400 feet north of a fence along the north side of the Hudson's Bay Company's store, 70 feet north and 10 feet west of the northwest corner of a garden, and about 330 feet westerly and 126 feet southerly from the southwesterly corner of a lot on which is located the Catholic Mission buildings. The point is marked by a stake 3 by 3 inches set flush with the ground. The following true bearings were determined: cross on front of Catholic Mission residence, 65° 07′·9; cross on dome of school, 71° 00′·7; chimney on Hudson's Bay Company's house, 209° 21′·9; cross on tower of Catholic church, 250° 30′·4; ornament on north end of Catholic church, 253° 09′·4.

Richmond, Que., 1921.—The station is about three-quarters of a mile easterly from the C.N.R. depot in a pasture field owned by Miss Gouin. It is about 900 feet northeasterly from the gate at the entrance to a lane leading along the southeasterly side of the property to the pasture field; it is 49·5 feet northwesterly from the wire fence on the southeasterly side of the field, 89·5 feet northeasterly from the corner of the wire fence and in line with the wire fence along the northwesterly side of the lane, and about 180 feet southerly from the base of a high rocky ridge. The point is marked by a stake 2 by 2 inches set flush with the ground. The following true bearings were determined: cross on Catholic church, 285° 51′·3; tip of spire on church across river, 221° 56′·8; spire of Methodist church, 209° 57′·8; base of lightning-rod on ventilator on centre of barn, 152° 07′·8; south gable of red brick house, 93° 44′·8.

Rosetown, Sask., 1922.—The station is on the fair grounds, in line with the west side of the easterly one of two exhibit buildings and 196·5 feet north of the northwest corner of the same; it is 135 feet east of the east side of the entrance to the grounds and 277 feet north of the fence along the south side of the grounds. A stake 2 by 4 inches set flush with the ground marks the point. The following true bearings were determined: north gable of Presbyterian church, 160° 04′·5; spire of English church, 171° 05′·9; flagstaff on high school, 185° 21′·0; left edge of chimney on C.P.R. depot, 353° 01′·2; south gable of Ogilvie's elevator, 26° 17′·2.

Ste. Agathe des Monts, Que., 1921.—The station is about three-quarters of a mile north of the C.P.R. depot. To reach the station take the road running northerly on the opposite side of the tracks from the depot, and continue along this road through a swamp until the first cross-road is reached. The station is on the summit of a low hill at the northeasterly angle of the intersection of the roads, being 148·5 feet from the north side of the road on the south and 178 feet from the east side of the road on the west. It is approximately at the intersection of the diagonals of a rough square formed by four large stones, 21·3 feet from the stone to the north, 26·9 feet from the stone to the south and 23·9 feet and 17·4 feet from the stones to the west and to the east, respectively. Observations were taken over a stone about 2 by 4 inches set flush with the ground. The following true

bearings were determined: south gable of house in valley, 60° 48′·8; cross on Catholic church, 192° 28′·8; tip of northeast gable on Sanatorium, 233° 28′·8.

St. Johns, Que., 1921.—The station is on the exhibition grounds on the southwest edge of the city. It is in the southeastern corner of the grounds, opposite the entrance gate, 69 feet north of the south fence and 100 feet west of the east fence of the grounds. The point is marked by a stake 2 by 4 inches set flush with the ground. The following true bearings were determined: base of pole on C.N.R. water-tank, 46° 43′·7; tip of cross on church, 28° 20′·7; top of ball on city water-tank, 26° 41′·7; base of pole on exhibition building, 358° 34′·7.

Sans Sault Rapids, N.W.T., 1923.—The station is at the northwesterly corner of the first island below Sans Sault rapids. It is just north of the northerly edge of a growth of spruce trees and almost at the high-water level, and 78 feet north of a lobstick.

Seal River, Man., 1923.—The station is just above high-tide line on the first point of land in Hudson bay from the mouth of Seal river; it is on the westerly side of a bay and northeasterly from the rapids. The station is in a bunch of willow about 100 yards from high-tide mark on the point. Observations were taken over a cross-mark chiseled in the top of a flat rock flush with the ground. The rock was marked, "D O M S 15."

Shamattawa River, Man., 1923.—The station is on the summit of the bluff at the junction of Hayes and Shamattawa rivers. The point is about 20 feet above the water, 24 feet north of the edge of the bluff on the Shamattawa, 46 feet westerly from the bluff on the Hayes, and is southeast from a big spruce tree. The point is marked by a cartridge shell in the top of a tamarack stake 2 by 2 inches projecting 8 inches above ground.

Sherbrooke, B, Que., 1921.—The D. O. station of 1920 was reoccupied. To reach the station proceed along Rue Conseil, passing the large Catholic church on the right, also two shirt factories, and turn to the north along the road in front of the second of these factories. Six hundred yards from Rue Conseil the road turns east leading up a slope to a farm house. The station is situated at this corner of the level field in front of the shirt factories, being 18 feet westerly from the west side of the north-south road, 69·5 feet southerly from the south side of the east-west road and 81·5 feet southerly from the wire fence along the north side of the field. The point is marked by a stake 2 by 2 inches driven flush with the ground. The following true bearings were determined: right edge of chimney on south side of frame house on hill to north, 32° 46′·4; cross on spire of Catholic church, 232° 39′·4; tip of cross on hospital, 256° 01′·4; base of pole on exhibition building, 282° 42′·4; base of pole on club house, 327° 19′·4.

Shethnanei Lake, Man., 1923.—The station is about one-quarter of a mile northerly from the outlet of Shethnanei lake on the right bank of Seal river. The point is on the top of a sand ridge which is covered with spruce, is marked by a cutting to the water and a lobstick, and is about 100 yards from and about 30 feet above the water. Observations were taken over a cross-mark cut in the top of a red granite boulder 2·2 by 1·2 feet projecting 9 inches above ground.

Simpson, A, N.W.T., 1923.—The station is near the M. S. station of 1910, on the left bank of Liard river and in front of the Hudson's Bay Company's buildings. It is in line with the north side of the Hudson's Bay Company's warehouse and 51·5 feet east of the fence along the front of their property, and is 10 feet from the edge of the bank along the river. Observations were taken over a hole in the top of a concrete block 6 by

7 inches set flush with the ground. The following true bearings were determined: door in side of house near water's edge across Mackenzie river, 51° 37′·8; chimney on house to southeast, 151° 13′·7; cross on tower of Catholic church, 305° 47′·8; spire of English church, 314° 10′·8; tip of sun dial on pier marking the D. O. astronomical station in the grounds of the Hudson's Bay Company, 246° 12′·8.

Simpson, B, N.W.T., 1923.—The station is on the road allowance along the river bank and about one-half mile northwesterly from station A. It is in front of lot 23 of the Settlement Survey and is 240 feet, on a course bearing N. 96° 55′·6 E., from the post at the corner of lots 23 and 25, and is about the same distance southerly from the saw-mill which is on lot 25. The following true bearings were determined: gable of most southerly house in grounds of the Indian Agency, 261° 39′·7; southerly gable of second house, 272° 43′·7; corner of lots 23 and 25, 276° 55′·6; chimney on third house, 280° 33′·9.

Souris, P.E.I., 1921.—The station is at the extreme westerly end of the town on an open space between the road and the beach, being about 2,550 feet west of the post office and about 525 feet northerly from the produced line of the north side of the street passing the post office. It is 81 feet westerly from the fence along the east side of the road, 10 feet from the edge of the bank and 23·2 feet northerly from a stone 5 by 6 inches having a drill hole in the top set flush with the ground. Observations were taken over the hole in the top of a stone 6 by 6 inches set flush with the ground. The spire of the Catholic church bears 79° 52′·1.

South Deer Lake, Sask., 1922.—The station is on the Hudson's Bay Company's reserve and about 20 yards westerly from the C. I. station of 1908. It is at the easterly edge of the base of a rocky bluff and on the rise of ground to the north of the Hudson's Bay Company's store. Observations were taken over the centre of a cross-mark chiseled in the top of a grey granite rock almost flush with the ground. The southwest corner of Revillon Freres' store bears 35° 39′·0.

Southern Indian Lake, Man., 1923.—The station is on the flat rock at the northwestern extremity of a point on the east shore of Southern Indian lake, this being the first point that has a high cut-bank on its southerly side, travelling north. The point is marked by a cross chiseled in the solid granite and covered with a mound of stones. The station is between the bank and the water and may be submerged at high water.

Stanstead, Que., 1921.—The station is in the exhibition grounds to the east of the village. It is in the enclosure inside the race-track, 80 feet southerly from the inside of the track and 216 feet easterly from the easterly end of the grandstand produced. Observations were taken over a large granite boulder which projects about 6 inches above the ground and is a rough triangle in shape. The following true bearings were determined: pole on Stanstead college, 249° 19′·2; cross on spire of Anglican church, 272° 11′·2; tip of spire of Methodist church, 267° 08′·2; cross on separate school, 276° 02′·2; cross on Catholic church, 314° 20′·2.

Sturgeon Landing, Sask., 1923.—The station is on the beach on the easterly side of the mouth of Sturgeon river, to the south of the buildings and to the west of the Ross Navigation Company's wharf. It is almost in line with the southerly pier across the river, 147 feet from the water's edge measured along this direction and 18 feet south from a slight rise in the ground at the R. N. Company's woodpiles, and is southeasterly from their warehouse. Observations were taken over a cross-mark cut in the easterly

side of the top of a red granite boulder 1·5 by 1·2 feet projecting 6 inches above the surface. The south gable of a white house bears 349° 20′·7.

Sturgeon-weir River, Sask., 1922.—The station is on the first island in Sturgeon-weir river north of Birch portage. The point is on the north end of the island on the northerly part of the summit of the granite rock which rises to form a dome about 15 feet above the elevation of the island. Observations were taken over the centre of a cross-mark chiseled in the granite rock. The mark was covered with a mound of stones.

Summerside, P.E.I., 1921.—The station is on the northwesterly edge of the town on the exhibition grounds, inside the race-course and almost on the centre line produced, of the street running east from the gate on the east side of the grounds. It is 290·5 feet west of the gate on the east side of the grounds, 197 feet west of the fence along the inside of the race-course on the east, 100·8 feet east of the fence along the inside of the race-course on the west, and 101·5 feet from the southeasterly corner of the judge's stand. The point is not marked. The following true bearings were determined: spire of Catholic church, 113° 17′·7; spire of Methodist church, 120° 24′·8; spire of Presbyterian church, 133° 04′·8.

Sutton, Que., 1921.—The station is on the northerly slope of Sutton mountain, about one-half mile south of the town. It is in a rocky pasture field just beyond the southerly boundary fence of a small open field which is about one-quarter of a mile east of the first north-south road to the west of the creek where it crosses the main street of the town, and south of the first east-west road south of the main street, and opposite a farm house. The station is 74 feet west of the wire fence along a portion of the west side of the open field, 64·5 feet south of part of the south boundary fence and 72·5 feet northeast of a large boulder. Observations were taken over a stake 2 by 2 inches driven flush with the ground. The following true bearings were determined: spire of Catholic church, 326° 21′·6; spire of Methodist church, 329° 01′·1.

Swampy Lake, Man., 1923.—The station is on the left bank of Hayes river about 1·5 miles below the last portage to Swampy lake and about one-half mile from the lake. It is on the east end of the summit of the first high bluff east of the portage and is about 100 yards east of a cabin. It is 20 feet north from the edge of the bluff and the same distance east of the bush. The point is marked by a cartridge shell in the top of a birch stake 3½ by 3½ inches painted yellow and projecting 9 inches above the ground.

Sydney, B, N.S., 1921.—The station of 1920 was reoccupied. It is northwest of the town in Victoria park, near the foot of the slope on the northwestern side of the highest point of ground in the western portion of the park. It is approximately 100 feet northwest of the station of 1912, or the C. I. station occupied first in 1905, and near the inner edge of a race-course; it is 220 feet easterly from an electric light post on which is a reflector, 278 feet southerly from the iron house near the signal mast and 131 feet southeasterly from a row of willow trees along the northerly side of the race-track. The point is marked by a drill hole in the top of a granite post 4 by 4 inches set flush with the ground. The following true bearings were determined: tip of pole near iron works, 69° 36′·3; spire of Catholic church, 126° 33′·7; spire of old stone church on esplanade, 147° 26′·4.

Sydney, C, N.S., 1921.—Station C is approximately a relocation of the C. I. station of 1909, and the D. O. station of subsequent years. It is 102·3 feet on a line bearing N. 133° 19′·3 E. from the station of 1920. The point is marked by an irregular shaped

stone placed there probably by an observer of the McMillan Arctic exploration party. The following true bearings were determined: spire of Catholic church, 126° 18′·0; spire of old church on esplanade, 148° 17′·5; church spire seen over steel plant, 33° 07′·3; pole on water-tank near steel plant, 66° 39′·8.

Tadoule Lake, Man., 1923.—The station is at the southeasterly end of Tadoule lake about four miles northeasterly from the long rapids into the lake. It is on the first sand-bank running northwest and southeast on the mainland after entering the lake. The ruins of an Indian village can be seen on this ridge. Observations were taken over a red granite boulder, the most northeasterly one of a boulder path just beyond the entrance to a long narrow bay. The boulder is 30 feet southerly from the edge of the bank at the water. A cross-mark chiseled in the rock marks the precise point.

The Pas, Man., 1922.—The D. O. station of 1919, which is a relocation of the C. I. station of 1908 was reoccupied. It is in the yard of the mission residence on an island about one-eighth of a mile down Saskatchewan river from the church of England and 100 feet from the mainland. The observations were taken over a cross filed in the gnomon of the sundial of Sir John Franklin. The sundial is mounted on a piece of oak fixed to the top of a post 9 inches in diameter projecting 2 feet 4 inches above the ground. The following true bearings were determined: west upper corner of third cement pier of bridge from north shore of river, 357° 55′·4; pole on tower of hospital, 113° 51′·5.

The Rock, Man., 1923.—The station is on the left bank of Hayes river, on the first point of land below the rapids, in a grove of poplar. The station is 53 feet southwesterly from a small creek and 10 feet northerly from the edge of the river bank. It is marked by a tamarack stake 2¾ inches in diameter projecting 5 inches above the ground.

Thicket Portage, Man., 1923.—The station is on Landing lake on the south end of the portage to Mile 185, H.B.R. It is on the point to the southeast of the small bay where the portage begins and about 100 yards distant. There is a small bay to the east of the station with a cabin on the east side of the bay. The station is on the extremity of a grey granite rock, 36 feet north from the edge of the bank to the south and 67 feet west from a landing place at the east end of the point. Observations were taken over the centre of a cross-mark chiseled in the rock.

Thorhild, Alta., 1922.—The station is on the grounds around the school, in S.E. ¼ sec. 6, tp. 60, rge. 21, W. 4th mer. It is in line with the west side of the school building and 99 feet from the southwest corner, 317 feet south of the north side of the grounds and 106 feet west of the east side. The point is marked by a stake set flush with the ground. The following true bearings were determined: insulator on telegraph pole, 44° 40′·3; east gable of hotel, 68° 43′·8; southeast corner of Jardy's store, 84° 07′·8.

Tignish, P.E.I., 1921.—The station is in a small opening in the grove of small trees along the north side of the grounds around the Presbyterian church about one-quarter of a mile south of the railway tracks. It is 124 feet east and 26 feet north of the north-east corner of the church, 69·5 feet north of the fence along the south side of the grounds and 47·5 feet west of the fence on the east side. Observations were taken over the drill hole in the top of a brick set flush with the ground. The following true bearings were determined: right edge of chimney on north end of house, 232° 51′·2; southeast corner of church, 233° 36′·8; northwest corner of church, 251° 00′·4.

Trout River, N.W.T., 1923.—The station is on the point at the confluence of Trout and MacKenzie rivers, being on the south side of the Mackenzie and on the west side of the Trout, and almost at the edge of the high-water mark. It is about 50 feet southerly from the northerly edge of a growth of willow along the Mackenzie and about the same distance westerly from the easterly edge of some poplar trees along the Trout. Observations were taken over a small hole in the top of a concrete block 6 by 8 inches projecting 2 inches above the ground.

T. S. Monument A 4, Alta., 1922.—The station is on the south bank of Athabaska river, being 135 feet east from the post at the T. S. Monument A 4, 28 feet from the bank along the bed of a creek, and 20 feet south of the bank along the river. Observations were taken over a stake 4 by 4 inches projecting 6 inches above the ground.

T. S. Monument 4 E, Alta., 1922.—The station is in a clearing on the edge of the bank along Slave river, being 43·5 feet westerly from the post of the T. S. Monument 4 E, and 6 feet north of the edge of the bank along the river. The point is marked by a stake 3 inches in diameter projecting 10 inches above the surface.

T. S. Monument 18 E, Alta., 1922.—The station is on the east side of Slave river and south of a creek; 27·2 feet southwesterly from the southwesterly corner of the most easterly pit and 27·7 feet from the post of the T. S. monument. The station is marked by a stake 2 by 2 inches projecting 6 inches above the surface.

T. S. Monument 56 N, N.W.T., 1923.—The station is on the right bank of Mackenzie river near the T. S. Monument 56 N. It is about 300 feet east from the edge of a ridge which terminates at the confluence of a creek and the river. Observations were taken over a hole in the top of a concrete block 7 by 8 inches set flush with the ground, the block being 20 feet southwesterly from the iron post at Monument 56 N.

T. S. Monument O 44, N.W.T., 1923.—The station is almost due north of the iron post at the T. S. Monument O 44, and almost in line with the post and the centre of the mound. Observations were taken over a concrete block 7 by 7 inches projecting about 2 inches above the ground. The block is 20·2 feet from the iron post.

T. S. Monument O 69, N.W.T., 1923.—The station is supposedly near the T. S. Monument O 69, and about 5 miles above Thunder river. It is on the east side of a creek (not marked on the map) on the right bank of Mackenzie river and opposite a low-lying island. The precise point is about 450 feet east of the middle of the creek, about 100 feet north of the shore line of the Mackenzie, on the hillside and 100 feet southwesterly from a trapper's cabin. Observations were taken over a concrete block 6 by 7 inches projecting 3 inches above the surface.

T. S. Monument T 22, Alta., 1922.—The station is near the edge of the north bank of Slave river, at the south end of a clearing which is about 12 feet wide and extends about 130 feet into the woods. At the north end of this clearing is located the T. S. Monument T 22. The station is 121 feet south from the post and 12 feet from the bank along the river. Observations were taken over a stake 2 inches in diameter projecting 12 inches above the surface.

Tweed, Ont., 1921.—The station is in the exhibition grounds across Moira river from the town, near the northeast corner of the grounds and inside the race-track. It is 99 feet west of the inside of the race-track on the east, 57 feet southwest from a large elm tree and 12 feet west of a line joining the north end of a hitching-rail and the elm tree.

The point is marked by a cedar stake 2 by 2 inches driven flush with the ground. The following true bearings were determined: tip of ornament on tank to east of grounds, 97° 32′·4; base of pole on C.P.R. water-tank, 197° 48′·4; base of pole on exhibition building, 229° 22′·9; north gable of grandstand, 237° 37′·4; tip of northeast gable of elevator, 244° 30′·4.

Twenty-fifth Base Line, Alta., 1922.—The station is almost in the middle of the clearing marking the 25th base line, on the west side of Peace river, about 35 feet west from the edge of the bank and 10 feet west of the edge of a sunken portion of the bank. The point is marked by a birch stake 4 by 4 inches projecting 8 inches above the surface.

Twenty-seventh Base Line, Alta., 1922.—The station is slightly south of the middle of the clearing marking the 27th base line, near the westerly extremity of an island in Peace river; this island is located in tps. 104 and 105, also in rges. 16 and 17, west of the 5th mer. Observations were taken over a birch stake 4 by 4 inches projecting 14 inches above the surface, the stake being 276 feet west of a witness mound, 75 feet east of the edge of the bank along the river and 20 feet south of the edge of the bank. A picket in the centre of the witness mound bears 89° 00′·4.

Twenty-ninth Base Line, Alta., 1922.—The station is on the southeasterly side of Peace river and on the centre line of the 29th base line, 15 feet from the edge of the bank on the west and 11 feet from the edge of the bank on the north. Observations were taken over a stake 2 by 2 inches projecting 8 inches above the ground.

Vermilion Chutes, Alta., 1922.—The station is near the east side of a clearing at the steamer landing and about 150 feet from Peace river. It is 54 feet southeast of the southeast corner of a log stable and 63 feet southwest of the southwest corner of another log building. A blaze on a large poplar tree on the river bank bears 33° 02′·5.

Victoriaville, Que., 1921.—The station is about one mile east of the C.N.R. depot, in the exhibition grounds and directly behind the town water-tank. It is 46 feet north of the northwest corner of the main exhibition building and in line with the west side produced, 35 feet southerly from a cattle shed and 60 feet west from the rail fence on the east side of the grounds. The point is marked by a stake 2 by 2 inches driven flush with the ground. The following true bearings were determined: spire of Catholic church, 261° 51′·7; cross on cupola on large brick building, 280° 12′·7; east gable of red brick house, 322° 11′·7; tip of ornament on town water-tank, 344° 42′·7.

Wabiskaw River, Alta., 1922.—The station is on the north bank of Peace river and opposite the mouth of Wabiskaw river. From the station the eastern end of an island in the Wabiskaw may be seen over the point of land at the southwest angle formed by the Peace and the Wabiskaw. The station is 28 feet southwesterly from the corner of an abandoned log cabin, and 25 feet north of the bank along the river. A stake 4 by 4 inches projecting 16 inches above the surface marks the station.

Whitemud River, Alta., 1922.—The station is on the north bank of Whitemud river at its confluence with Peace river, being approximately in line with a portion of the west bank of the Peace just above the Whitemud. It is 18 feet from the edge of the bank along the Whitemud. Observations were taken over a small hole in the top of a stone about 5 by 7 inches projecting 3 inches above the surface.

Wrigley, A, N.W.T., 1923.—The station is near the river bank and on the front of lot 4 of the Settlement plan; this lot is the property of the Northern Trading Company. Observations were taken over a hole in the top of a concrete block 7 by 7 inches set flush with the ground. The station is in line with the south side of a small garden at the northeast corner of lot 4 and 50 feet south from the southeast corner of a garden, and also in line with the north end of the Northern Trading Company's store. The following true bearings were determined: spire of Catholic church, 342° 32′·4; tree on hillside to southeast, 148° 06′·7; bottom of Hudson's Bay Company's flagstaff, 345° 17′·1; vertical edge of rock near summit of mountain, 2° 52′·1.

Wrigley, B, N.W.T., 1923.—The station is approximately a relocation of the M. S. station of 1910, though now rather unfavourably located. It is in front of the Hudson's Bay Company's house occupied by the post manager, being 42·7 feet northerly from the southeast corner of the same, 125·8 feet northerly from the northeasterly corner of a store, 29 feet northwesterly from the base of a post supporting a sun-dial and 40 feet easterly from the southeasterly corner of a house in course of construction. The point is marked by a stake 2 by 2 inches set flush with the ground. The following true bearings were determined: spire of Catholic church, 345° 02′·5; vertical edge of rock on east side, near top, of mountain, 3° 22′·5; top of mountain, 113° 40′·0; tree on hillside, 148° 33′·4; bottom of Northern Trading Company's flagstaff, 160° 39′·4.

York Factory, Man., 1923.—The station is on the grounds of the Hudson's Bay Company, inside the enclosure between the buildings and the river. It is in line with the west side of the office and 114·0 feet southerly from its southwest corner and 80·5 feet northerly, measured along the same line, from the fence towards the river; it is 94 feet westerly from the fence to the east, at the board walk, and 80 feet westerly and 22 feet northerly from the centre of the base of the flagstaff. The point is marked by a cartridge shell in the top of an elm stake 4 by 4 inches projecting 10 inches above the ground.

DEPARTMENT OF THE INTERIOR
CANADA

HON. CHARLES STEWART, *Minister* W. W. CORY, C.M.G., *Deputy Minister*

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Gravity in Western Canada

BY

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CONTENTS

	Page
Introduction	245
Gravity Anomalies	245
Relation between the Anomalies and the Geological Formations	247
Isostasy in Western Canada	248
Depth of Compensation	248
Regional Tendencies of the Anomalies Illustrated by the Gravity Map	250
Accuracy of the Observations and Reductions	250
Distribution of the Compensation	252
Descriptions of Stations	324

TABLES

Table I.	Gravity Stations in Western Canada in their Numerical and Chronological Order	253
Table II.	Principal Facts for Gravity Stations	254
Table III.	Anomalies for the Various Stations Grouped According to Their Geological Formations	257
Table IV.	Anomalies by Different Methods of Reduction for 20 Stations in the Canadian Cordillera	258
Table V.	Results of Standardizations Made at the Base Station	258
Table VI.	Periods of Pendulums at the Stations occupied between July, 1915, and January, 1927	259
Table VII.	Pendulum Observations and Reductions	261
Table VIII.	Average Elevations and Corrections for Topography and Compensation for Separate Zones	294

MAPS

Gravity Map of Western Canada	At end of report
Map of Western Canada Showing Gravity Stations and Their Anomalies	At end of report

GRAVITY IN WESTERN CANADA

INTRODUCTION

This publication contains the results of all gravity stations that have so far been established in Western Canada. The determinations were made with the standard half-seconds pendulum apparatus of the Observatory. At every station the pendulum case was set up either on a concrete basement floor or a concrete block specially erected for the purpose. Flexure was measured with an interferometer. At the thirteen stations whose numbers are given as 31 to 43 the rates of the chronometers were determined directly by telegraphic connection with the Observatory clock. The rates at all the remaining stations, with the exception of four, were obtained by comparison, by the method of coincidences by extinction, with a chronometer set to gain, in most cases, about one second in fifty seconds on the mean time wireless signals from Annapolis. At the end of the season of 1925 when Annapolis was not sending it became necessary for the four stations mentioned to make use of the signals from either Arlington or WQL. For the last three years it has been the practice for the pendulum observer to make his own time comparisons with a small receiving set that is built for the purpose by the Observatory.

The more important results of the work in this part of the country are summarized in the tables appearing throughout the report and are in part shown graphically on the two accompanying maps. Descriptions of the stations and tables giving information of a more or less detailed nature, and to which no particular reference is required, appear at the end of the publication. Similar information for those stations not appearing in the latter tables has been given in previous publications of the Observatory.

In certain cases the name and other information corresponding to a certain station number may be required. In order to satisfy this requirement the stations are listed in their numerical order in Table I. This table also gives the gravity anomaly, the observer and the year in which the station was established.

GRAVITY ANOMALIES

As the gravity anomalies (the differences between the observed and computed values) form a very important part of the results of a gravity investigation, the computation of theoretical values for each station becomes also a matter of considerable importance. The observed values are, of course, obtained from the pendulum observations. The computed values given in this publication are values which are obtained on the assumption of isostasy. Corrections have been made for the gravitational effect at each station of all the topography on the earth's surface, and the compensating effect due to diminished density beneath the continents and increased density under the oceans has also been taken into account. The compensation is assumed to be complete and distributed uniformly down to a depth of 113·7 kilometres. In making the computation a formula for gravity at sea-level is first assumed. In this case, Bowie's

formula, $\gamma_o = 978 \cdot 039\ (1 + \cdot 005294 \sin^2 \phi - \cdot 000007 \sin^2 2\phi)$, derived from over 200 stations in different parts of the world, has been taken. To change to the position of the station this is corrected for the diminished attraction due to increased distance from the centre of the earth and to this result there is finally applied the correction for topography and compensation to which reference has already been made. The results are given in Table II, in which the stations are separated into groups according to the provinces in which they are situated. The first five columns give the number, name, longitude, latitude and altitude of the station. The sixth column gives the value of g at sea-level (γ_o) for the latitude (ϕ) of the station. The corrections for altitude and for topography and compensation are given in the next two columns. Columns 9 and 10 contain the computed and observed values. The gravity anomalies are given in the last column, and they are obtained by subtracting the computed values from the observed values. A positive anomaly indicates an excess of gravity and is obtained when the observed value is greater than the computed value. An anomaly of 001 dyne (or cm. per sec. per sec.), about one-millionth part of gravity, is equivalent to the effect that would be produced at the station by a layer of rock 30 feet thick and of density 2·7.

It is obvious that a gravity anomaly may be due to one cause or a combination of a number of causes. To produce an anomaly of any magnitude, however, the number of the more important causes is limited. With sufficient computation it may in certain cases be possible to form a fairly definite estimate of the chief cause or causes of the anomaly.

One of the possible causes of a gravity anomaly is the existence of abnormal rock densities in the vicinity of the station. In computing the effect of topography for the station the normal rock density is taken as 2·67. If the density of the rock in the vicinity of the station is different from this and if the excess or deficiency of material is uncompensated, provided there are no other compensating disturbances, a gravity anomaly is bound to result. If the excess or deficiency along with the original mass is completely compensated it turns out, rather paradoxically, that an anomaly will be produced if the horizontal extent of the abnormal density is not too great. This is a fact that was first pointed out by Bowie. A few figures illustrating this may be of some interest. Suppose at Elbow (No. 80) where gravity is practically normal, we were to replace the existing rock, whose density is taken for the present to be 2·67, by heavier rock of density 2·94 (10 per cent greater) extending to a depth of 10,000 feet. If the deposit extended out in every direction to a distance of one mile from the station the anomaly would be ·012. The maximum anomaly ·026 would be reached for a distance of five miles. For 100 miles the anomaly would decrease to ·010 and for 750 miles would be only ·002. If the excess of matter were uncompensated the anomaly for 5 miles would be ·028, for 100 miles ·034 and for 750 miles ·037. If in addition part or all of the original mass were uncompensated the anomalies would be still larger.

It is characteristic of large anomalies that they do not persist over large areas. This is well illustrated by the variation of the anomalies over the Puget Sound district in the United States, to which attention has been directed by Bowie and others. Considerable interest has been added to this region by the recent work on Vancouver island. In a distance of 20 miles across the strait of Juan de Fuca there is a change

from a negative anomaly of $-\cdot 008$ at Port Angeles to the largest known anomaly in Canada, $+\cdot 054$ at Victoria. This is also one of the largest positive anomalies yet discovered on the whole continent. Inside a distance of approximately 75 miles we go from the largest negative anomaly on the continent at Seattle to the large positive anomaly at Victoria. The chief cause of the large anomalies in the United States has been attributed by Bowie to local densities. It is certain that this is at least partly the cause of the anomaly at Victoria. A determination of the densities of several samples of the rock exposure (Gonzales hill) on which the station is situated, showed that none of them had a density less than 2·75 while the average was 2·81. This is considerably in excess of the assumed normal density of 2·67 and no doubt there is still heavier rock near the station, as the geological reports of the Victoria district give analyses of the rock in this vicinity all with densities considerably higher than those already mentioned. At Ocean Falls again what seemed to be a fairly representative sample of rock in the vicinity of the station had also a density of 2·81. The anomaly here is small but positive. In Masset inlet a sample taken from an exposure which seemed fairly typical, when weighed, was found to have a density of 2·67, the normal value. The anomaly at Masset is slightly negative. At Phoenix we have a fairly large positive anomaly. The gravity station is located on a copper mine which is underlain with grano-diorite, the average density of which is also in excess of the normal value 2·67.

The collecting of rocks in the vicinity of the stations was begun only towards the end of the field season of 1926. The limited number of densities that have been mentioned represent the values for all rock samples that have so far been collected. When time permits for further computation and investigation it is proposed to give further attention to the consideration of the individual anomalies. While it is certain that anomalies may not always be due to abnormal densities, there is sufficient evidence to show that for some of our Canadian stations there is a relation between the anomalies and the local densities. The value of the observations in revealing abnormal densities that may not otherwise be apparent is at least worthy of consideration.

RELATION BETWEEN THE ANOMALIES AND THE GEOLOGICAL FORMATIONS

Connected, quite possibly, with the relations that have just been mentioned are the relations that apparently exist between the anomalies and certain of the geological formations. In the accompanying table (Table III), giving the anomalies, the stations are grouped according to the geological formations upon which they are situated. The classification has been made from the geological map of Canada, dated 1924. A geological map, with the stations and their anomalies marked upon it, accompanies this report.

An examination of the summary of Table III indicates quite definite relations between the anomalies and both the Mesozoic and the Tertiary. Nearly all the Mesozoic stations have positive anomalies, while the Tertiary stations with the exception of Estevan are all negative. In the case of the igneous of the Mesozoic a plausible explanation of the anomalies is the existence in this formation of heavy igneous rocks. If the anomalies of the Cretaceous are due to abnormal densities they must lie beneath the sedimentary formation as the rocks of the formation are supposed to be lighter than

normal. In this case the contour lines on the gravity map would give some idea of the shape of the underlying formation. The anomalies on the Tertiary could be explained by the lower densities which the rocks of this formation are known to have.

The relations between gravity anomalies and the two geological formations—the Cretaceous and the Tertiary—have already been found by Bowie to exist for gravity stations in the United States.

There are no very definite relations between the other formations and their anomalies. It is quite possible that as the survey is extended into other parts of the country relations between the results and some of the other formations may be found.

ISOSTASY IN WESTERN CANADA

Judging from the anomalies it may be inferred that the greater portion, if not all, of that part of Western Canada covered by the observations, is in isostatic equilibrium or in a condition closely approximating it. Stations with large anomalies are not very numerous and, as already indicated, it is possible that these may be explained at least in part, if not wholly, by conditions which are local and are not a violation of isostasy. The anomalies on the southern part of Vancouver island may possibly be explained by the local densities. For example the anomaly at Victoria could be entirely accounted for by a compensated block of density 2·94, and 5 miles in radius, extending to a depth of 25,000 feet. There may be some doubt about Saskatchewan and the southern part of Manitoba. This area of comparatively large positive anomalies is not confined to Canada but runs across the border into the United States and reaches still larger values in the western part of South Dakota. If the anomalies in this region cannot be explained by the density and form of the underlying formation they may possibly indicate a lack of compensation.

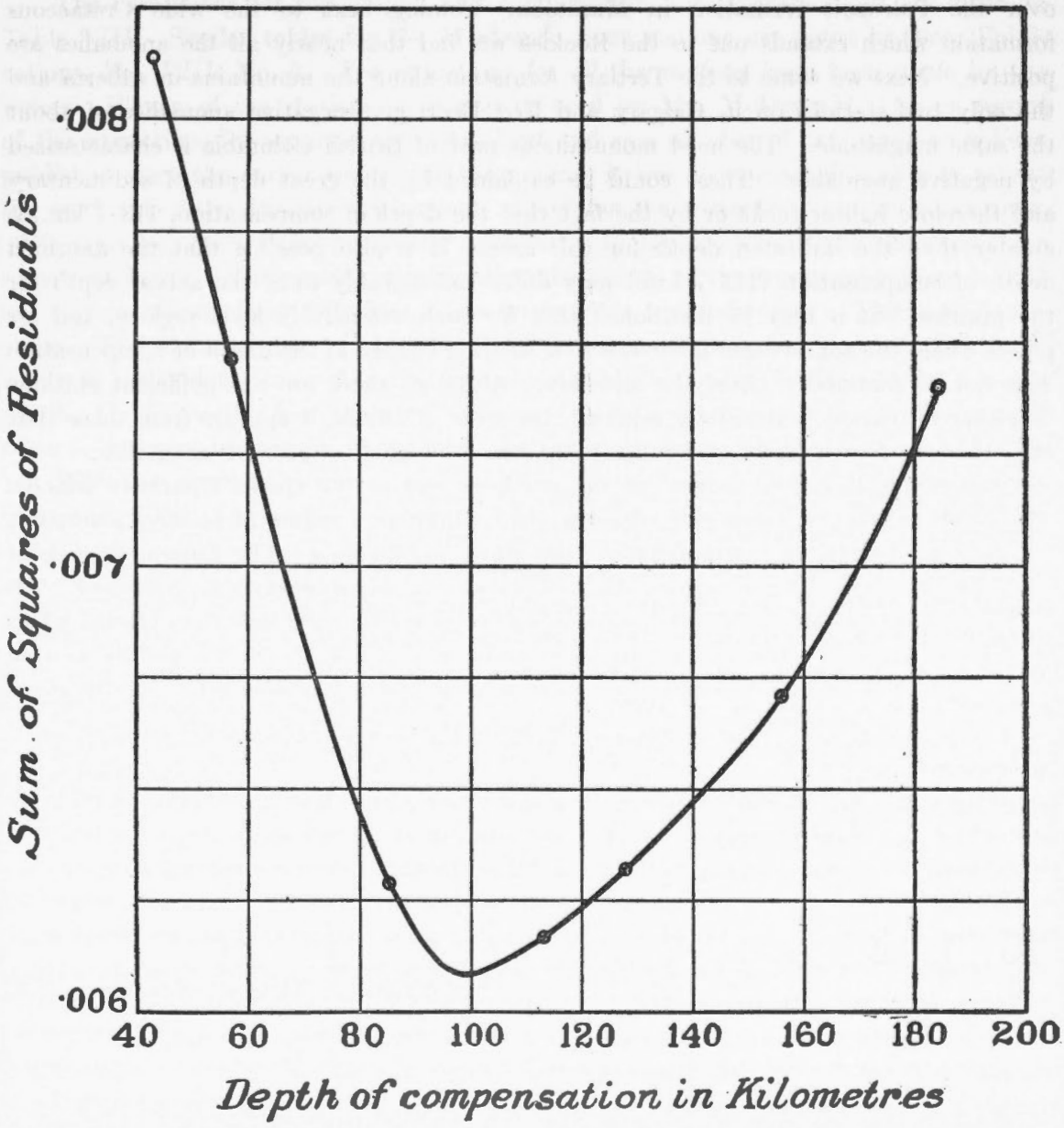
It is also certain that there is no other known method of computing gravity, which does not involve the assumption of isostasy, that will give values of gravity that agree with the actual observed results. For the purpose of illustrating this fact anomalies obtained by different methods of computing gravity are given in Table IV for 20 stations in the mountainous part of the country. The Free Air and Bouguer methods are two old and well known methods of computing gravity. It is also well known that generally they give erroneous values. The interesting comparison is between the isostatic and rigid crust anomalies. The rigid crust anomalies are obtained by leaving out of consideration the correction for compensation but by taking into account the entire topography of the earth's surface.

DEPTH OF COMPENSATION

Two determinations of the depth at which isostatic equilibrium is reached have been made. One of these, by the method of least squares, gives for nine stations in the Mackenzie river basin a depth of 91 kilometres with a probable error of 29 kilometres. A more accurate determination has been obtained from the results of the twenty stations, already referred to, in the Cordilleran region. The result of this determination is shown graphically in fig. 1 by a method first used by Bowie. The gravity anomalies for a number of depths were computed from tables published by the U. S. Coast and Geodetic Survey. According to the theory of probabilities the most probable depth of compensa-

tion is that for which the sum of the squares of the residual gravity anomalies is a minimum—the lowest point on the curve of fig. 1. The plotted points in the figure, indicated by the circles, are the results of the computations. The curve is obtained by joining these points. Evidently, the most probable depth of compensation for the twenty stations is between 85·3 and 113·7 kilometres, possibly slightly less than 100 kilometres.

Figure 1. Graphical determination of the depth of compensation from 20 stations in the southern portion of the Canadian Cordillera.



REGIONAL TENDENCIES OF THE ANOMALIES ILLUSTRATED BY THE GRAVITY MAP

The positions of the gravity stations with their numbers and their anomalies for a depth of compensation of 113·7 kilometres have been plotted on one of the official maps of Canada. A copy of this map will be found at the end of this publication. Regions of positive anomalies are shown in green, while negative areas are shown in yellow. Lines are drawn through places where the anomalies are the same and have certain values which are indicated on the map. The position of these lines is naturally not so certain in areas where the stations are not so numerous. The information for stations south of the international boundary, designated by the letter 'S', has been taken from the special publications of the U.S. Coast and Geodetic Survey.

The tendencies, as regards sign, of the anomalies are quite interesting. By consulting both the maps it will be seen that we start with a region of negative anomalies over the Paleozoic formation in Manitoba. Coming next to the wide Cretaceous formation which extends out to the Rockies we find that nearly all the anomalies are positive. Next we come to the Tertiary formation along the mountains in Alberta and the only two stations on it, Calgary and Red Deer, give negative anomalies of about the same magnitude. The most mountainous part of British Columbia is characterized by negative anomalies. These could be explained by the great depth of sedimentary and therefore lighter rocks or by the fact that the depth of compensation, 113·7 km., is greater than the indicated depth for this area. It is also possible that the assumed depth of compensation (113·7 km.) may differ considerably from the actual depth for the prairies, but it may be mentioned that for such extensively level regions, and for places where the compensation correction is small, a change in the depth of compensation does not so materially affect the anomaly. Although there are not sufficient stations on either formation to definitely establish the state of affairs, it appears from those that exist that the Nelson and Coast range batholiths are regions of positive anomalies.

Gravity is less than normal at the northern end of the Queen Charlotte islands. The southern part of Vancouver island is quite definitely a region of positive anomalies and Victoria has the largest anomaly of any of the 69 stations. The Edmonton district and the region north of it are remarkably normal in so far as gravity is concerned. All the way down the Mackenzie this state of affairs exists till we reach Good Hope, when we come to a region where the anomalies are getting larger and have changed to positive values. On the prairies the largest anomalies are at Manitou, Estevan and Saskatoon and they are all positive.

ACCURACY OF THE OBSERVATIONS AND REDUCTIONS

An estimate of the accuracy of the observations may be obtained by examination of Tables V, VI and VII. Table V gives the periods of the pendulums resulting from the various standardizations at Ottawa and also the adopted values for each season. The periods of the pendulums at the field stations and the deduced values of g are given in Table VI. Table VII gives the pendulum observations and the reductions giving the times of vibration from these observations.

If the probable errors of the field observations are determined from Table VI it will be found that there are 15 stations with a probable error of ·000 dyne, 39 with ·001 dyne, 11 with ·002 dyne and 2 with ·003 dyne. The two stations at which only one

pendulum was used are not included in this list. The results are no doubt more in error than these figures would indicate. If we add to them the probable errors in the determinations of the mean periods of the pendulums obtained from the spring and fall standardizations at Ottawa it will be found that this sum is zero for 11 stations, ·001 for 15 stations, ·002 for 24 stations, ·003 for 6 stations, ·004 for 10 stations and ·005 for 1 station. The average is ·002. During 1924 and 1925 when most (40) of the stations were established the pendulums remained quite steady during each season. During the season of 1915 also the behaviour of two of the pendulums was quite satisfactory. The stations with the largest uncertainties in the observed values are the 9 in the Mackenzie river basin and 8 established along the Pacific coast in 1926. The probable error in the determination of these stations is estimated to be about ·004 to ·005 dyne.

The corrections for topography and compensation for separate zones are given in Table VIII. Similar tables for the Mackenzie river stations are given in these Publications, Vol. VIII, No. 6. The reductions for all the stations have been made by the writer. Eleven of the stations were also reduced by Mr. McDiarmid. As no record of the corrections for separate zones was kept and as a number of new maps have been published since the earlier reductions were made, it was considered desirable to repeat the work. For the Prairies the writer's values for the corrections are, on an average, ·010 dyne less than those previously obtained. In the mountains the differences are somewhat larger. Taking into consideration the nature of the topography there is only one station where a large difference exists between the two reductions. This is at Revelstoke. The mapping around this station is rather incomplete but in spite of this the writer is inclined to think that the previously published value for Revelstoke was too small. Owing to the fact that the necessary maps are not available, at the present time, no attempt has been made to make the reduction for North Bend.

With the exception of the stations in the mountains, most of which are in the interior of British Columbia, the probable error of the reductions is estimated at less than ·005 dyne. The stations in the mountains, especially those in the more mountainous parts, may be in error by as much as ·010 dyne.

Directly affecting the computed values are the elevations of the stations. An error of 11 feet in elevation introduces an error of ·001 dyne in the computed value of g. There is only one station (Liard River) for which the assigned elevation may be very much in error. It might be as much as 100 to 150 feet higher than has been estimated. The elevations of Resolution and the four stations on Mackenzie river may be from 20 to 50 feet in error. With the possible exceptions of Paradise Mine and Barkerville the elevations of all the remaining stations have been determined by methods which should give results that are correct to within a few feet. In many cases they have been determined precisely from accurate elevations (rail levels) or bench-marks of the Geodetic Survey. The elevations to which stations are referred are given in the descriptions of the stations.

DISTRIBUTION OF THE COMPENSATION

No computations have so far been made by the writer for possible distributions of compensation other than for the uniform distribution upon which the Hayford and Bowie reduction tables are based. There is reason for believing, however, that on the average not very different results would be obtained by any other simple assumption that is likely to represent the actual facts. In fact Heiskanen* has shown from the results of observations, and Jeffreys** theoretically, that by merely a change in the depth of compensation very much the same anomalies are obtained from quite a different (Airy's) distribution of the compensation.

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* "Untersuchungen uber Schwerkraft und Isostasie" von W. Heiskanen.

** "On the Nature of Isostasy" by Harold Jeffreys—Gerland's Beitrage zur Geophysik—Band 15, Heft 2, 1926.

TABLE I

GRAVITY STATIONS IN WESTERN CANADA IN THEIR NUMERICAL AND CHRONOLOGICAL ORDER

Station Number	Station	Gravity Anomaly	Observer	Season Established	Station Number	Station	Gravity Anomaly	Observer	Season Established
31	Winnipeg	+·006	F. A. McDiarmid	1915	66	Princeton	−·010	A. H. Miller	1924
32	Brandon	+·021	" "	1915	67	Phoenix	+·028	"	1924
33	Moosejaw	+·009	" "	1915	68	Nelson	−·008	"	1924
34	Medicine Hat	+·010	" "	1915	69	Cranbrook	+·021	"	1924
35	Calgary	−·014	" "	1915	70	Blairmore	+·016	"	1924
36	Banff	+·034	" "	1915	71	Lethbridge	+·004	"	1924
37	Field	+·002	" "	1915	72	Riverton	−·004	"	1925
38	Glacier	−·002	" "	1915	73	Gypsumville	−·013	"	1925
39	Revelstoke	−·007	" "	1915	74	Manitou	+·036	"	1925
40	Kamloops	−·005	" "	1915	75	Melita	+·019	"	1925
41	North Bend		" "	1915	76	Estevan	+·039	"	1925
42	Vancouver	−·001	" "	1915	77	Indian Head	+·031	"	1925
43	Peace River	+·008	A. H. Miller	1921	78	Moosomin	+·016	"	1925
44	Providence	−·001	"	1921	79	Yorkton	+·024	"	1925
45	Simpson	+·007	"	1921	80	Elbow	+·001	"	1925
46	Norman	−·004	"	1921	81	Swift Current	+·013	"	1925
47	Resolution	−·010	"	1921	82	Bassano	+·008	"	1925
48	Liard River	−·017	"	1922	83	Red Deer	−·011	"	1925
49	Good Hope	+·013	"	1922	84	Coronation	−·008	"	1925
50	Arctic Red R.	+·021	"	1922	85	Paradise Mine	−·008	"	1925
51	Chipewyan	−·009	"	1922	86	Invermere	−·010	"	1925
52	Dauphin	−·007	"	1924	87	Vernon	−·003	"	1925
53	Swan River	+·022	"	1924	88	Barkerville	−·004	"	1925
54	The Pas	+·016	"	1924	89	Tyaughton Creek	−·024	"	1925
55	Prince Albert	+·015	"	1924	90	Union Bay	+·041	"	1925
56	Saskatoon	+·031	"	1924	91	Cloverdale	−·010	"	1925
57	Vermilion	+·006	"	1924	92	Victoria	+·054	"	1926
58	Edmonton	·000	"	1924	93	Banfield	+·020	"	1926
59	Grande Prairie	+·012	"	1924	94	Nootka	·000	"	1926
60	Kinuso	+·004	"	1924	95	Quatsino	+·011	"	1926
61	Lac la Biche	+·003	"	1924	96	Prince Rupert	+·017	"	1926
62	Waterways	+·003	"	1924	97	Stewart	−·016	"	1926
63	Edson	+·012	"	1924	98	Masset	−·013	"	1926
64	Jasper	−·012	"	1924	99	Ocean Falls	+·012	"	1926
65	Mt. Olie	+·001	"	1924					

Average anomaly with regard to sign +·006

Average anomaly without regard to sign ·013

TABLE II

PRINCIPAL FACTS FOR GRAVITY STATIONS

(a) In Manitoba

Number and Station	Longitude	Latitude	Altitude		Computed gravity at sea-level	Corrections for		Computed gravity	Observed gravity	Gravity anomalies
			Feet	Metres		Altitude	Topography and Isostatic Compensation			
72. Riverton	96 59·8	50 59·5	724	221	981·159	−·068	−·006	981·085	981·081	−·004
31. Winnipeg	97 08·0	49 54·4	754	230	981·062	−·071	−·008	980·983	980·989	+·006
74. Manitou	98 32·3	49 14·3	1,607	490	981·002	−·151	+·008	980·859	980·895	+·036
73. Gypsumville	98 37·9	51 46·1	857	261	981·227	−·081	−·004	981·142	981·129	−·013
32. Brandon	99 56·8	49 50·9	1,216	371	981·057	−·115	−·009	980·933	980·954	+·021
52. Dauphin	100 03·0	51 08·7	963	294	981·172	−·091	−·012	981·069	981·062	−·007
75. Melita	100 59·2	49 16·3	1,452	443	981·005	−·137	−·005	980·863	980·882	+·019
54. The Pas	101 14·7	53 49·7	872	266	981·407	−·082	−·004	981·321	981·337	+·016
53. Swan River	101 15·7	52 06·4	1,107	337	981·257	−·104	−·009	981·144	981·166	+·022
Mean anomaly with regard to sign (Manitoba stations)										+·011
Mean anomaly without regard to sign (Manitoba stations)										·016

(b) In Saskatchewan

78. Moosomin	101 40·3	50 08·7	1,892	577	981·084	−·178	+·006	980·912	980·928	+·016
79. Yorkton	101 27·3	51 12·8	1,650	503	981·178	−·155	+·001	981·024	981·048	+·024
76. Estevan	102 59·4	49 08·4	1,860	567	980·994	−·175	−·002	980·817	980·856	+·039
77. Indian Head	103 40·0	50 31·9	1,919	585	981·118	−·181	+·001	980·938	980·969	+·031
33. Moosejaw	105 31·8	50 23·7	1,774	541	981·106	−·167	−·007	980·932	980·941	+·009
55. Prince Albert	105 45·3	53 12·3	1,398	426	981·353	−·132	−·004	981·217	981·232	+·015
80. Elbow	106 35·5	51 07·2	1,929	588	981·170	−·182	·000	980·988	980·989	+·001
56. Saskatoon	106 38·1	52 07·8	1,629	497	981·259	−·153	−·003	981·103	981·134	+·031
81. Swift Current	107 48·1	50 17·4	2,498	761	981·096	−·235	+·004	980·865	980·878	+·013
Mean anomaly with regard to sign (Saskatchewan stations)										+·020
Mean anomaly without regard to sign (Saskatchewan stations)										·020

(c) In Alberta

34. Medicine Hat	110 40·0	50 02·4	2,178	664	981·075	−·205	−·014	980·856	980·866	+·010
57. Vermilion	110 50·8	53 21·4	2,016	614	981·366	−·190	−·001	981·175	981·181	+·006
51. Chipewyan	111 08·8	58 42·7	750	229	981·815	−·071	−·012	981·732	981·723	−·009
62. Waterways	111 15·3	56 40·5	820	250	981·649	−·077	−·024	981·548	981·551	+·003
84. Coronation	111 26·6	52 05·8	2,593	790	981·256	−·244	+·004	981·016	981·008	−·008
61. Lac la Biche	111 58·3	54 46·5	1,801	549	981·488	−·169	−·004	981·315	981·318	+·003
82. Bassano	112 28·2	50 47·5	2,601	793	981·141	−·245	−·008	980·888	980·896	+·008
71. Lethbridge	112 50·3	49 41·7	2,971	906	981·044	−·280	−·012	980·752	980·756	+·004
58. Edmonton	113 31·0	53 31·6	2,197	670	981·381	−·207	−·005	981·169	981·169	·000
83. Red Deer	113 47·7	52 16·3	2,810	856	981·271	−·264	−·005	981·002	980·991	−·011
35. Calgary	114 03·8	51 02·7	3,433	1,046	981·164	−·323	−·006	980·835	980·821	−·014
70. Blairmore	114 26·2	49 36·5	4,222	1,287	981·036	−·397	−·021	980·618	980·634	+·016
60. Kinuso	115 25·9	55 19·9	1,922	586	981·536	−·181	−·010	981·345	981·349	+·004
36. Banff	115 34·5	51 10·9	4,527	1,380	091·176	−·426	−·033	980·717	980·751	+·034
63. Edson	116 25·8	53 35·3	3,038	926	981·386	−·286	−·010	981·090	981·102	+·012
43. Peace River	117 17·3	56 14·1	1,063	324	981·612	−·100	−·038	981·474	981·482	+·008
64. Jasper	118 04·7	52 52·6	3,476	1,060	981·324	−·327	−·057	980·940	980·928	−·012
59. Grande Prairie	118 47·5	55 10·3	2,154	657	981·521	−·203	−·013	981·305	981·317	+·012
Mean anomaly with regard to sign (Alberta stations)										+·004
Mean anomaly without regard to sign (Alberta stations)										·010

(d) In British Columbia

69. Cranbrook	115 45·3	49 30·6	3,004	916	981·027	−·283	−·053	980·691	980·712	+·021
86. Invermere	116 03·4	50 30·2	2,715	828	981·115	−·256	−·086	980·773	980·763	−·010
85. Paradise Mine	116 19·8	50 28·4	7,470	2,277	981·113	−·703	+·066	980·476	980·468	−·008
37. Field	116 29·8	51 23·7	4,081	1,244	981·194	−·384	−·066	980·744	980·746	+·002
68. Nelson	117 17·2	49 29·5	1,823	556	981·025	−·172	−·094	980·759	980·751	−·008
38. Glacier	117 29·5	51 15·7	4,094	1,248	981·183	−·385	−·056	980·742	980·740	−·002
39. Revelstoke	118 11·8	50 59·8	1,486	453	981·160	−·140	−·112	980·908	980·901	−·007
67. Phoenix	118 36·3	49 05·8	4,529	1,380	980·990	−·426	+·028	980·592	980·620	+·028
87. Vernon	119 16·4	50 15·9	1,236	377	981·094	−·116	−·073	980·905	980·902	−·003
65. Mt. Olie	120 12·2	51 24·7	1,269	387	981·196	−·120	−·073	981·003	981·004	+·001
40. Kamloops	120 19·5	50 40·7	1,155	352	981·131	−·109	−·072	980·950	980·945	−·005
66. Princeton	120 30·4	49 27·1	2,086	636	981·022	−·196	−·042	980·784	980·774	−·010
41. North Bend	121 27·0	49 52·3	497	151	981·059	−·047	.....	.....	980·887	.....
88. Barkerville	121 29·8	53 03·8	4,227	1,288	981·341	−·398	+·007	980·950	980·946	−·004
89. Tyaughton Creek	122 42·0	50 56·9	2,084	635	981·155	−·196	−·090	980·869	980·845	−·024
91. Cloverdale	122 44·0	49 06·5	10	3	980·991	−·001	−·045	980·945	980·935	−·010
42. Vancouver	123 06·8	49 16·8	31	9	981·006	−·003	−·054	980·949	980·948	−·001

TABLE II—*Concluded*

PRINCIPAL FACTS FOR GRAVITY STATIONS—*Concluded*

(d) In British Columbia—*Concluded*

Number and Station	Longitude	Latitude	Altitude		Computed gravity at sea-level	Corrections for		Computed gravity	Observed gravity	Gravity anomalies
			Feet	Metres		Altitude	Topography and Isostatic Compensation			
92. Victoria	123 19·5	48 24·8	219	67	980·929	−·021	−·014	980·894	980·948	+·054
48. Liard River	123 47·5	59 58·7	525	160	981·915	−·049	−·059	981·807	981·790	−·017
90. Union Bay	124 53·0	49 34·9	10	3	981·033	−·001	−·044	980·988	981·029	+·041
93. Banfield	125 08·7	48 49·9	30	9	980·967	−·003	−·007	980·957	980·977	+·020
94. Nootka	126 37·6	49 35·5	75	23	981·034	−·007	−·002	981·025	981·025	·000
95. Quatsino	127 37·4	50 32·0	41	12	981·118	−·004	−·004	981·110	981·121	+·011
99. Ocean Falls	127 42·9	52 21·3	60	18	981·279	−·006	−·057	981·216	981·228	+·012
97. Stewart	129 58·3	55 57·2	44	13	981·588	−·004	−·120	981·464	981·448	−·016
96. Prince Rupert	130 19·8	54 18·7	79	24	981·448	−·007	−·026	981·415	981·432	+·017
98. Masset	132 08·8	54 00·7	30	9	981·423	−·003	+·024	981·444	981·431	−·013
Mean anomaly with regard to sign (British Columbia stations)										+·003
Mean anomaly without regard to sign (British Columbia stations)										·013
(e) In Northwest Territories										
47. Resolution	113 40·5	61 10·1	500	152	982·008	−·047	−·009	981·952	981·942	−·010
44. Providence	117 39·3	61 21·2	512	156	982·022	−·048	−·018	981·956	981·955	−·001
45. Simpson	121 20·8	61 51·7	433	132	982·061	−·041	−·023	981·997	982·004	+·007
46. Norman	125 34·3	64 54·0	285	87	982·281	−·027	−·036	982·218	982·214	−·004
49. Good Hope	128 38·3	66 15·3	195	59	982·374	−·018	−·029	982·327	982·340	+·013
50. Artic Red River	133 44·3	67 26·6	135	41	982·452	−·013	−·026	982·413	982·434	+·021
Mean anomaly with regard to sign (N. W. Territories stations)										+·004
Mean anomaly without regard to sign (N. W. Territories stations)										·009
Mean anomaly with regard to sign (all stations)										+·006
Mean anomaly without regard to sign (all stations)										·013

TABLE III

TABLE SHOWING ANOMALIES FOR THE VARIOUS STATIONS GROUPED ACCORDING TO THEIR GEOLOGICAL FORMATIONS

Formation and Station Number	Anomaly in Dynes	Formation and Station Number	Anomaly in Dynes	Formation and Station Number	Anomaly in Dynes
Precambrian A_1 and A_2—		Mesozoic (concluded)		Tertiary T-T_1—	
51	−·009	55	+·015	76	+·039
69	+·021	80	+·001	83	−·011
85	−·008	56	+·031	35	−·014
38	−·002	81	+·013	46	−·004
Paleozoic P_2-P_5—		34	+·010	66	−·010
72	−·004	57	+·006	91	−·010
31	+·006	84	−·008	42	−·001
73	−·013	61	+·003	98	−·013
54	+·016	82	+·008		
62	+·003	71	+·004	Unclassified A-P—	
47	−·010	58	·000	39	−·007
44	−·001	60	+·004	87	−·003
45	+·007	63	+·012		
49	+·013	43	+·008	Unclassified P—	
89	−·024	59	+·012	36	+·034
40	−·005	48	−·017	37	+·002
		50	+·021	64	−·012
Mesozoic M_2 (Cretaceous)—		90	+·041	88	−·004
74	+·036			67	+·028
32	+·021	Mesozoic 2 (Igneous)—		68	−·008
52	−·007	92	+·054	86	−·010
75	+·019	93	+·020		
53	+·022	99	+·012	Unclassified M—	
78	+·016	65	+·001	70	+·016
79	+·024			94	·000
77	+·031			95	+·011
33	+·009			96	+·017
				97	−·016

—	Number of Stations			Mean Anomaly in Dynes	
	Total number	With positive anomalies	With negative anomalies	With regard to sign	Without regard to sign
Precambrian (A_1-A_2)	4	1	3	+·001	·010
Paleozoic (P_2-P_5)	11	5	6	−·001	·009
Mesozoic (M_2 Cretaceous)	27	23	3	+·012	·014
Mesozoic 2 (Igneous)	4	4	0	+·022	·022
Tertiary	8	1	7	−·003	·013
Unclassified (A-P)	2	0	2	−·005	·005
Unclassified (P)	7	3	4	+·004	·012
Unclassified (M)	5	3	1	+·006	·013
All Stations in Western Canada	68	40	26	+·006	·013
313 Stations in United States	313	.....	.....	−·004	·021

TABLE IV

ANOMALIES BY DIFFERENT METHODS OF REDUCTION FOR 20 STATIONS IN THE CANADIAN CORDILLERA

Station	Elevation of station in feet	Anomalies			
		Free Air	Bouguer	Isostatic	Rigid Crust
		Dynes	Dynes	Dynes	Dynes
Blairmore	4,222	−·005	−·149	+·016	−·043
Banff	4,514	+·002	−·152	+·036	−·033
Cranbrook	3,004	−·032	−·135	+·021	−·021
Invermere	2,715	−·096	−·189	−·010	−·070
Paradise Mine	7,470	+·058	−·197	−·008	−·072
Field	4,066	−·064	−·202	+·002	−·071
Nelson	1,823	−·102	−·164	−·008	−·039
Glacier	4,094	−·057	−·198	−·001	−·057
Jasper	3,476	−·069	−·188	−·012	−·054
Revelstoke	1,486	−·117	−·168	−·005	−·036
Phoenix	4,529	+·056	−·099	+·028	+·022
Vernon	1,236	−·076	−·118	−·003	+·007
Mount Olie	1,269	−·071	−·115	+·002	+·020
Kamloops	1,155	−·075	−·115	−·004	+·012
Princeton	2,086	−·052	−·123	−·010	+·002
Barkerville	4,227	+·003	−·141	−·004	−·008
Tyaughton Ck	2,084	−·114	−·185	−·024	−·037
Cloverdale	10	−·055	−·055	−·010	+·072
Vancouver	20	−·055	−·056	−·001	+·072
Union Bay	10	+·001	+·001	+·041	+·132
Mean with regard to sign		−·046	−·137	+·002	−·067
Mean without regard to sign		·058	·137	·012	·044

TABLE V

RESULTS OF STANDARDIZATIONS MADE AT THE BASE STATION

Date	Periods of Pendulums in Seconds at Ottawa		
	1	2	3
July, 1915	·5013240	·5014408	·5014109
Sept., 1915*	·5013244	·5014431	·5014102
March 14-17, 1921	·5013476	·5014658	·5014396
April 20-23, 1921	·5013471	·5014646	·5014385
Oct. 27-Nov. 4, 1921	·5013455	·5014628	·5014365
Feb. 25-27, 1922	·5013464	·5014635	·5014373
Nov. 7-18, 1922	·5013442	·5014624	·5014364
April 25-30, 1924	·5013458	·5014635	·5014374
March 5-15, 1925	·5013450	·5014638	·5014371
April 14-20, 1925	·5013436	·5014630	·5014369
Dec. 4-11, 1925	·5013435	·5014631	·5014374
May 18-24, 1926	·5013449	·5014632	·5014375
Jan. 10-16, 1927	·5013402	·5014615	·5014351
Adopted value for season of 1915*	·5013242	·5014420	·5014105
" " 1921	·5013463	·5014637	·5014375
" " 1922	·5013453	·5014630	·5014369
" " 1924	·5013454	·5014637	·5014373
" " 1925	·5013436	·5014631	·5014372
" " 1926	·5013426	·5014624	·5014363

*In order to do away with apparent shiftings of the stem in the bob a rivet was inserted through the stem in the bob of each pendulum at the end of the season of 1915. This altered the periods of pendulums as shown in the table.

TABLE VI

PERIODS OF PENDULUMS AT THE STATIONS OCCUPIED BETWEEN JULY, 1915 AND JANUARY, 1927

Number and Station		Periods of Pendulums in Seconds			Value of g in Dynes			Weighted Mean
		1	2	3	1	2	3	
1	Ottawa (July 1915)	·5013240	·5014408	·5014109	.....	.....	.....	980·618
31	Winnipeg	·5012293	·5013479	·5013151	980·989	980·986	980·991	980·989
32	Brandon	·5012381	·5013568	·5013239	980·955	980·951	980·957	980·954
33	Moose Jaw	·5012409	·5013603	·5013276	980·944	980·937	980·942	980·941
34	Medicine Hat	·5012606	·5013795	·5013465	980·867	980·862	980·868	980·866
35	Calgary	·5012725	·5013906	·5013579	980·820	980·819	980·824	980·821
36	Banff	·5012900	·5014089	·5013758	980·752	980·747	980·754	980·751
37	Field	·5012911	·5014100	·5013775	980·747	980·743	980·747	980·746
38	Glacier	·5012928	·5014117	·5013788	980·741	980·736	980·742	980·740
39	Revelstoke	·5012515	·5013705	·5013377	980·902	980·898	980·903	980·901
40	Kamloops	·5012407	·5013590	·5013264	980·944	980·943	980·947	980·945
41	North Bend	·5012551	·5013740	·5013412	980·888	980·884	980·889	980·887
42	Vancouver	·5012398	·5013584	·5013254	980·948	980·945	980·951	980·948
1	Ottawa (Sept. 1915)	·5013244	·5014431	·5014102	.....	.....	.....	980·618
1	Ottawa (April 1921)	·5013471	·5014646	·5014385	.....	.....	.....	980·618
43	Peace River	·5011254	·5012430	.....	981·482	981·482	.....	981·482
44	Providence	·5010040	·5011225	·5010966	981·958	981·954	981·953	981·955
45	Simpson	·5009925	.....	·5010833	982·003	.....	982·005	982·004
46	Norman	·5009385	·5010563	·5010295	982·215	982·213	982·215	982·214
47	Resolution	·5010084	·5011252	·5010985	981·941	981·943	981·945	981·942
1	Ottawa (Oct.-Nov., 1921)	·5013455	·5014628	·5014365	.....	.....	.....	980·618
1	Ottawa (Feb., 1922)	·5013464	·5014635	·5014373	.....	.....	.....	980·618
48	Liard River	·5010460	·5011635	·5011377	981·790	981·790	981·789	981·790
49	Good Hope	·5009058	·5010234	·5009969	982·340	982·339	982·341	982·340
50	Arctic Red River	·5008820	·5009990	.....	982·443	982·435	.....	982·434
51	Chipewyan	·5010627	·5011810	·5011555	981·724	981·722	981·720	981·723
1	Ottawa (Nov., 1922)	·5013442	·5014624	·5014364	.....	.....	.....	980·618
1	Ottawa (April, 1924)	·5013458	·5014635	·5014374	.....	.....	.....	980·618
52	Dauphin	·5012313	·5013507	.....	981·064	981·060	.....	981·062
53	Swan River	.....	·5013230	·5012983	.....	981·169	981·162	981·166
54	The Pas	·5011614	.....	·5012539	981·338	.....	981·336	981·337
55	Prince Albert	·5011881	·5013071	.....	981·233	981·231	.....	981·232
56	Saskatoon	.....	·5013312	·5013059	.....	981·136	981·132	981·134
57	Vermilion	·5012014	.....	·5012936	981·181	.....	981·180	981·181
58	Edmonton	·5012052	·5013221	.....	981·166	981·172	.....	981·169
59	Grande Prairie	.....	·5012848	·5012590	.....	981·318	981·316	981·317
60	Kinuso	·5011585	.....	·5012504	981·349	.....	981·349	981·349
61	Lac la Biche	·5011665	.....	.....	981·318	.....	.....	981·318
62	Waterways	·5011069	·5012261	.....	981·552	981·548	.....	981·551
63	Edson	·5012229	·5013379	·5013151	981·097	981·110	981·096	981·102
64	Jasper	·5012655	.....	·5013586	980·930	.....	980·926	980·928
65	Mt. Olie	·5012466	·5013648	·5013387	981·004	981·005	981·004	981·004
66	Princeton	.....	·5014241	·5013970	.....	980·773	980·776	980·774
67	Phoenix	·5013447	.....	·5014367	980·621	.....	980·620	980·620
68	Nelson	·5013115	·5014297	.....	980·751	980·751	.....	980·751
69	Cranbrook	.....	·5014395	·5014138	.....	980·713	980·710	980·712
70	Blairmore	·5013410	.....	·5014332	980·635	.....	980·634	980·634
71	Lethbridge	·5013098	·5014289	.....	980·757	980·754	.....	980·756
1	Ottawa (March, 1925)	·5013450	·5014638	·5014371	.....	.....	.....	980·618
1	Ottawa (April, 1925)	·5013436	·5014630	·5014369	.....	.....	.....	980·618
72	Riverton	·5012253	·5013444	.....	981·081	981·082	.....	981·081

TABLE VI—*Concluded*

PERIODS OF PENDULUMS AT ALL THE STATIONS OCCUPIED BETWEEN JULY, 1915 AND JANUARY, 1927

Number and Station	Periods of Pendulums in Seconds			Value of g in Dynes			Weighted Mean
	1	2	3	1	2	3	
73 Gypsumville	.....	·5013325	·5013066	.....	981·129	981·129	981·129
74 Manitou	·5012735	.....	·5013659	980·892	.....	980·897	980·895
75 Melita	·5012755	·5013963	.....	980·884	980·879	.....	980·882
76 Estevan	·5012842	·5014025	·5013756	980·850	980·855	980·859	980·856
77 Indian Head	·5012549	.....	·5013471	980·965	.....	980·971	980·969
78 Moosomin	·5012643	·5013835	.....	980·928	980·929	.....	980·928
79 Yorkton	.....	·5013531	·5013275	.....	981·048	981·047	981·048
80 Elbow	·5012497	·5013685	·5013414	980·985	980·988	980·993	980·989
81 Swift Current	·5012774	·5013965	·5013704	980·877	980·879	980·879	980·878
82 Bassano	·5012735	·5013916	.....	980·892	980·898	.....	980·896
83 Red Deer	.....	·5013679	·5013418	.....	980·990	980·991	980·991
84 Coronation	·5012444	.....	·5013367	981·006	.....	981·011	981·008
85 Paradise Mine	·5013824	·5015012	.....	980·466	980·469	.....	980·468
86 Invermere	·5013068	·5014258	.....	980·762	980·764	.....	980·763
87 Vernon	·5012712	·5013903	.....	980·901	980·903	.....	980·902
88 Barkerville	·5012597	·5013791	.....	980·946	980·946	.....	980·946
89 Tyaughton Creek	·5012862	·5014044	.....	980·842	980·848	.....	980·845
90 Union Bay	·5012349	·5013579	·5013329	981·043	981·029	981·026	981·029
91 Cloverdale	.....	.....	·5013561	.....	.....	980·935	980·935
1 Ottawa (Dec., 1925)	·5013435	·5014631	·5014374	.....	.....	.....	980·618
1 Ottawa (May, 1926)	·5013449	·5014632	·5014375	.....	.....	.....	980·618
92 Victoria (June, 1926)	·5012592	·5013770	·5013518	980·946	980·952	980·948	980·948
93 Banfield	.....	·5013709	·5013443	.....	980·976	980·978	980·977
94 Nootka	.....	·5013585	·5013319	.....	981·024	981·026	981·025
95 Quatsino	.....	·5013336	·5013079	.....	981·122	981·120	981·121
96 Prince Rupert	.....	·5012544	·5012287	.....	981·432	981·431	981·432
97 Stewart	.....	·5012498	·5012246	.....	981·450	981·447	981·448
98 Masset	.....	·5012550	·5012283	.....	981·430	981·432	981·431
99 Ocean Falls	.....	·5013067	·5012795	.....	981·227	981·231	981·228
92 Victoria (Sept., 1926)	.....	·5013775	·5013527	.....	980·950	980·945	980·948
1 Ottawa (Jan., 1927)	·5013402	·5014615	·5014351	.....	.....	.....	980·618

TABLE VII

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: OTTAWA, ONT. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond No. 627	Corrections: Rate: Dent No. 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Mean
1924																					
April 25.....	1	1	D	1	184·15	183·81	7·8	2·0	16·68	55·0	·5013613	·5013638	−18	− 70	+ 8	− 24	− 94	− 9	·5013500	·5013455	
" 25.....	2	1	D	1	185·45	184·00	8·0	1·6	16·14	62·0	·5013517	·5013624	−17	− 48	+ 1	− 24	− 94	− 9	·5013420	·5013457	
																Mean.....		....	·5013460	·5013456	·5013458
" 25-26...	3	1	D	1	185·74	184·10	8·0	1·9	15·90	53·5	·5013496	·5013617	−18	− 38	+ 9	+ 24	− 101	− 9	·5013464	·5013460	·5013462
" 26.....	4	1	D	1	185·97	184·18	8·0	1·4	15·77	60·0	·5013479	·5013610	−15	− 32	+ 3	+ 27	− 105	− 9	·5013453	·5013452	·5013453
																Mean.....		....	.....	.....	·5013457
" 26-27...	5	2	D	1	170·78	169·44	7·7	1·7	15·75	60·3	·5014682	·5014798	−16	− 31	+ 3	+ 5	− 108	− 9	·5014634	·5014637	
" 27.....	6	2	D	1	170·77	169·52	7·8	1·9	15·68	61·0	·5014683	·5014791	−18	− 28	+ 2	+ 5	− 108	− 9	·5014635	·5014630	
																Mean.....		....	·5014635	·5014634	·5014634
" 28.....	7	2	D	1	170·62	169·47	7·6	2·3	16·00	53·2	·5014696	·5014795	−20	− 42	+10	+ 11	− 104	− 9	·5014646	·5014630	
" 28.....	8	2	D	1	171·06	169·43	7·8	1·9	15·55	53·3	·5014658	·5014781	−18	− 23	+10	+ 11	− 104	− 9	·5014629	·5014637	
																Mean.....		....	·5014638	·5014634	·5014636
" 29.....	9	3	R	1	173·76	172·77	7·8	2·1	15·80	47·0	·5014429	·5014513	−19	− 34	+16	− 3	− 93	− 9	·5014380	·5014374	·5014377
" 29.....	10	3	R	1	174·12	172·86	7·7	1·9	15·58	47·0	·5014400	·5014505	−17	− 24	+16	+ 8	− 98	− 9	·5014374	·5014373	·5014374
" 29-30...	11	3	R	1	173·96	172·80	7·8	1·5	15·72	47·0	·5014413	·5014510	−16	− 30	+16	+ 7	− 94	− 9	·5014381	·5014377	
" 30.....	12	3	R	1	174·15	172·80	7·8	1·7	15·73	47·6	·5014397	·5014510	−17	− 31	+15	+ 7	− 94	− 9	·5014362	·5014374	
																Mean.....		....	·5014372	·5014376	·5014374

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: DAUPHIN, MANITOBA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval Chronometer Bond No. 627	Coincidence Interval Chronometer Dent No. 56182	Arc Initial	Arc Final	Temperature	Pressure	Period Uncorrected Chronometer Bond No. 627	Period Uncorrected Chronometer Dent No. 56182	Corrections (7th Decimal Place) Arc	Corrections Temp.	Corrections Pressure	Corrections Rate Bond No. 627	Corrections Rate Dent No. 56182	Corrections Flexure	Period Corrected Chronometer Bond No. 627	Period Corrected Chronometer Dent No. 56182	Mean
1924 May 14-15...	1	1	D	1	207·18	204·99	7·7	1·1	9·26	51·3	·5012096	·5012226	−13	+ 241	+11	− 23	− 154	− 7	·5012305	·5012304	·5012305
" 15.....	2	1	D	1	207·32	203·84	7·8	1·5	9·42	53·3	·5012088	·5012295	−16	+ 234	+ 9	+ 21	− 193	− 7	·5012329	·5012322	
" 15-16...	3	1	D	1	207·45	203·67	7·9	1·7	9·78	55·8	·5012080	·5012305	−17	+ 219	+ 6	+ 21	− 193	− 7	·5012302	·5012313	
																Mean.	.....	....	·5012316	·5012318	·5012317
" 16-17...	4	2	D	1	189·29	187·44	8·0	1·5	10·03	51·0	·5013243	·5013373	−16	+ 208	+11	+ 73	− 64	− 7	·5013512	·5013505	
" 17.....	5	2	D	1	189·65	187·57	8·2	2·0	9·59	52·3	·5013217	·5013364	−20	+ 227	+10	+ 73	− 64	− 7	·5013500	·5013510	
																Mean.	.....	....	·5013506	·5013508	·5013507

STATION: SWAN RIVER, MANITOBA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval Chronometer Bond No. 627	Coincidence Interval Chronometer Dent No. 56182	Arc Initial	Arc Final	Temperature	Pressure	Period Uncorrected Chronometer Bond No. 627	Period Uncorrected Chronometer Dent No. 56182	Corrections (7th Decimal Place) Arc	Corrections Temp.	Corrections Pressure	Corrections Rate Bond No. 627	Corrections Rate Dent No. 56182	Corrections Flexure	Period Corrected Chronometer Bond No. 627	Period Corrected Chronometer Dent No. 56182	Mean
1924 May 23.....	1	2	D	1	191·44	190·87	7·9	1·6	10·41	50·0	·5013093	·5013132	−17	+ 192	+12	+ 3	− 71	−11	·5013272	·5013237	
" 23-24...	2	2	D	1	192·15	190·74	8·0	2·0	10·30	52·3	·5013045	·5013141	−19	+ 197	+10	+ 3	− 71	−11	·5013225	·5013247	
" 24.....	3	2	D	1	193·08	191·57	8·0	1·8	9·45	55·0	·5012981	·5013084	−18	+ 233	+ 7	+ 3	− 71	−11	·5013195	·5013224	
" 24-25...	4	2	D	1	192·99	191·97	7·9	1·9	9·15	47·8	·5012988	·5013057	−18	+ 245	+14	+ 3	− 71	−11	·5013221	·5013216	
																Mean.	.....	....	·5013228	·5013231	·5013230
" 25.....	5	2	D	1	194·13	192·21	8·0	2·3	8·73	48·5	·5012911	·5013040	−21	+ 263	+13	+ 78	− 54	−11	·5013233	·5013230	·5013232
" 26.....	6	3	R	1	197·38	195·21	8·0	1·9	10·13	45·8	·5012698	·5012839	−18	+ 204	+16	+ 104	− 41	−11	·5012993	·5012989	
" 26-27...	7	3	R	1	198·12	195·76	8·0	1·9	9·47	48·0	·5012651	·5012803	−18	+ 232	+14	+ 104	− 41	−11	·5012972	·5012979	
																Mean.	.....	....	·5012983	·5012984	·5012983

STATION: THE PAS, MAN. OBSERVER: A. H. MILLER

1924 May 31-June 1.....	1	3	R	1	199·85	198·91	7·8	1·5	14·42	49·0	·5012541	·5012600	−16	+ 24	+14	− 17	− 77	−11	·5012535	·5012534	·5012535
June 1.....	2	3	R	1	199·45	198·56	7·9	1·8	14·22	51·0	·5012566	·5012622	−18	+ 33	+12	− 41	− 103	−11	·5012541	·5012535	
" 1-2....	3	3	R	1	199·65	198·54	7·8	1·7	14·08	53·5	·5012554	·5012624	−17	+ 39	+ 9	− 41	− 103	−11	·5012533	·5012541	
																Mean.....		....	·5012537	·5012538	·5012538
" 2.....	4	3	R	1	199·56	198·92	7·8	1·8	13·90	55·8	·5012559	·5012600	−17	+ 46	+ 7	− 31	− 89	−11	·5012553	·5012536	
" 2-3....	5	3	R	1	199·77	198·69	8·0	1·5	14·04	58·0	·5012546	·5012614	−16	+ 40	+ 5	− 31	− 89	−11	·5012533	·5012543	
																Mean.....		....	·5012543	·5012540	·5012541
" 3.....	6	1	D	1	215·55	214·48	7·9	1·9	13·99	55·0	·5011626	·5011683	−18	+ 42	+ 8	− 6	− 91	−11	·5011641	·5011613	
" 3-4....	7	1	D	1	216·85	214·79	8·0	1·5	13·63	56·0	·5011556	·5011667	−16	+ 57	+ 7	− 6	− 91	−11	·5011587	·5011613	
																Mean.....		....	·5011614	·5011613	·5011614

STATION: PRINCE ALBERT, SASK. OBSERVER: A. H. MILLER

1924 June 9.....	1	1	D	1	207·62	207·82	7·6	1·3	17·09	48·5	·5012070	·5012059	−14	− 88	+14	− 95	− 92	−11	·5011876	·5011868	
" 9-10....	2	1	D	1	206·38	206·28	7·9	1·9	18·49	50·5	·5012143	·5012149	−18	− 146	+12	− 95	− 92	−11	·5011885	·5011894	
																Mean.....		....	·5011881	·5011881	·5011881
" 10.....	3	1	D	1	207·04	206·56	7·9	1·5	18·18	52·0	·5012105	·5012132	−16	− 133	+11	− 67	− 101	−11	·5011889	·5011882	
" 10-11...	4	1	D	1	207·40	206·74	7·9	1·5	18·01	53·8	·5012083	·5012122	−16	− 126	+ 9	− 67	− 101	−11	·5011872	·5011877	
" 11.....	5	1	D	1	207·21	206·62	7·8	2·0	17·93	56·0	·5012094	·5012129	−18	− 123	+ 7	− 67	− 101	−11	·5011882	·5011883	
																Mean.....		....	·5011881	·5011881	·5011881
" 11-12...	6	2	D	1	189·01	188·47	7·6	1·2	18·02	46·0	·5013262	·5013300	−13	− 127	+17	− 56	− 94	−11	·5013072	·5013072	·5013072
" 12.....	7	2	D	1	188·72	188·36	8·1	2·1	18·05	48·0	·5013283	·5013309	−20	− 128	+15	− 71	− 95	−11	·5013068	·5013070	·5013069

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: SASKATOON, SASK. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Internal Chronometer Bond No. 627	Coincidence Internal Chronometer Dent No. 56182	Arc Initial	Arc Final	Temperature	Pressure	Period Uncorrected Chronometer Bond No. 627	Period Uncorrected Chronometer Dent No. 56182	Corrections (7th Decimal Place) Arc	Corrections Temp.	Corrections Pressure	Corrections Rate Bond No. 627	Corrections Rate Dent No. 56182	Corrections Flexure	Period Corrected Chronometer Bond No. 627	Period Corrected Chronometer Dent No. 56182	Mean
1924																					
June 16.....	1	2	D	1	186·75	184·91	7·8	1·7	17·84	55·0	·5013422	·5013556	−17	− 119	+ 8	+ 34	− 96	−11	·5013317	·5013321	
" 16-17...	2	2	D	1	186·98	185·13	7·7	1·6	17·67	58·5	·5013406	·5013540	−16	− 112	+ 5	+ 34	− 96	−11	·5013306	·5013310	
																Mean.	.....	....	·5013312	·5013316	·5013314
" 17.....	3	2	D	1	186·42	184·81	8·1	1·8	17·97	61·3	·5013447	·5013564	−19	− 124	+ 3	+ 13	− 104	−11	·5013309	·5013309	
" 17-18...	4	2	D	1	186·36	184·78	8·1	1·5	17·94	64·8	·5013451	·5013566	−17	− 123	− 1	+ 13	− 104	−11	·5013312	·5013310	
																Mean.	.....	....	·5013311	·5013310	·5013310
" 18.....	5	3	R	1	189·85	188·35	8·5	2·0	17·99	54·5	·5013204	·5013308	−21	− 125	+ 8	+ 16	− 96	−11	·5013071	·5013063	
" 18-.19..	6	3	R	1	190·44	188·78	7·9	1·7	17·59	57·5	·5013162	·5013278	−17	− 109	+ 6	+ 16	− 96	−11	·5013047	·5013051	
																Mean.	.....	....	·5013059	·5013057	·5013058
" 19.....	7	3	R	1	190·55	188·73	7·5	1·3	17·30	60·8	·5013155	·5013282	−14	− 96	+ 3	+ 30	− 107	−11	·5013067	·5013057	
" 19-20...	8	3	R	1	191·04	188·91	8·3	1·8	16·66	63·8	·5013120	·5013269	−19	− 70	0	+ 30	− 107	−11	·5013050	·5103062	
																Mean.	.....	....	·5013059	·5013060	·5013059

STATION: VERMILION, ALTA. OBSERVER: A. H. MILLER

1924																					
June 24.....	1	3	R	1	193·58	192·74	8·2	2·0	13·11	52·0	·5012948	·5013005	−20	+ 79	+10	− 56	− 125	−10	·5012951	·5012939	
" 24-25...	2	3	R	1	193·95	192·79	7·8	1·5	13·21	59·8	·5012924	·5013002	−16	+ 75	+ 3	− 56	− 125	−10	·5012920	·5012929	
																Mean.	.....	....	·5012936	·5012934	·5012935

" 25.....	3	3	R	1	193·81	192·41	7·8	1·6	13·29	66·0	·5012932	·5013027	−16	+ 72	− 3	− 29	− 134	−10	·5012946	·5012936	
" 25-26...	4	3	R	1	194·08	192·33	7·9	1·6	13·59	55·0	·5012914	·5013032	−17	+ 59	+ 8	− 29	− 134	−10	·5012925	·5012938	
																Mean.....		....	·5012936	·5012937	·5012936
" 26.....	5	1	D	1	209·25	206·88	8·0	2·0	13·90	51·0	·5011976	·5012113	−19	+ 46	+12	+ 37	− 124	−10	·5012042	·5012018	
" 26-27...	6	1	D	1	209·90	206·75	8·5	1·8	14·08	55·0	·5011939	·5012121	−20	+ 39	+ 8	+ 37	− 124	−10	·5011993	·5012014	
																Mean.....		....	·5012018	·5012016	·5012017
" 27.....	7	1	D	1	209·77	206·58	8·2	1·7	14·17	59·0	·5011946	·5012131	−18	+ 35	+ 4	+ 57	− 129	−10	·5012014	·5012013	
" 27-28...	8	1	D	1	209·83	206·53	8·1	1·6	14·27	63·0	·5011943	·5012134	−18	+ 31	0	+ 57	− 129	−10	·5012003	·5012008	
																Mean.....		....	·5012009	·5012011	·5012010

STATION: EDMONTON, ALTA. OBSERVER: A. H. MILLER

1924																						
July 1.....	1	1	D	1	202·61	201·19	7·9	1·9	21·23	49·0	·5012369	·5012457	−18	− 261	+15	− 29	− 123	−10	·5012066	·5012060	
" 1-2.....	2	1	D	1	202·85	201·25	7·9	1·6	21·30	52·0	·5012355	·5012453	−17	− 264	+12	− 29	− 123	−10	·5012047	·5012051	
																Mean.....		....	·5012057	·5012056	·5012056
" 2.....	3	1	D	1	202·40	201·01	8·0	1·6	21·60	55·5	·5012383	·5012468	−17	− 277	+ 8	− 33	− 122	−10	·5012054	·5012050	
" 2-3.....	4	1	D	1	202·43	200·92	7·9	1·6	21·80	58·8	·5012381	·5012474	−17	− 285	+ 5	− 33	− 122	−10	·5012041	·5012045	
																Mean.....		....	·5012048	·5012048	·5012048
" 3.....	5	2	D	1	184·45	184·01	8·1	1·9	21·75	48·3	·5013591	·5013624	−19	− 283	+16	− 65	− 105	−10	·5013230	·5013223	
" 3-4.....	6	2	D	1	184·70	184·15	8·0	1·7	21·59	53·3	·5013571	·5013613	−17	− 276	+11	− 65	− 105	−10	·5013214	·5013216	
																Mean.....		....	·5013222	·5013220	·5013221
" 4.....	7	2	D	1	184·80	184·24	7·7	1·3	21·62	59·0	·5013565	·5013607	−14	− 277	+ 6	− 27	− 88	−10	·5013243	·5013224	
" 4-5.....	8	2	D	1	185·44	184·34	7·2	1·8	21·68	53·4	·5013518	·5013599	−16	− 280	+11	− 27	− 88	−10	·5013196	·5013216	
																Mean.....		....	·5013220	·5013220	·5013220

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: GRANDE PRAIRIE, ALTA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond No. 627	Corrections: Rate: Dent No. 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Period Corrected: Mean
1924																					
July 10.....	1	2	D	1	194·70	192·62	7·9	1·7	15·21	51·0	·5012873	·5013012	−17	− 9	+12	+ 9	− 139	−11	·5012857	·5012848	
" 10-11....	2	2	D	1	194·92	192·52	8·0	1·9	15·19	54·8	·5012859	·5013020	−18	− 8	+ 8	+ 9	− 139	−11	·5012839	·5012852	
																Mean.....		....	·5012848	·5012850	·5012849
" 11.....	3	2	D	1	194·61	192·17	7·9	1·7	15·50	59·0	·5012880	·5013043	−17	− 21	+ 4	+ 17	− 150	−11	·5012852	·5012848	
" 11-12...	4	2	D	1	194·49	191·94	7·9	1·6	15·85	63·0	·5012888	·5013059	−17	− 36	0	+ 17	− 150	−11	·5012841	·5012845	
																Mean.....		....	·5012847	·5012847	·5012847
" 12.....	5	3	R	1	197·99	195·85	7·5	1·9	16·41	56·3	·5012659	·5012797	−17	− 59	+ 7	+ 20	− 120	−11	·5012599	·5012597	
" 12-13...	6	3	R	1	198·10	195·87	7·9	1·6	16·64	60·0	·5012652	·5012796	−17	− 69	+ 4	+ 20	− 120	−11	·5012579	·5012583	
																Mean.....		....	·5012589	·5012590	·5012590

STATION: KINUSO, ALTA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond No. 627	Corrections: Rate: Dent No. 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Period Corrected: Mean
1924																					
July 18.....	1	3	R	1	202·26	199·29	7·5	1·6	13·55	54·6	·5012391	·5012576	−16	+ 61	+ 8	+ 67	− 122	−11	·5012500	·5012496	
" 18-19...	2	3	R	1	202·19	199·01	7·9	1·6	13·61	58·5	·5012396	·5012593	−17	+ 58	+ 5	+ 67	− 122	−11	·5012498	·5012506	
																Mean.....		....	·5012499	·5012501	·5012500
" 19.....	3	3	R	1	202·44	199·88	8·0	1·6	13·67	50·0	·5012380	·5012539	−17	+ 56	+13	+ 85	− 80	−11	·5012506	·5012500	
" 19-20...	4	3	R	1	202·31	199·67	8·0	1·8	13·64	53·0	·5012388	·5012552	−18	+ 57	+10	+ 85	− 80	−11	·5012511	·5012510	
																Mean.....		....	·5012509	·5012505	·5012507

" 20.....	5	1	D	1	218·51	214·91	8·3	1·7	13·75	53·0	·5011468	·5011659	−18	+ 52	+10	+ 90	− 104	−11	·5011591	·5011588	
" 20-21...	6	1	D	1	219·03	215·26	7·9	1·9	13·33	56·5	·5011440	·5011641	−18	+ 70	+ 6	+ 90	− 104	−11	·5011577	·5011584	
																Mean.....		....	·5011584	·5011586	·5011585

STATION: LAC LA BICHE, ALBERTA. OBSERVER: A. H. MILLER

1924																						
July 26-27 ...	1	1	D	1	217·04	214·76	8·0	1·1	13·57	53·0	·5011545	·5011668	−14	+60	+10	+ 53	− 67	−10	·5011644	·5011647	·5011646
" 27.....	2	1	D	1	216·97	214·60	8·0	1·5	13·31	57·0	·5011549	·5011677	−16	+71	+ 6	+ 89	− 42	−10	·5011689	·5011686	
" 27-28...	3	1	D	1	217·46	214·75	8·0	1·6	13·16	60·5	·5011523	·5011669	−17	+77	+ 2	+ 89	− 42	−10	·5011664	·5011679	
" 28.....	4	1	D	1	217·47	215·22	7·9	1·5	12·99	64·5	·5011522	·5011643	−16	+84	− 2	+ 89	− 42	−10	·5011667	·5011657	
" 28-29...	5	1	D	1	217·84	215·44	7·8	1·5	12·92	56·8	·5011503	·5011631	−16	+87	+ 6	+ 89	− 42	−10	·5011659	·5011656	
																Mean.....		....	·5011670	·5011670	·5011670

STATION: WATERWAYS, ALTA. OBSERVER: A. H. MILLER

1924																						
Aug. 2.....	1	1	D	1	227·52	225·96	8·1	1·7	15·01	51·0	·5011012	·5011088	−18	0	+12	+ 84	+ 2	−13	·5011077	·5011071	
" 2-3.....	2	1	D	1	228·88	227·20	8·0	1·6	13·50	54·0	·5010947	·5011028	−17	+ 63	+ 9	+ 84	+ 2	−13	·5011073	·5011072	
																Mean.....		....	·5011075	·5011072	·5011073
" 3.....	3	1	D	1	230·27	227·92	8·0	1·6	12·90	57·0	·5010881	·5010993	−17	+ 88	+ 6	+ 135	+ 16	−13	·5011080	·5011073	
" 3-4.....	4	1	D	1	233·10	230·39	7·9	1·4	10·44	60·0	·5010748	·5010875	−15	+ 191	+ 2	+ 135	+ 16	−13	·5011048	·5011056	
																Mean.....		....	·5011064	·5011065	·5011064
" 4.....	5	2	D	1	207·30	205·43	8·1	1·9	13·51	51·0	·5012089	·5012199	−19	+ 62	+12	+ 126	+ 21	−13	·5012257	·5012262	
" 4-5.....	6	2	D	1	209·20	207·44	7·9	1·6	10·68	54·0	·5011979	·5012081	−17	+ 181	+ 8	+ 126	+ 21	−13	·5012264	·5012261	
																Mean.....		....	·5012261	·5012262	·5012261

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: EDSON, ALTA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval		Arc		Temperature	Pressure	Period Uncorrected		Corrections (7th Decimal Place)						Period Corrected		Mean
					Chronometer						Chronometer					Rate			Chronometer		
					Bond No. 627	Dent No. 56182	Initial	Final			Bond No. 627	Dent No. 56182	Arc	Temp.	Pressure	Bond No. 627	Dent No. 56182	Flexure	Bond No. 627	Dent No. 56182	
1924																					
Aug. 14.....	1	2	D	1	186·76	185·63	8·0	1·7	16·06	52·8	·5013422	·5013504	−17	− 44	+10	+ 34	− 61	− 8	·5013397	·5013384	
" 14-15...	2	2	D	1	187·39	185·82	8·2	1·5	15·93	56·3	·5013377	·5013490	−17	− 39	+ 7	+ 34	− 61	− 8	·5013354	·5013372	
																Mean.....			·5013376	·5013378	·5013377
" 15.....	3	2	D	1	187·34	185·83	8·0	1·5	15·89	59·3	·5013380	·5013490	−16	− 37	+ 4	+ 60	− 49	− 8	·5013383	·5013384	
" 15-16...	4	2	D	1	187·47	186·01	8·0	1·4	15·70	62·6	·5013371	·5013476	−15	− 29	+ 1	+ 60	− 49	− 8	·5013380	·5013376	
																Mean.....			·5013382	·5013380	·5013381
" 16.....	5	3	R	1	190·86	189·29	8·0	1·8	15·81	54·5	·5013133	·5013243	−18	− 34	+ 8	+ 72	− 38	− 8	·5013153	·5013153	
" 16-17...	6	3	R	1	190·98	189·40	8·1	1·8	15·63	57·5	·5013124	·5013235	−19	− 26	+ 5	+ 72	− 38	− 8	·5013148	·5013149	
																Mean.....			·5013152	·5013151	·5013151
" 17.....	7	3	R	1	190·82	189·41	8·0	1·7	15·69	60·6	·5013136	·5013234	−17	− 29	+ 3	+ 66	− 29	− 8	·5013151	·5013154	
" 17-18...	8	3	R	1	191·05	189·60	7·9	1·4	15·45	63·5	·5013119	·5013221	−15	− 19	0	+ 66	− 29	− 8	·5013143	·5013150	
																Mean.....			·5013147	·5013152	·5013150
" 18.....	9	1	D	1	205·34	203·62	8·1	2·0	15·64	52·8	·5012205	·5012308	−20	− 27	+10	+ 74	− 30	− 8	·5012234	·5012233	
" 18-19...	10	1	D	1	205·82	204·12	8·1	1·5	15·16	55·8	·5012176	·5012278	−17	− 7	+ 7	+ 74	− 30	− 8	·5012225	·5012223	
																Mean.....			·5012230	·5012228	·5012229

STATION: JASPER, ALTA. OBSERVER: A. H. MILLER

1924 Aug. 22.....	1	3	R	1	185·79	184·47	8·0	1·5	14·00	55·0	·5013493	·5013589	−16	+ 42	+ 8	+ 63	− 30	− 9	·5013581	·5013584	
" 22-23..	2	3	R	1	185·37	184·17	8·0	1·8	14·36	58·8	·5013523	·5013612	−18	+ 27	+14	+ 63	− 30	− 9	·5013590	·5013586	
																Mean.	.....	....	·5013586	·5013585	·5013585
" 23.....	3	3	R	1	185·38	184·24	8·0	1·5	14·53	62·5	·5013522	·5013606	−16	+ 20	0	+ 64	− 19	− 9	·5013581	·5013592	
" 23-24...	4	3	R	1	185·15	184·08	8·0	1·5	14·70	65·8	·5013539	·5013618	−16	+ 13	− 3	+ 64	− 19	− 9	·5013588	·5013584	
																Mean.	.....	....	·5013585	·5013588	·5013586
" 24.....	5	1	D	1	198·84	197·55	7·8	1·8	14·94	55·1	·5012604	·5012687	−17	+ 3	+ 8	+ 55	− 20	− 9	·5012644	·5012652	
" 24-25...	6	1	D	1	198·43	197·31	8·0	1·6	15·06	64·9	·5012631	·5012702	−17	− 3	− 2	+ 55	− 20	− 9	·5012655	·5012651	
																Mean.	.....	....	·5012650	·5012652	·5012651
" 25.....	7	1	D	1	198·47	197·33	8·0	2·2	15·37	48·0	·5012628	·5012702	−20	− 16	+15	+ 65	− 11	− 9	·5012663	·5012661	·5012662

STATION: MT. OLIE, B.C. OBSERVER: A. H. MILLER

1924 Aug. 31.....	1	1	D	1	203·48	202·12	7·8	1·7	13·79	56·1	·5012316	·5012400	−17	+ 51	+ 7	+ 106	+ 25	−11	·5012452	·5012455	
" 31- Sept. 1.....	2	1	D	1	202·59	201·35	7·8	1·5	14·43	59·9	·5012371	·5012447	−16	+ 24	+ 3	+ 106	+ 25	−11	·5012477	·5012472	
																Mean.	.....	....	·5012465	·5012464	·5012464
Sept. 1.....	3	1	D	1	202·71	201·86	7·8	1·8	14·45	52·3	·5012363	·5012415	−17	+ 23	+11	+ 90	+ 38	−11	·5012459	·5012459	
" 1-2....	4	1	D	1	201·85	200·96	8·1	1·7	15·23	55·8	·5012416	·5012472	−18	− 10	+ 7	+ 90	+ 38	−11	·5012474	·5012478	
																Mean.	.....	....	·5012467	·5012469	·5012468
" 2.....	5	2	D	1	184·47	183·24	8·0	1·9	15·30	55·0	·5013589	·5013681	−18	− 13	+ 8	+ 89	− 5	−11	·5013644	·5013642	
" 2-3....	6	2	D	1	184·24	182·96	8·0	1·5	15·50	58·8	·5013606	·5013702	−16	− 21	+ 4	+ 89	− 5	−11	·5013651	·5013653	
																Mean.	.....	....	·5013648	·5013648	·5013648
" 3.....	7	3	R	1	187·91	186·74	7·7	2·3	15·72	55·0	·5013340	·5013423	−20	− 30	+ 8	+ 102	+ 15	−11	·5013389	·5013385	·5013387

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: PRINCETON, B.C. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond No. 627	Corrections: Rate: Dent No. 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Mean
1924																					
Sept. 23.....	1	2	D	1	177·64	176·53	7·6	1·6	13·86	57·5	·5014113	·5014202	−16	+ 48	+ 5	+ 104	+ 14	−11	·5014243	·5014242	
" 23-24...	2	2	D	1	177·95	176·80	8·0	1·4	13·44	59·7	·5014088	·5014180	−15	+ 65	+ 3	+ 104	+ 14	−11	·5014234	·5014236	
																Mean.	.....	....	·5014239	·5014239	·5014239
" 24.....	3	2	D	1	178·38	176·54	7·8	1·4	13·25	63·0	·5014055	·5014201	−15	+ 73	0	+ 141	− 7	−11	·5014243	·5014241	
" 24-25...	4	2	D	1	178·36	176·49	8·0	1·4	13·24	66·3	·5014056	·5014206	−15	+ 74	− 3	+ 141	− 7	−11	·5014242	·5014244	
																Mean.	.....	....	·5014243	·5014243	·5014243
" 25.....	5	3	R	1	181·78	180·29	7·6	1·9	13·32	53·8	·5013791	·5013905	−17	+ 70	+ 9	+ 129	+ 10	−11	·5013971	·5013966	
" 25-26...	6	3	R	1	181·90	180·33	8·0	1·5	13·09	57·0	·5013782	·5013902	−16	+ 80	+ 6	+ 129	+ 10	−11	·5013970	·5013971	
																Mean.	.....	....	·5013971	·5013969	·5013970

STATION: PHOENIX, B.C. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond No. 627	Corrections: Rate: Dent No. 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Mean
1924																					
Sept. 30.....	1	3	R	1	178·25	176·86	7·8	1·9	9·65	48·6	·5014065	·5014175	−18	+ 224	+13	+ 99	− 16	− 8	·5014375	·5014370	
" 30-Oct. 1.....	2	3	R	1	178·93	177·41	7·5	1·6	8·68	51·6	·5014011	·5014131	−16	+ 265	+10	+ 99	− 16	− 8	·5014361	·5014366	
																Mean.	.....	....	·5014368	·5014368	·5014368
" 1.....	3	3	R	1	179·56	177·74	7·2	1·6	8·15	55·3	·5013962	·5014105	−15	+ 287	+ 7	+ 134	− 10	− 8	·5014367	·5014366	
" 1-2.....	4	3	R	1	179·61	177·87	7·9	1·4	7·97	58·9	·5013958	·5014094	−15	+ 295	+ 3	+ 134	− 10	− 8	·5014367	·5014359	
																Mean.	.....	....	·5014367	·5014363	·5014365

" 2.....	5	1	D	1	192·69	190·63	7·8	1·8	7·77	56·3	·5013008	·5013149	−17	+ 303	+ 6	+ 159	+ 15	− 8	·5013451	·5013448	
" 2-3....	6	1	D	1	193·90	191·71	7·8	1·7	6·29	45·0	·5012927	·5013074	−17	+ 365	+16	+ 159	+ 15	− 8	·5013442	·5013445	
																Mean.....		....	·5013447	·5013447	·5013447

STATION: NELSON, B.C. OBSERVER: A. H. MILLER

1924																						
Oct. 7-8....	1	1	D	1	194·90	192·59	7·8	1·7	11·96	57·5	·5012860	·5013015	−17	+ 127	+ 4	+ 154	− 5	− 8	·5013120	·5013116	
" 8.....	2	1	D	1	195·39	192·94	7·9	1·7	11·47	61·0	·5012828	·5012991	−17	+ 148	+ 1	+ 154	− 5	− 8	·5013106	·5013110	
																Mean.....		....	·5013113	·5013113	·5013113
" 8-9....	3	1	D	1	195·64	193·16	7·9	1·8	11·29	48·1	·5012811	·5012976	−18	+ 155	+14	+ 164	+ 2	− 8	·5013118	·5013121	
" 9.....	4	1	D	1	196·12	193·72	7·9	1·8	10·61	51·0	·5012780	·5012939	−18	+ 184	+11	+ 164	+ 2	− 8	·5013113	·5013110	
																Mean.....		....	·5013116	·5013116	·5013116
" 9-10...	5	2	D	1	179·33	177·41	8·0	1·8	10·87	50·5	·5013980	·5014131	−18	+ 173	+11	+ 162	+ 13	− 8	·5014300	·5014302	
" 10.....	6	2	D	1	179·24	177·39	8·0	1·8	11·08	54·5	·5013987	·5014133	−18	+ 164	+ 7	+ 162	+ 13	− 8	·5014294	·5014291	
																Mean.....		....	·5014297	·5014297	·5014297

STATION: CRANBROOK, B.C. OBSERVER: A. H. MILLER

1924																						
Oct. 14.....	1	2	D	1	173·61	172·03	8·0	1·7	17·57	55·3	·5014442	·5014575	−17	− 108	+ 8	+ 78	− 55	−11	·5014392	·5014392	
" 14-15...	2	2	D	1	173·68	172·11	8·0	1·5	17·24	58·1	·5014437	·5014568	−16	− 94	+ 6	+ 78	− 55	−11	·5014400	·5014398	
																Mean.....		....	·5014396	·5014395	·5014396
" 15.....	3	2	D	1	173·43	171·84	8·0	1·5	17·85	61·6	·5014457	·5014591	−16	− 119	+ 2	+ 78	− 56	−11	·5014391	·5014391	
" 15-16...	4	2	D	1	172·94	171·35	8·1	1·5	18·61	65·3	·5014498	·5014633	−17	− 151	− 1	+ 78	− 56	−11	·5014396	·5014397	
																Mean.....		....	·5014394	·5014394	·5014394
" 16.....	5	3	R	1	176·21	174·67	7·7	1·9	18·61	50·4	·5014228	·5014354	−17	− 151	+13	+ 79	− 48	−11	·5014141	·5014140	
" 16-17...	6	3	R	1	176·44	174·90	8·0	1·7	18·20	53·3	·5014210	·5014335	−17	− 134	+10	+ 79	− 48	−11	·5014137	·5014135	
																Mean.....		....	·5014139	·5014138	·5014138

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: BLAIRMORE, ALTA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond 627	Corrections: Rate: Dent 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Period Corrected: Mean
1924																					
Oct. 21.....	1	3	R	1	173·89	172·31	7·9	1·8	17·77	53·8	·5014419	·5014552	−18	− 116	+ 9	+ 50	− 85	− 9	·5014335	·5014333	
" 21-22...	2	3	R	1	174·52	172·85	8·1	1·7	16·72	56·1	·5014367	·5014506	−18	− 72	+ 7	+ 50	− 85	− 9	·5014325	·5014329	
																Mean.....			·5014330	·5014331	·5014331
" 22.....	3	3	R	1	174·50	172·72	8·0	1·7	17·09	58·9	·5014368	·5014516	−17	− 88	+ 5	+ 65	− 86	− 9	·5014324	·5014321	
" 22-23...	4	3	R	1	173·91	172·12	8·0	1·4	17·80	62·3	·5014417	·5014567	−15	− 117	+ 2	+ 65	− 86	− 9	·5014343	·5014342	
																Mean.....			·5014334	·5014332	·5014333
" 23.....	5	1	D	1	185·87	183·55	7·7	1·7	18·01	52·8	·5013486	·5013658	−16	− 126	+10	+ 73	− 100	− 9	·5013418	·5013417	
" 23-24...	6	1	D	1	186·59	184·27	7·8	1·7	16·96	55·8	·5013435	·5013604	−17	− 82	+ 7	+ 73	− 100	− 9	·5013407	·5013403	
" 24.....	7	1	D	1	186·80	184·38	7·8	2·1	16·56	58·8	·5013419	·5013596	−19	− 65	+ 5	+ 73	− 100	− 9	·5013404	·5013408	
																Mean.....			·5013410	·5013409	·5013410

STATION: LETHBRIDGE, ALTA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond 627	Corrections: Rate: Dent 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Period Corrected: Mean
1924																					
Oct. 28-29...	1	1	D	1	188·65	186·25	8·0	1·7	20·67	52·4	·5013287	·5013459	−17	− 238	+12	+ 64	− 102	−10	·5013098	·5013104	
" 29.....	2	1	D	1	188·54	186·26	8·2	1·9	20·69	55·4	·5013295	·5013458	−19	− 236	+ 9	+ 64	− 102	−10	·5013101	·5013098	
																Mean.....			·5013100	·5013101	·5013100
" 29.....	3	1	D	1	188·64	186·40	7·8	1·4	20·74	58·8	·5013288	·5013448	−15	− 241	+ 5	+ 68	− 94	−10	·5013095	·5013093	
" 29-30...	4	1	D	1	188·48	186·27	8·2	1·7	20·80	62·5	·5013299	·5013457	−18	− 243	+ 2	+ 68	− 94	−10	·5013098	·5013094	
																Mean.....			·5013097	·5013094	·5013095

" 30.....	5	2	D	1	173·13	171·12	8·0	1·5	20·98	55·0	·5014482	·5014652	−16	− 251	+ 9	+ 75	− 89	−10	·5014289	·5014295	
" 30-31...	6	2	D	1	173·13	171·23	8·0	1·5	20·94	58·6	·5014482	·5014643	−16	− 249	+ 5	+ 75	− 89	−10	·5014287	·5014284	
																Mean.	.....	....	·5014288	·5014290	·5014289

STATION: OTTAWA, ONTARIO. OBSERVER: A. H. MILLER

1925																					
Mar. 5-6....	1	1	D	1	187·40	184·99	7·9	1·8	14·49	53·6	·5013376	·5013551	−18	+ 21	+ 9	+ 81	− 105	− 9	·5013460	·5013449	
" 6-7....	2	1	D	1	187·99	185·30	7·9	0·8	14·10	55·1	·5013334	·5013528	−12	+ 38	+ 8	+ 81	− 105	− 9	·5013440	·5013448	
																Mean.	.....	....	·5013450	·5013449	·5013449
" 9-10...	3	1	D	1	188·18	185·58	7·8	1·5	13·93	60·0	·5013320	·5013508	−16	+ 45	+ 3	+ 105	− 80	− 9	·5013448	·5013451	
" 10.....	4	1	D	1	188·10	185·54	7·8	1·3	13·86	67·8	·5013326	·5013511	−15	+ 48	− 5	+ 105	− 80	− 9	·5013450	·5013450	
																Mean.	.....	....	·5013449	·5013451	·5013450
" 11-12 ..	5	2	D	1	172·63	170·92	8·0	1·5	13·81	61·0	·5014524	·5014670	−16	+ 50	+ 2	+ 98	− 64	− 9	·5014649	·5014633	
" 12.....	6	2	D	1	173·06	171·04	8·0	1·7	13·61	51·0	·5014488	·5014660	−17	+ 58	+12	+ 98	− 64	− 9	·5014630	·5014640	
																Mean.	.....	....	·5014640	·5014637	·5014638
" 12-13...	7	2	D	1	173·06	170·93	8·1	1·5	13·41	59·0	·5014488	·5014669	−17	+ 67	+ 4	+ 118	− 76	− 9	·5014651	·5014638	
" 13.....	8	2	D	1	173·50	171·01	8·1	1·5	13·30	54·5	·5014451	·5014662	−17	+ 71	+ 8	+ 118	− 76	− 9	·5014622	·5014639	
																Mean.	.....	....	·5014637	·5014639	·5014638
" 13-14...	9	3	R	1	176·42	173·81	7·8	1·9	13·56	51·0	·5014211	·5014425	−18	+ 60	+12	+ 119	− 97	− 9	·5014375	·5014373	
" 14.....	10	3	R	1	176·50	173·80	7·5	1·3	13·47	59·0	·5014205	·5014426	−14	+ 64	+ 4	+ 119	− 97	− 9	·5014369	·5014374	
																Mean.	.....	....	·5014372	·5014374	·5014373
" 14-15...	11	3	R	1	176·40	174·30	7·9	1·5	13·20	49·5	·5014213	·5014384	−16	+ 75	+12	+ 112	− 81	− 9	·5014387	·5014365	
" 15.....	12	3	R	1	176·83	174·42	8·0	1·1	12·91	57·5	·5014178	·5014375	−14	+ 88	+ 5	+ 112	− 81	− 9	·5014360	·5014364	
																Mean.	.....	....	·5014374	·5014365	·5014369

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: OTTAWA, ONTARIO. OBSERVER: A. H. MILLER—*Concluded*

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval		Arc.		Temperature	Pressure	Period Uncorrected		Corrections (7th Decimal Place)						Period Corrected		
					Chronometer						Chronometer					Rate			Chronometer		Mean
					Bond No. 627	Dent No. 56182	Initial	Final			Bond No. 627	Dent No. 56182	Arc	Temp.	Pressure	Bond No. 627	Dent No. 56182	Flexure	Bond No. 627	Dent No. 56182	
1925																					
April 14-15...	1	1	D	1	185·83	183·78	7·8	1·7	15·40	58·0	·5013489	·5013640	−17	− 17	+ 5	− 12	− 162	− 9	·5013439	·5013440	
" 15.....	2	1	D	1	185·87	183·89	8·0	1·5	15·36	58·7	·5013486	·5013632	−16	− 15	+ 4	− 12	− 162	− 9	·5013438	·5013434	
																Mean.....			·5013439	·5013437	·5013438
April 15-16...	3	1	D	1	186·05	183·76	7·8	1·4	15·27	59·4	·5013474	·5013642	−15	− 11	+ 4	− 10	− 176	− 9	·5013433	·5013435	
" 16.....	4	1	D	1	186·03	183·83	8·1	1·5	15·13	60·2	·5013475	·5013637	−17	− 5	+ 3	− 10	− 176	− 9	·5013437	·5013433	
																Mean.....			·5013435	·5013434	·5013435
" 16-17...	5	2	D	1	170·99	169·14	7·9	1·8	15·11	54·5	·5014664	·5014824	−18	− 5	+ 8	− 9	− 171	− 9	·5014631	·5014629	
" 17.....	6	2	D	1	171·05	169·16	7·9	1·4	15·00	59·5	·5014658	·5014823	−15	0	+ 3	− 9	− 171	− 9	·5014628	·5014631	
																Mean.....			·5014630	·5014630	·5014630
" 17-18...	7	2	D	1	170·91	168·98	8·0	1·6	15·13	54·0	·5014670	·5014839	−17	− 5	+ 9	− 17	− 183	− 9	·5014631	·5014634	
" 18.....	8	2	D	1	170·84	169·00	8·0	1·6	15·16	59·9	·5014676	·5014837	−17	− 7	+ 3	− 17	− 183	− 9	·5014629	·5014624	
																Mean.....			·5014630	·5014629	·5014630
" 18-19...	9	3	R	1	173·94	171·92	7·7	1·4	15·39	50·5	·5014414	·5014585	−15	− 16	+12	− 19	− 184	− 9	·5014367	·5014373	
" 19.....	10	3	R	1	173·98	172·07	7·8	1·5	15·20	51·6	·5014411	·5014571	−16	− 8	+11	− 19	− 184	− 9	·5014370	·5014365	
																Mean.....			·5014369	·5014369	·5014369
" 19-20...	11	3	R	1	174·08	172·27	8·0	1·7	15·03	54·4	·5014403	·5014554	−17	− 1	+ 9	− 15	− 165	− 9	·5014370	·5014371	
" 20.....	12	3	R	1	174·13	172·34	8·0	1·5	14·95	57·4	·5014398	·5014549	−16	+ 2	+ 6	− 15	− 165	− 9	·5014366	·5014367	
																Mean.....			·5014368	·5014369	·5014369

59075—3½

STATION: RIVERTON, MANITOBA. OBSERVER: A. H. MILLER.

1925																					
May 7.....	1	1	D	1	212·01	208·24	7·8	1·9	6·15	49·0	·5011820	·5012035	−18	+ 371	+12	+ 93	− 143	− 8	·5012270	·5012249	
" 7-8....	2	1	D	1	215·07	210·42	7·8	1·6	3·07	49·0	·5011652	·5011909	−16	+ 500	+12	+ 93	− 143	− 8	·5012233	·5012254	
																Mean.....			·5012251	·5012251	·5012251
" 8.....	3	1	D	1	211·04	207·89	8·0	1·8	7·00	49·5	·5011874	·5012055	−18	+ 335	+11	+ 59	− 128	− 8	·5012253	·5012247	
" 8-9....	4	1	D	1	211·50	208·24	8·0	1·6	6·12	56·4	·5011848	·5012035	−17	+ 372	+ 5	+ 59	− 128	− 8	·5012259	·5012259	
																Mean.....			·5012256	·5012253	·5012254
" 9.....	5	2	D	1	193·09	189·99	8·0	1·9	5·19	62·5	·5012981	·5013194	−18	+ 411	− 1	+ 104	− 124	− 8	·5013469	·5013454	
" 9-10...	6	2	D	1	195·43	191·81	7·8	1·7	3·11	42·5	·5012825	·5013067	−17	+ 498	−18	+ 104	− 124	− 8	·5013420	·5013434	
																Mean.....			·5013444	·5013444	·5013444

STATION: GYPSUMVILLE, MANITOBA. OBSERVER: A. H. MILLER

1925																					
May 16.....	1	2	D	1	195·24	192·06	7·9	1·8	4·70	59·5	·5012838	·5013051	−18	+ 432	+ 1	+ 57	− 142	−10	·5013300	·5013314	
" 16-17...	2	2	D	1	194·06	191·30	8·2	1·8	5·58	43·2	·5012916	·5013103	−19	+ 395	+18	+ 57	− 142	−10	·5013357	·5013345	
																Mean.....			·5013329	·5013329	·5013329
" 17.....	3	2	D	1	191·14	189·30	8·2	1·8	9·11	57·3	·5013114	·5013242	−19	+ 247	+ 5	− 18	− 162	−10	·5013319	·5013303	
" 17-18...	4	2	D	1	191·91	189·56	8·2	1·8	8·10	45·0	·5013061	·5013224	−19	+ 289	+16	− 18	− 162	−10	·5013319	·5013338	
																Mean.....			·5013319	·5013321	·5013320
" 18.....	5	3	R	1	193·76	192·11	7·9	2·2	10·90	41·1	·5012936	·5013048	−20	+ 172	+21	− 39	− 151	−10	·5013060	·5013060	
" 18-19...	6	3	R	1	193·06	191·50	8·0	1·7	11·70	41·5	·5012983	·5013089	−17	+ 138	+21	− 39	− 151	−10	·5013076	·5013070	
																Mean.....			·5013068	·5013065	·5013066

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: MANITOU, MAN. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Internal Chronometer Bond No. 627	Coincidence Internal Chronometer Dent No. 56182	Arc Initial	Arc Final	Temperature	Pressure	Period Uncorrected Chronometer Bond No. 627	Period Uncorrected Chronometer Dent No. 56182	Corrections (7th Decimal Place) Arc	Temp.	Pressure	Rate Bond No. 627	Rate Dent No. 56182	Flexure	Period Corrected Chronometer Bond No. 627	Period Corrected Chronometer Dent No. 56182	Mean
1925																					
May 28.....	1	3	R	1	184·58	183·33	7·8	1·8	11·53	55·1	·5013581	·5013674	−17	+ 145	+ 7	− 44	− 131	−12	·5013660	·5013666	
" 28-29...	2	3	R	1	184·35	183·21	8·0	1·5	11·78	60·0	·5013598	·5013683	−16	+ 135	+ 3	− 44	− 131	−12	·5013664	·5013662	
																Mean.....		....	·5013662	·5013664	·5013663
" 29.....	3	3	R	1	184·25	182·86	8·0	1·8	12·30	50·6	·5013606	·5013709	−18	+ 113	+11	− 55	− 150	−12	·5013645	·5013653	
" 29-30...	4	3	R	1	183·67	182·43	8·0	1·5	12·91	54·8	·5013648	·5013741	−16	+ 88	+ 8	− 55	− 150	−12	·5013661	·5013659	
																Mean.....		....	·5013653	·5013656	·5013655
" 30.....	5	1	D	1	196·44	195·17	8·2	1·9	13·66	52·0	·5012759	·5012842	−19	+ 56	+11	− 48	− 137	−12	·5012747	·5012741	
" 30-31...	6	1	D	1	196·56	195·23	8·4	1·5	13·87	57·2	·5012751	·5012838	−18	+ 47	+ 6	− 48	− 137	−12	·5012838	·5012724	
																Mean.....		....	·5012736	·5012733	·5012735

STATION: MELITA, MANITOBA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Internal Chronometer Bond No. 627	Coincidence Internal Chronometer Dent No. 56182	Arc Initial	Arc Final	Temperature	Pressure	Period Uncorrected Chronometer Bond No. 627	Period Uncorrected Chronometer Dent No. 56182	Corrections (7th Decimal Place) Arc	Temp.	Pressure	Rate Bond No. 627	Rate Dent No. 56182	Flexure	Period Corrected Chronometer Bond No. 627	Period Corrected Chronometer Dent No. 56182	Mean
1925																					
June 6.....	1	1	D	1	197·42	195·54	8·2	1·7	13·00	51·0	·5012696	·5012818	−18	+ 84	+11	− 8	− 121	−15	·5012750	·5012759	
" 6-7.....	2	1	D	1	197·46	195·85	7·9	1·5	12·96	52·0	·5012693	·5012798	−16	+ 86	+10	− 8	− 121	−15	·5012750	·5012742	
																Mean.....		....	·5012750	·5012750	·5012750
" 7.....	3	1	D	1	197·11	195·38	8·2	1·7	12·89	53·2	·5012716	·5012828	−18	+ 88	+ 9	− 17	− 133	−15	·5012763	·5012759	
" 7-8.....	4	1	D	1	197·35	195·51	8·0	1·7	12·67	54·2	·5012700	·5012820	−17	+ 98	+ 9	− 17	− 133	−15	·5012758	·5012762	
																Mean.....		....	·5012760	·5012760	·5012760

" 8.....	5	2	D	1	180·47	179·04	7·9	1·9	12·60	50·1	·5013891	·5014003	−18	+ 101	+12	+ 1	− 118	−15	·5013972	·5013965	
" 8-9.....	6	2	D	1	180·87	179·29	7·9	1·5	12·27	50·9	·5013860	·5013983	−16	+ 114	+11	+ 1	− 118	−15	·5013955	·5013959	
																Mean.	.....	....	·5013963	·5013962	·5013963

STATION: ESTEVAN, SASKATCHEWAN. OBSERVER: A. H. MILLER

1925																					
June 13.....	1	2	D	1	178·65	177·32	8·0	1·8	14·28	51·1	·5014033	·5014139	−18	+ 30	+12	− 17	− 126	− 9	·5014031	·5014028	
" 13-14...	2	2	D	1	178·72	177·34	8·2	1·5	14·22	55·3	·5014028	·5014137	−17	+ 33	+ 8	− 17	− 126	− 9	·5014026	·5014026	
																Mean.	.....	....	·5014028	·5014027	·5014028
" 14.....	3	2	D	1	178·73	177·30	7·8	1·5	14·29	60·6	·5014026	·5014140	−16	+ 30	+ 2	− 11	− 117	− 9	·5014022	·5014030	
" 14-15...	4	2	D	1	178·74	177·46	8·2	1·3	14·22	66·8	·5014025	·5014127	−16	+ 33	− 4	− 11	− 117	− 9	·5014018	·5014014	
																Mean.	.....	....	·5014020	·5014022	·5014021
" 15.....	5	3	R	1	182·13	180·69	8·0	1·9	14·84	49·4	·5013765	·5013873	−18	+ 7	+14	− 2	− 110	− 9	·5013757	·5013757	
" 15-16...	6	3	R	1	182·25	180·82	8·0	1·5	14·70	49·8	·5013755	·5013864	−16	+ 13	+13	− 2	− 110	− 9	·5013754	·5013755	
																Mean.	.....	....	·5013756	·5013756	·5013756
" 16.....	7	3	R	1	182·19	180·73	8·0	1·9	14·70	50·5	·5013760	·5013871	−18	+ 13	+13	+ 4	− 102	− 9	·5013763	·5013768	
" 16-17...	8	3	R	1	182·43	181·12	8·1	1·4	14·56	51·0	·5013741	·5013841	−16	+ 18	+12	+ 4	− 102	− 9	·5013750	·5013744	
																Mean.	.....	....	·5013756	·5013756	·5013756
" 17.....	9	1	D	1	195·18	193·69	8·3	2·0	14·65	47·1	·5012841	·5012941	−20	+ 15	+16	+ 4	− 96	− 9	·5012847	·5012847	
" 17-18...	10	1	D	1	195·29	193·79	8·2	1·8	14·74	47·6	·5012835	·5012934	−19	+ 11	+15	+ 4	− 96	− 9	·5012837	·5012836	
																Mean.	.....	....	·5012842	·5012842	·5012842

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: INDIAN HEAD, SASKATCHEWAN OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond No. 627	Corrections: Rate: Dent No. 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Mean
1925																					
June 23.....	1	3	R	1	187·03	185·13	7·8	1·8	13·77	48·7	·5013403	·5013540	−17	+ 52	+14	+ 31	− 100	−10	·5013473	·5013479	
" 23-24...	2	3	R	1	187·38	185·60	7·9	1·7	13·23	48·3	·5013377	·5013506	−17	+ 74	+14	+ 31	− 100	−10	·5013469	·5013467	
																Mean.....		....	·5013471	·5013473	·5013472
" 24.....	3	3	R	1	187·69	185·59	7·9	1·7	13·05	48·4	·5013356	·5013507	−17	+ 82	+14	+ 41	− 104	−10	·5013466	·5013472	
" 24-25...	4	3	R	1	187·60	185·70	7·7	1·6	13·02	48·7	·5013362	·5013499	−16	+ 83	+13	+ 41	− 104	−10	·5013473	·5013465	
																Mean.....		....	·5013470	·5013468	·5013469
" 25.....	5	1	D	1	201·18	199·18	7·9	1·9	13·14	52·7	·5012457	·5012583	−18	+ 78	+10	+ 36	− 93	−10	·5012553	·5012550	
" 25-26...	6	1	D	1	201·49	199·39	7·9	1·7	12·91	53·0	·5012439	·5012569	−17	+ 88	+10	+ 36	− 93	−10	·5012546	·5012547	
																Mean.....		....	·5012550	·5012548	·5012549

STATION: MOOSOMIN, SASKATCHEWAN. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond No. 627	Corrections: Rate: Dent No. 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Mean
1925																					
June 30.....	1	1	D	1	198·30	196·44	8·1	2·0	14·96	47·0	·5012639	·5012759	−20	+ 2	+16	+ 16	− 104	− 9	·5012644	·5012644	
" 30-July 1.....	2	1	D	1	198·49	196·66	7·8	1·7	14·70	47·0	·5012626	·5012745	−17	+ 13	+16	+ 16	− 104	− 9	·5012645	·5012644	
																Mean.....		....	·5012645	·5012644	·5012644
July 1.....	3	1	D	1	198·65	196·78	8·0	1·9	14·61	47·8	·5012617	·5012737	−18	+ 16	+15	+ 21	− 95	− 9	·5012642	·5012646	
" 1-2....	4	1	D	1	198·79	197·00	7·9	1·7	14·50	48·9	·5012608	·5012723	−17	+ 21	+14	+ 21	− 95	− 9	·5012638	·5012637	
																Mean.....		....	·5012640	·5012641	·5012641

" 2.....	5	2	D	1	181·49	179·80	8·3	2·1	14·79	48·6	·5013813	·5013943	−21	+ 9	+14	+ 35	− 96	− 9	·5013841	·5013840	
" 2-3....	6	2	D	1	181·84	180·08	7·9	1·6	14·54	48·8	·5013786	·5013921	−17	+ 19	+14	+ 35	− 96	− 9	·5013828	·5013832	
																Mean.....		....	·5013835	·5013836	·5013835

STATION: YORKTON, SASKATCHEWAN. OBSERVER: A. H. MILLER

1925																						
July 9.....	1	2	D	1	184·87	183·57	8·0	1·5	15·86	53·9	·5013559	·5013656	−16	− 36	+ 9	+ 19	− 78	− 8	·5013527	·5013527	
" 9-10...	2	2	D	1	184·51	183·23	8·1	1·3	16·38	54·9	·5013586	·5013682	−16	− 58	+ 8	+ 19	− 78	− 8	·5013531	·5013530	
																Mean.....		....	·5013529	·5013528	·5013529
" 10.....	3	2	D	1	184·77	183·12	8·1	1·6	16·65	55·1	·5013567	·5013690	−18	− 69	+ 8	+ 52	− 70	− 8	·5013532	·5013533	
" 10-11...	4	2	D	1	184·60	183·02	8·1	1·3	16·86	56·0	·5013580	·5013697	−16	− 78	+ 7	+ 52	− 70	− 8	·5013537	·5013532	
																Mean.....		....	·5013534	·5013533	·5013533
" 11.....	5	3	R	1	187·96	186·42	7·5	1·8	17·16	49·5	·5013336	·5013447	−17	− 91	+13	+ 39	− 64	− 8	·5013272	·5013280	
" 11-12...	6	3	R	1	187·73	186·37	8·0	1·5	17·45	50·7	·5013353	·5013450	−16	− 103	+12	+ 39	− 64	− 8	·5013277	·5013271	
																Mean.....		....	·5013274	·5013275	·5013275

STATION: ELBOW, SASKATCHEWAN. OBSERVER: A. H. MILLER

1925																						
July 17.....	1	3	R	1	185·46	183·70	7·8	1·8	18·29	51·7	·5013517	·5013646	−17	− 138	+11	+ 38	− 84	− 9	·5013402	·5013409	
" 17-18...	2	3	R	1	184·95	183·48	8·1	1·5	18·68	52·7	·5013553	·5013663	−17	− 154	+11	+ 38	− 84	− 9	·5013422	·5013410	
																Mean.....		....	·5013412	·5013410	·5013411
" 18.....	3	3	R	1	185·34	183·95	8·1	1·7	18·32	54·5	·5013525	·5013628	−18	− 139	+ 8	+ 49	− 57	− 9	·5013416	·5013413	
" 18-19...	4	3	R	1	185·65	184·12	8·1	1·7	17·75	56·3	·5013503	·5013615	−18	− 115	+ 7	+ 49	− 57	− 9	·5013417	·5013423	
																Mean.....		....	·5013416	·5013418	·5013417
" 19.....	5	1	D	1	199·81	197·48	7·8	1·9	17·29	52·9	·5012544	·5012691	−18	− 96	+10	+ 72	− 78	− 9	·5012503	·5012500	
" 19-20...	6	1	D	1	199·98	197·64	8·5	1·7	17·10	53·9	·5012533	·5012681	−19	− 88	+ 9	+ 72	− 78	− 9	·5012498	·5012496	
																Mean.....		....	·5012500	·5012498	·5012499

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: ELBOW, SASKATCHEWAN. OBSERVER: A. H. MILLER—*Concluded*

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond 627	Corrections: Rate: Dent 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Period Corrected: Mean
1925																					
July 20.....	7	1	D	1	200·06	198·15	7·8	1·7	16·99	54·9	·5012528	·5012649	−17	− 83	+ 8	+ 69	− 57	− 9	·5012496	·5012491	
" 20-21...	8	1	D	1	200·25	198·21	8·5	1·7	16·66	55·0	·5012516	·5012644	−19	− 70	+ 8	+ 69	− 57	− 9	·5012495	·5012497	
																Mean.	.....	....	·5012496	·5012494	·5012495
" 21... ..	9	2	D	1	182·92	181·36	8·0	2·0	16·65	46·3	·5013705	·5013823	−19	− 69	+17	+ 60	− 57	− 9	·5013685	·5013686	
" 21-22...	10	2	D	1	182·93	181·36	8·1	1·6	16·68	47·1	·5013704	·5013823	−18	− 70	+16	+ 60	− 57	− 9	·5013683	·5013685	
																Mean.	.....	....	·5013684	·5013686	·5013685

STATION: SWIFT CURRENT, SASKATCHEWAN. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond 627	Corrections: Rate: Dent 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Period Corrected: Mean
1925																					
July 26.....	1	1	D	1	194·14	192·60	8·1	1·7	19·07	57·5	·5012911	·5013014	−18	− 171	+ 7	+ 54	− 49	− 9	·5012774	·5012774	
" 26-27...	2	1	D	1	194·13	192·63	8·2	1·4	19·03	61·2	·5012911	·5013012	−16	− 169	+ 3	+ 54	− 49	− 9	·5012774	·5012772	
																Mean.	.....	....	·5012774	·5012773	·5012774
" 27.....	3	2	D	1	177·84	176·48	8·3	2·0	19·00	47·9	·5014097	·5014206	−20	− 168	+15	+ 50	− 57	− 9	·5013965	·5013967	
" 27-28...	4	2	D	1	177·98	176·64	7·8	1·5	18·81	50·1	·5014086	·5014193	−16	− 160	+13	+ 50	− 57	− 9	·5013964	·5013964	
																Mean.	.....	....	·5013965	·5013965	·5013965
" 28.....	5	3	R	1	181·37	180·12	7·9	1·9	18·78	50·8	·5013822	·5013919	−18	− 158	+12	+ 57	− 44	− 9	·5013706	·5013702	
" 28-29...	6	3	R	1	181·45	180·15	8·1	1·5	18·61	54·8	·5013816	·5013916	−17	− 151	+ 9	+ 57	− 44	− 9	·5013705	·5013704	
																Mean.	.....	....	·5013705	·5013703	·5013704

STATION: BASSANO, ALBERTA OBSERVER: A. H. MILLER

1925																					
Aug. 2.....	1	1	D	1	193·86	192·10	8·2	1·9	20·40	46·5	·5012929	·5013048	−19	− 226	+17	+ 46	− 71	−12	·5012735	·5012737	
" 2-3.....	2	1	D	1	193·63	191·94	8·0	1·7	20·74	49·3	·5012945	·5013059	−17	− 241	+15	+ 46	− 71	−12	·5012736	·5012733	
																Mean.....			·5012735	·5012735	·5012735
" 3.....	3	2	D	1	176·62	175·70	8·0	2·1	20·85	46·1	·5014194	·5014269	−20	− 245	+17	+ 19	− 93	−12	·5013953	·5013916	
" 3-4.....	4	2	D	1	177·54	175·81	8·0	1·5	20·69	47·9	·5014121	·5014260	−16	− 238	+16	+ 19	− 93	−12	·5013890	·5013917	
																Mean.....			·5013922	·5013916	·5013919
" 4.....	5	2	D	1	177·68	175·80	8·0	1·8	20·59	50·4	·5014110	·5014261	−18	− 234	+14	+ 46	− 99	−12	·5013906	·5013912	
" 4-5.....	6	2	D	1	177·63	175·83	8·2	1·5	20·40	53·7	·5014114	·5014258	−17	− 226	+10	+ 46	− 99	−12	·5013915	·5013914	
																Mean.....			·5013910	·5013913	·5013912

STATION: RED DEER, ALBERTA OBSERVER: A. H. MILLER

1925																					
Aug. 10.....	1	2	D	1	184·04	182·20	8·0	1·8	14·63	51·0	·5013621	·5013759	−18	+ 16	12	+ 56	− 81	−10	·5013677	·5013678	
" 10-11...	2	2	D	1	184·07	182·34	8·0	1·7	14·44	52·0	·5013620	·5013749	−17	+ 24	11	+ 56	− 81	−10	·5013684	·5013676	
																Mean.....			·5013680	·5013677	·5013679
" 11.....	3	3	R	1	188·00	185·92	8·0	2·0	14·40	51·0	·5013333	·5013482	−19	+ 25	12	+ 68	− 71	−10	·5013409	·5013419	
" 11-12...	4	3	R	1	188·01	186·09	8·0	1·6	14·12	52·5	·5013332	·5013471	−17	+ 37	10	+ 68	− 71	−10	·5013420	·5013420	
																Mean.....			·5013415	·5013420	·5013417
" 12.....	5	3	R	1	188·13	185·94	8·0	1·7	14·20	56·1	·5013324	·5013481	−17	+ 34	7	+ 74	− 79	−10	·5013412	·5013416	
" 12-13...	6	3	R	1	187·83	185·84	7·9	1·6	14·24	59·3	·5013346	·5013489	−17	+ 32	4	+ 74	− 79	−10	·5013429	·5013419	
																Mean.....			·5013420	·5013417	·5013419

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: CORONATION, ALBERTA OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond No. 627	Corrections: Rate: Dent No. 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Mean
1925																					
Aug. 18.....	1	3	R	1	187·16	185·48	8·1	2·0	16·43	44·5	·5013393	·5013515	−20	− 60	+18	+ 43	− 79	− 8	·5013366	·5013366	
" 18-19...	2	3	R	1	187·18	185·51	8·2	1·8	16·32	46·5	·5013391	·5013513	−19	− 55	+16	+ 43	− 79	− 8	·5013368	·5013368	
																Mean.....		....	·5013367	·5013367	·5013367
" 19.....	3	1	D	1	200·97	199·22	7·9	2·1	16·62	49·8	·5012471	·5012581	−20	− 68	+13	+ 52	− 50	− 8	·5012440	·5012448	
" 19-20...	4	1	D	1	200·71	199·20	8·1	1·6	16·81	50·5	·5012488	·5012582	−18	− 76	+13	+ 52	− 50	− 8	·5012451	·5012443	
																Mean.....		....	·5012445	·5012445	·5012445
" 20.....	5	1	D	1	200·64	198·82	7·8	1·8	17·02	52·0	·5012491	·5012606	−17	− 85	+11	+ 44	− 66	− 8	·5012436	·5012441	
" 20-21...	6	1	D	1	200·34	198·66	8·0	1·7	17·19	53·0	·5012510	·5012616	−17	− 92	+10	+ 44	− 66	− 8	·5012447	·5012443	
																Mean.....		....	·5012441	·5012442	·5012442

STATION: PARADISE MINE, BRITISH COLUMBIA OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond No. 627	Corrections: Rate: Dent No. 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Mean
1925																					
Sept. 7.....	1	1	D	1	188·43	184·28	7·7	1·8	7·54	47·6	·5013302	·5013604	−17	+ 313	+14	+ 215	− 88	−10	·5013817	·5013816	
" 7-8.....	2	1	D	1	188·07	183·88	8·0	1·8	7·79	48·9	·5013328	·5013633	−18	+ 302	+13	+ 215	− 88	−10	·5013830	·5013832	
																Mean.....		....	·5013824	·5013824	·5013824
" 8.....	3	2	D	1	172·69	168·88	8·1	1·8	8·55	47·0	·5014519	·5014847	−19	+ 270	+15	+ 239	− 94	−10	·5015014	·5015009	
" 8-9.....	4	2	D	1	172·47	168·59	8·2	1·9	8·72	47·0	·5014537	·5014873	−19	+ 263	+15	+ 239	− 94	−10	·5015025	·5015028	
																Mean.....		....	·5015020	·5015019	·5015019
" 9.....	5	2	D	1	172·44	168·80	8·0	1·7	8·45	47·4	·5014540	·5014855	−17	+ 274	+14	+ 207	− 109	−10	·5015008	·5015007	
" 9-10....	6	2	D	1	172·78	169·09	7·6	1·8	7·95	48·6	·5014512	·5014830	−15	+ 295	+13	+ 207	− 109	−10	·5015002	·5015004	
																Mean.....		....	·5015005	·5015006	·5015005

STATION: INVERMERE, BRITISH COLUMBIA. OBSERVER: A. H. MILLER

1925																						
Sept. 14.....	1	1	D	1	194·60	190·88	7·8	1·7	15·73	50·0	·5012880	·5013132	−17	− 31	+13	+ 231	− 30	−10	·5013066	·5013057	
" 14-15...	2	1	D	1	194·47	190·46	7·8	1·7	15·94	50·5	·5012889	·5013161	−17	− 39	+12	+ 231	− 30	−10	·5013066	·5013077	
																Mean.	.....	....	·5013066	·5013067	·5013067
" 15.....	3	1	D	1	194·59	190·47	8·0	1·7	15·94	51·5	·5012880	·5013159	−17	− 39	+11	+ 252	− 39	−10	·5013077	·5013065	
" 15-16...	4	1	D	1	194·82	190·34	8·2	1·7	15·94	52·5	·5012866	·5013169	−18	− 39	+10	+ 252	− 39	−10	·5013061	·5013073	
																Mean.	.....	....	·5013069	·5013069	·5013069
" 16.....	5	2	D	1	178·60	174·68	8·0	1·9	15·91	48·5	·5014037	·5014353	−18	− 38	+14	+ 277	− 47	−10	·5014262	·5014254	
" 16-17...	6	2	D	1	178·72	174·63	8·0	1·8	15·78	49·3	·5014027	·5014357	−18	− 33	+14	+ 277	− 47	−10	·5014257	·5014263	
																Mean.	.....	....	·5014260	·5014259	·5014259
" 17.....	7	2	D	1	178·71	174·72	8·0	1·9	15·59	51·9	·5014029	·5014350	−18	− 25	+11	+ 280	− 54	−10	·5014267	·5014254	
" 17-18...	8	2	D	1	178·94	174·73	7·8	1·4	15·56	56·3	·5014010	·5014349	−15	− 23	+ 7	+ 280	− 54	−10	·5014249	·5014254	
																Mean.	.....	....	·5014258	·5014254	·5014256

STATION: VERNON, BRITISH COLUMBIA. OBSERVER, A. H. MILLER

1925																						
Sept. 27.....	1	1	D	1	198·49	193·82	8·0	1·7	19·05	56·3	·5012627	·5012932	−17	− 170	+ 8	+ 293	− 31	−10	·5012731	·5012712	
" 27-28...	2	1	D	1	199·12	193·80	8·2	1·5	18·95	59·0	·5012587	·5012933	−17	− 166	+ 5	+ 293	− 31	−10	·5012692	·5012714	
																Mean.	.....	....	·5012712	·5012713	·5012712
" 28.....	3	2	D	1	181·58	177·48	8·0	2·0	19·21	51·1	·5013807	·5014126	−19	− 176	+12	+ 286	− 35	−10	·5013900	·5013898	
" 28-29...	4	2	D	1	181·34	177·31	8·0	1·5	19·59	54·2	·5013824	·5014139	−16	− 192	+10	+ 286	− 35	−10	·5013902	·5013896	
																Mean.	.....	....	·5013901	·5013897	·5013899
" 29.....	5	2	D	1	181·28	177·42	8·1	1·4	19·36	57·0	·5013829	·5014130	−16	− 183	+ 7	+ 299	− 24	−10	·5013926	·5013904	
" 29-30...	6	2	D	1	182·16	177·73	8·2	1·6	18·61	60·0	·5013762	·5014105	−18	− 151	+ 4	+ 299	− 24	−10	·5013886	·5013906	
																Mean.	.....	....	·5013906	·5013905	·5013906

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: BARKERVILLE, BRITISH COLUMBIA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval Chronometer Bond No. 627	Coincidence Interval Chronometer Dent No. 56182	Arc. Initial	Arc. Final	Temperature	Pressure	Period Uncorrected Chronometer Bond No. 627	Period Uncorrected Chronometer Dent No. 56182	Corrections (7th Decimal Place) Arc	Temp.	Pressure	Rate Bond No. 627	Rate Dent No. 56182	Flexure	Period Corrected Chronometer Bond No. 627	Period Corrected Chronometer Dent No. 56182	Mean
1925																					
Oct. 6	1	1	D	1	214·41	207·17	8·0	1·8	1·82	51·0	·5011688	·5012097	−18	+ 552	+ 9	+ 397	− 40	−10	·5012618	·5012590	
" 6-7	2	1	D	1	215·33	207·17	8·0	1·7	1·72	51·1	·5011637	·5012097	−17	+ 556	+ 9	+ 397	− 40	−10	·5012572	·5012595	
																Mean	.....	....	·5012595	·5012593	·5012594
" 7	3	1	D	1	214·47	206·75	8·2	1·8	2·24	54·2	·5011684	·5012121	−19	+ 535	+ 6	+ 394	− 47	−10	·5012590	·5012586	
" 7-8	4	1	D	1	213·51	205·72	8·2	1·6	3·08	57·8	·5011736	·5012182	−18	+ 499	+ 2	+ 394	− 47	−10	·5012603	·5012608	
																Mean	.....	....	·5012597	·5012597	·5012597
" 8	5	1	D	1	212·01	205·12	8·3	1·8	3·93	61·3	·5011820	·5012218	−19	+ 464	− 1	+ 361	− 48	−10	·5012615	·5012604	
" 8-9	6	1	D	1	211·29	204·42	8·2	1·8	5·16	47·8	·5011860	·5012259	−19	+ 412	+13	+ 361	− 48	−10	·5012617	·5012607	
" 9	7	1	D	1	211·14	204·51	8·2	1·8	5·51	50·0	·5011868	·5012254	−19	+ 398	+11	+ 361	− 48	−10	·5012609	·5012586	
" 9-10	8	1	D	1	212·68	205·07	8·2	1·6	4·54	52·8	·5011782	·5012221	−18	+ 438	+ 8	+ 361	− 48	−10	·5012561	·5012591	
																Mean	.....	....	·5012601	·5012597	·5012599
" 10	9	2	D	1	193·59	187·82	8·0	2·0	3·89	49·0	·5012948	·5013347	−19	+ 466	+12	+ 409	+ 2	−10	·5013806	·5013798	
" 10-11	10	2	D	1	194·72	188·73	8·1	1·6	2·76	49·0	·5012872	·5013282	−18	+ 513	+12	+ 409	+ 2	−10	·5013778	·5013781	
																Mean	.....	....	·5013792	·5013790	·5013791

STATION: TYAUGHTON CREEK, LILLOOET DISTRICT, B.C. OBSERVER: A. H. MILLER

1925																					
Oct. 16-17	1	2	D	1	189·87	184·62	8·0	1·8	3·36	49·5	·5013202	·5013578	−15	+ 488	+11	+ 368	− 5	−11	·5014043	·5014046	·5014045
" 17	2	2	D	1	190·40	184·96	8·0	2·0	2·71	49·3	·5013165	·5013553	−19	+ 515	+11	+ 394	− 15	−11	·5014055	·5014034	
" 17-18	3	2	D	1	191·31	185·37	8·0	1·8	1·74	49·5	·5013102	·5013523	−16	+ 556	+10	+ 394	− 15	−11	·5014035	·5014047	
																Mean	.....	....	·5014045	·5014041	·5014043

" 18.....	4	1	D	1	209·56	203·15	8·0	2·7	1·72	45·0	·5011959	·5012337	−23	+ 556	+15	+ 392	+ 9	−11	·5012888	·5012883		
" 18-19.....	5	1	D	1	209·36	202·85	8·1	1·5	2·80	45·8	·5011969	·5012355	−17	+ 511	+14	+ 392	+ 9	−11	·5012858	·5012861		
																Mean.....		....	·5012873	·5012872	·5012873	
" 19.....	6	1	D	1	208·38	202·28	7·9	2·2	3·72	48·0	·5012026	·5012391	−20	+ 473	+13	+ 369	− 5	−11	·5012850	·5012841		
" 19-20.....	7	1	D	1	207·30	201·08	7·9	1·5	5·14	49·0	·5012089	·5012464	−16	+ 413	+12	+ 369	− 5	−11	·5012856	·5012857		
																Mean.....		....	·5012853	·5012849	·5012851	

STATION: UNION BAY, BRITISH COLUMBIA. OBSERVER: A. H. MILLER

1925																						
Oct. 26.....	1	1	D	1	210·47	205·56	8·2	1·8	11·10	49·4	·5011906	·5012191	−19	+ 163	+13	+ 320	+ 17	−10	·5012373	·5012355		
" 26-27.....	2	1	D	1	210·93	205·47	8·1	1·3	11·29	51·4	·5011880	·5012196	−16	+ 155	+11	+ 320	+ 17	−10	·5012340	·5012353		
																Mean.....		....	·5012357	·5012354	·5012355	
" 27.....	3	1	D	1	210·64	205·75	8·1	1·6	11·01	54·3	·5011897	·5012180	−18	+ 167	+ 8	+ 300	+ 13	−10	·5012344	·5012340		
" 27-28.....	4	1	D	1	210·35	205·41	8·2	1·5	11·34	57·5	·5011913	·5012200	−17	+ 153	+ 4	+ 300	+ 13	−10	·5012343	·5012343		
																Mean.....		....	·5012344	·5012342	·5012343	
" 28-29.....	5	2	D	1	190·79	186·57	7·5	1·2	11·83	49·2	·5013138	·5013436	−13	+ 133	+13	+ 306	+ 20	−10	·5013567	·5013579		
" 29.....	6	2	D	1	190·50	186·61	7·6	2·2	11·75	51·3	·5013158	·5013434	−19	+ 136	+11	+ 306	+ 20	−10	·5013582	·5013572		
																Mean.....		....	·5013575	·5013576	·5013575	
" 29-30.....	7	2	D	1	190·22	186·01	8·0	1·2	11·78	54·0	·5013178	·5013477	−14	+ 135	+ 8	+ 311	+ 1	−10	·5013608	·5013597		
" 30.....	8	2	D	1	191·36	186·65	7·6	2·0	11·06	56·5	·5013099	·5013430	−18	+ 165	+ 5	+ 311	+ 1	−10	·5013552	·5013573		
																Mean.....		....	·5013580	·5013585	·5013583	
" 30.....	9	3	R	1	194·50	190·43	7·9	1·5	10·87	47·0	·5012887	·5013164	−16	+ 173	+15	+ 324	+ 21	−10	·5013373	·5013347		
" 30-31.....	10	3	R	1	195·79	190·85	8·0	2·4	10·86	47·0	·5012801	·5013134	−21	+ 173	+15	+ 324	+ 21	−10	·5013282	·5013312		
																Mean.....		....	·5013328	·5013330	·5013329	

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: CLOVERDALE, BRITISH COLUMBIA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Internal Chronometer Bond No. 627	Coincidence Internal Chronometer Dent No. 56182	Arc Initial	Arc Final	Temperature	Pressure	Period Uncorrected Chronometer Bond No. 627	Period Uncorrected Chronometer Dent No. 56182	Corrections (7th Decimal Place) Arc	Temp.	Pressure	Rate Bond No. 627	Rate Dent No. 56182	Flexure	Period Corrected Chronometer Bond No. 627	Period Corrected Chronometer Dent No. 56182	Mean
1925																					
Nov. 6	1	3	R	1	194·95	190·91	8·0	1·9	6·00	44·9	·5012856	·5013129	−18	+ 377	+16	+ 383	+ 84	−10	·5013604	·5013578	
" 6-7	2	3	R	1	197·53	192·01	8·0	1·7	5·13	46·0	·5012688	·5013054	−17	+ 414	+15	+ 383	+ 84	−10	·5013473	·5013540	
" 7	3	3	R	1	196·76	192·14	8·0	1·7	4·62	48·5	·5012738	·5013045	−17	+ 435	+12	+ 383	+ 84	−10	·5013541	·5013549	
7-8	4	3	R	1	195·42	191·00	7·7	1·7	5·78	52·0	·5012826	·5013123	−16	+ 386	+ 9	+ 383	+ 84	−10	·5013578	·5013576	
" 8	5	3	R	1	193·85	190·46	7·9	1·9	6·79	55·0	·5012930	·5013161	−18	+ 344	+ 6	+ 383	+ 84	−10	·5013635	·5013567	
																Mean			·5013566	·5013562	·5013564
" 8-9	6	3	R	1	193·70	190·32	8·5	1·4	7·48	58·0	·5012940	·5013171	−17	+ 315	+ 4	+ 310	+ 83	−10	·5013542	·5013546	·5013544

STATION: OTTAWA, ONTARIO. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Internal Chronometer Bond No. 627	Coincidence Internal Chronometer Dent No. 56182	Arc Initial	Arc Final	Temperature	Pressure	Period Uncorrected Chronometer Bond No. 627	Period Uncorrected Chronometer Dent No. 56182	Corrections (7th Decimal Place) Arc	Temp.	Pressure	Rate Bond No. 627	Rate Dent No. 56182	Flexure	Period Corrected Chronometer Bond No. 627	Period Corrected Chronometer Dent No. 56182	Mean
1925																					
Dec. 4-5	1	1	D	1	189·88	185·99	8·2	1·9	15·18	47·0	·5013202	·5013478	−19	− 8	+16	+ 268	− 28	− 9	·5013450	·5013430	
" 5	2	1	D	1	190·42	186·06	8·1	1·5	15·05	47·4	·5013164	·5013473	−17	− 2	+16	+ 268	− 28	− 9	·5013420	·5013433	
																Mean			·5013435	·5013432	·5013433
" 5-6	3	1	D	1	190·10	185·94	8·2	1·8	15·01	48·3	·5013186	·5013482	−19	0	+15	+ 287	− 26	− 9	·5013460	·5013443	
" 6	4	1	D	1	190·92	186·24	7·9	1·5	14·85	49·1	·5013129	·5013460	−16	+ 6	+14	+ 287	− 26	− 9	·5013411	·5013429	
																Mean			·5013436	·5013436	·5013436
" 6-7	5	2	D	1	174·86	171·01	8·0	2·0	14·72	45·0	·5014338	·5014662	−19	+ 12	+18	+ 313	− 27	− 9	·5014653	·5014637	
" 7	6	2	D	1	175·51	171·30	8·1	1·7	14·42	45·1	·5014286	·5014637	−18	+ 24	+17	+ 313	− 27	− 9	·5014613	·5014624	
																Mean			·5014633	·5014631	·5014632
" 7-8	7	2	D	1	175·73	171·48	7·9	1·9	14·23	45·3	·5014267	·5014622	−18	+ 32	+17	+ 340	− 20	− 9	·5014629	·5014624	
" 8	8	2	D	1	176·09	171·54	8·0	1·5	14·03	45·6	·5014238	·5014617	−16	+ 41	+16	+ 340	− 20	− 9	·5014610	·5014629	
" 8-9	9	2	D	1	175·72	171·54	8·2	2·0	13·75	46·5	·5014268	·5014616	−20	+ 52	+15	+ 340	− 20	− 9	·5014646	·5014634	
																Mean			·5014628	·5014632	·5014630

" 9.....	10	3	R	1	179·27	174·71	7·5	1·7	13·62	46·4	·5013985	·5014350	−16	+ 58	+16	+ 321	− 28	− 9	·5014355	·5014371	
" 9-10.....	11	3	R	1	178·91	174·68	8·0	1·9	13·42	47·1	·5014012	·5014358	−18	+ 66	+15	+ 321	− 28	− 9	·5014387	·5014379	
																Mean.....			·5014371	·5014375	·5014373
" 10.....	12	3	R	1	179·47	174·83	8·0	1·5	13·19	47·6	·5013968	·5014341	−16	+ 76	+14	+ 328	− 33	− 9	·5014361	·5014373	
" 10-11.....	13	3	R	1	179·12	174·76	8·0	1·9	13·15	49·0	·5013997	·5014346	−18	+ 78	+13	+ 328	− 33	− 9	·5014389	·5014377	
																Mean.....			·5014375	·5014375	·5014375

STATION: OTTAWA, ONTARIO. OBSERVER: A. H. MILLER

1926																						
May 18.....	1	1	D	1	185·06	184·00	7·6	2·1	17·46	57·0	·5013546	·5013624	−19	− 103	+ 6	+ 28	− 52	− 9	·5013449	·5013447	
" 18.....	2	1	D	1	185·40	184·29	7·7	1·9	17·05	51·0	·5013521	·5013603	−17	− 86	+12	+ 28	− 52	− 9	·5013449	·5013451	
																Mean.....			·5013449	·5013449	·5013449
" 19.....	3	1	D	1	185·39	184·21	7·6	2·0	17·16	51·2	·5013522	·5013608	−18	− 91	+12	+ 35	− 51	− 9	·5013451	·5013451	
" 19.....	4	1	D	1	185·47	184·35	7·8	2·0	16·89	58·1	·5013516	·5013598	−18	− 79	+ 6	+ 35	− 51	− 9	·5013451	·5013447	
																Mean.....			·5013451	·5013449	·5013450
" 20-21.....	5	2	D	1	170·75	169·78	8·4	1·7	16·58	54·1	·5014684	·5014768	−19	− 66	+ 9	+ 31	− 50	− 9	·5014630	·5014633	
" 21.....	6	2	D	1	170·77	169·79	8·1	1·4	16·47	61·6	·5014683	·5014767	−16	− 62	+ 1	+ 31	− 50	− 9	·5014628	·5014631	
																Mean.....			·5014629	·5014632	·5014631
" 21-22.....	7	2	D	1	170·81	169·91	8·2	1·8	16·52	50·2	·5014679	·5014757	−19	− 64	+13	+ 35	− 45	− 9	·5014635	·5014633	
" 22.....	8	2	D	1	170·80	169·94	8·2	2·1	16·52	48·1	·5014680	·5014754	−21	− 64	+15	+ 35	− 45	− 9	·5014636	·5014630	
																Mean.....			·5014636	·5014632	·5014634
" 22-23.....	9	3	R	1	173·85	172·84	7·5	1·7	16·65	48·8	·5014422	·5014506	−16	− 69	+14	+ 33	− 50	− 9	·5014375	·5014376	
" 23.....	10	3	R	1	174·07	173·06	7·9	1·8	16·17	49·2	·5014403	·5014488	−18	− 49	+14	+ 33	− 50	− 9	·5014374	·5014376	
																Mean.....			·5014375	·5014376	·5014375
" 23-24.....	11	3	R	1	174·18	173·16	8·7	1·8	15·93	50·9	·5014395	·5014479	−21	− 39	+12	+ 38	− 49	− 9	·5014376	·5014373	
" 24.....	12	3	R	1	174·20	173·24	8·0	2·5	15·74	53·0	·5014393	·5014473	−22	− 31	+10	+ 38	− 49	− 9	·5014379	·5014372	
																Mean.....			·5014378	·5014373	·5014375

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: VICTORIA, BRITISH COLUMBIA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval		Arc		Temperature	Pressure	Period Uncorrected		Corrections (7th Decimal Place)						Period Corrected		
					Chronometer						Chronometer					Rate			Chronometer		
					Bond No. 627	Dent No. 56182	Initial	Final			Bond No. 627	Dent No. 56182	Arc	Temp.	Pressure	Bond No. 627	Dent No. 56182	Flexure	Bond No. 627	Dent No. 56182	Mean
1926																					
June 11	1	1	D	1	197·66	195·92	8·2	1·6	17·84	47·0	·5012680	·5012793	−18	− 119	+16	+ 40	− 73	− 9	·5012590	·5012590	
" 11-12	2	1	D	1	197·54	195·86	8·2	2·0	17·81	49·0	·5012688	·5012797	−20	− 118	+14	+ 40	− 73	− 9	·5012595	·5012591	
																Mean			·5012593	·5012591	·5012592
" 12	3	1	D	1	197·59	.....	8·2	1·7	17·78	52·0	·5012685	.....	−18	− 116	+11	+ 37	.....	− 9	·5012590	.....	
" 12-13	4	1	D	1	197·43	.....	8·3	1·3	17·82	56·0	·5012695	.....	−16	− 118	+ 7	+ 37	.....	− 9	·5012596	.....	
																Mean			·5012593	.....	·5012593
" 13	5	1	D	1	197·32	.....	7·8	1·4	17·97	60·5	·5012702	.....	−15	− 124	+ 3	+ 28	.....	− 9	·5012585	.....	
" 13-14	6	1	D	1	197·25	.....	7·9	1·8	18·00	49·5	·5012707	.....	−18	− 126	+13	+ 28	.....	− 9	·5012595	.....	
																Mean			·5012590	.....	·5012590
" 14	7	2	D	1	180·65	179·77	8·2	1·8	17·90	48·1	·5013877	·5013945	−19	− 122	+15	+ 26	− 37	− 9	·5013768	·5013773	
" 14-15	8	2	D	1	180·63	179·78	8·3	1·9	17·79	50·5	·5013878	·5013945	−19	− 117	+12	+ 26	− 37	− 9	·5013771	·5013775	
																Mean			·5013770	·5013774	·5013772
" 15	9	2	D	1	180·63	.....	7·8	1·4	17·52	53·6	·5013879	.....	−15	− 106	+ 9	+ 12	.....	− 9	·5013770	.....	
" 15-16	10	2	D	1	180·75	.....	8·1	1·1	17·39	57·6	·5013870	.....	−15	− 100	+ 6	+ 12	.....	− 9	·5013764	.....	
																Mean			·5013767	.....	·5013767
" 19	11	3	R	1	184·47	183·47	7·7	1·9	17·03	59·0	·5013589	·5013663	−17	− 85	+ 5	+ 25	− 57	− 9	·5013508	·5013500	·5013504
" 19-20	12	3	R	1	184·72	183·74	8·2	1·4	16·96	48·5	·5013570	·5013643	−16	− 82	+14	+ 49	− 20	− 9	·5013526	·5013530	·5013528
" 20	13	3	R	1	184·52	183·66	8·0	2·1	16·90	53·6	·5013586	·5013649	−20	− 80	+ 9	+ 37	− 29	− 9	·5013523	·5013520	·5013522

59075—4

STATION: BANFIELD, BRITISH COLUMBIA. OBSERVER: A. H. MILLER

1926																						
June 25	1	2	D	1	181·76	180·60	8·0	1·8	17·67	49·8	·5013792	·5013881	−18	− 112	+13	+ 50	− 43	−10	·5013715	·5013711	
" 25-26	2	2	D	1	182·08	180·84	8·1	1·5	17·21	53·0	·5013769	·5013863	−17	− 93	+10	+ 50	− 43	−10	·5013709	·5013710	
																Mean			·5013712	·5013711	·5013711
" 26	3	2	D	1	182·41	.....	7·9	1·2	16·60	56·1	·5013744	.....	−14	− 67	+ 7	+ 47	.....	−10	·5013707	.....	
" 26-27	4	2	D	1	182·33	.....	8·0	1·8	16·57	60·0	·5013749	.....	−18	− 66	+ 4	+ 47	.....	−10	·5013706	.....	
																Mean			·5013707	.....	·5013707
" 27	5	3	R	1	185·86	185·08	7·5	1·9	16·58	49·3	·5013487	·5013544	−17	− 66	+14	+ 44	− 14	−10	·5013452	·5013451	
" 27-28	6	3	R	1	186·02	185·26	8·0	1·6	16·50	54·4	·5013476	·5013531	−17	− 63	+ 9	+ 44	− 14	−10	·5013439	·5013436	
																Mean			·5013446	·5013444	·5013445
" 28	7	3	R	1	185·46	184·79	8·0	1·7	16·95	60·8	·5013517	·5013566	−17	− 82	+ 3	+ 34	− 20	−10	·5013445	·5013440	
" 28-29	8	3	R	1	185·79	185·09	8·3	1·8	16·66	49·6	·5013493	·5013544	−19	− 70	+13	+ 34	− 20	−10	·5013441	·5013438	
																Mean			·5013443	·5013439	·5013441

STATION: NOOTKA, BRITISH COLUMBIA. OBSERVER: A. H. MILLER

1926																						
July 7	1	3	R	1	188·27	187·08	8·0	2·1	15·66	48·3	·5013314	·5013400	−20	− 28	+15	+ 56	− 34	−13	·5013324	·5013320	
" 7-8	2	3	R	1	188·44	187·10	7·9	1·7	15·49	53·1	·5013302	·5013398	−17	− 21	+10	+ 56	− 34	−13	·5013317	·5013323	
																Mean			·5013321	·5013322	·5013321
" 8	3	3	R	1	188·34	186·78	8·1	1·7	15·51	58·4	·5013309	·5013420	−18	− 21	+ 5	+ 60	− 55	−13	·5013322	·5013318	
" 8-9	4	3	R	1	188·25	186·61	8·1	1·4	15·83	63·6	·5013315	·5013433	−16	− 35	0	+ 60	− 55	−13	·5013311	·5013314	
																Mean			·5013317	·5013316	·5013316
" 9	5	2	D	1	184·23	182·81	7·9	2·0	16·25	46·8	·5013607	·5013713	−19	− 52	+16	+ 55	− 51	−13	·5013594	·5013594	
" 9-10	6	2	D	1	184·29	182·88	8·2	1·8	16·26	54·4	·5013602	·5013708	−19	− 53	+ 9	+ 55	− 51	−13	·5013581	·5013581	
																Mean			·5013588	·5013588	·5013588
" 10	7	2	D	1	184·39	183·03	8·0	2·0	16·44	43·0	·5013595	·5013697	−19	− 60	+16	+ 59	− 40	−13	·5013578	·5013581	
" 10-11	8	2	D	1	184·18	182·89	8·0	1·6	16·51	54·0	·5013611	·5013707	−17	− 63	+ 9	+ 59	− 40	−13	·5013586	·5013583	
																Mean			·5013582	·5013582	·5013582

TABLE VII—*Continued*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: QUATSINO, BRITISH COLUMBIA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond No. 627	Corrections: Rate: Dent No. 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Period Corrected: Mean
1926																					
July 20	1	2	D	1	188·58	187·30	8·0	1·9	15·70	49·3	·5013292	·5013383	−18	− 29	+14	+ 79	− 5	−11	·5013327	·5013334	
" 20-21	2	2	D	1	188·22	187·12	7·8	1·8	15·89	49·4	·5013318	·5013396	−17	− 37	+14	+ 79	− 5	−11	·5013346	·5013340	
																Mean	.....	....	·5013337	·5013337	·5013337
" 21	3	2	D	1	188·50	187·22	8·0	1·9	15·92	49·6	·5013298	·5013389	−18	− 39	+13	+ 88	− 2	−11	·5013331	·5013332	
" 21-22	4	2	D	1	187·91	186·76	8·4	1·9	16·58	50·7	·5013340	·5013422	−20	− 66	+12	+ 88	− 2	−11	·5013343	·5013335	
																Mean	.....	....	·5013337	·5013334	·5013335
" 22	5	3	R	1	192·25	190·91	7·7	1·9	15·91	47·8	·5013038	·5013130	−17	− 38	+15	+ 88	− 3	−11	·5013075	·5013076	
" 22-23	6	3	R	1	192·65	191·31	8·0	1·9	15·32	48·0	·5013011	·5013102	−18	− 13	+15	+ 88	− 3	−11	·5013072	·5013072	
																Mean	.....	....	·5013074	·5013074	·5013074
" 23	7	3	R	1	192·84	191·54	8·0	2·0	15·01	49·1	·5012998	·5013086	−19	0	+14	+ 97	+ 15	−11	·5013079	·5013085	
" 23-24	8	3	R	1	192·57	191·38	8·1	1·8	15·21	51·9	·5013016	·5013098	−18	− 9	+11	+ 97	+ 15	−11	·5013086	·5013086	
																Mean	.....	....	·5013083	·5013086	·5013084

STATION: PRINCE RUPERT, BRITISH COLUMBIA. OBSERVER: A. H. MILLER

1926																					
Aug. 6	1	3	R	1	204·79	204·04	8·2	1·9	15·69	49·3	·5012238	·5012283	−19	− 29	+14	+ 92	+ 52	− 9	·5012287	·5012292	
" 6-7	2	3	R	1	204·74	204·03	8·1	1·9	15·76	52·0	·5012240	·5012283	−19	− 32	+11	+ 92	+ 52	− 9	·5012283	·5012286	
																Mean	.....	....	·5012285	·5012289	·5012287

" 7.....	3	2	D	1	200·50	199·68	7·9	2·1	15·72	43·0	·5012500	·5012551	−20	− 30	+20	+ 85	+ 30	− 9	·5012546	·5012542	
" 7-8.....	4	2	D	1	200·58	199·73	8·2	2·0	15·63	43·0	·5012495	·5012548	−20	− 26	+20	+ 85	+ 30	− 9	·5012545	·5012543	
																Mean.	.....	....	·5012546	·5012543	·5012544
" 8.....	5	2	D	1	200·68	199·42	7·8	2·4	15·60	43·0	·5012489	·5012568	−20	− 25	+20	+ 91	+ 8	− 9	·5012546	·5012542	·5012544

STATION: STEWART, BRITISH COLUMBIA. OBSERVER: A. H. MILLER

1926																					
Aug. 13.....	1	2	D	1	199·44	198·56	8·2	1·6	18·07	52·0	·5012567	·5012623	−18	− 129	+11	+ 78	+ 16	− 9	·5012500	·5012494	
" 13-14.....	2	2	D	1	199·41	198·36	8·0	1·7	18·06	53·5	·5012568	·5012636	−17	− 128	+ 9	+ 78	+ 16	− 9	·5012501	·5012507	
																Mean.	.....	....	·5012501	·5012501	·5012501
" 14.....	3	2	D	1	199·78	198·87	8·0	1·6	17·82	53·8	·5012545	·5012603	−17	− 118	+ 9	+ 89	+ 27	− 9	·5012499	·5012495	
" 14-15.....	4	2	D	1	199·87	198·87	8·2	1·8	17·78	55·0	·5012540	·5012603	−19	− 116	+ 8	+ 89	+ 27	− 9	·5012493	·5012494	
																Mean.	.....	....	·5012496	·5012495	·5012495
" 15.....	5	3	R	1	203·80	201·98	8·0	1·8	18·00	49·0	·5012297	·5012408	−18	− 126	+14	+ 99	− 2	− 9	·5012257	·5012267	
" 15-16.....	6	3	R	1	204·38	202·44	8·0	2·0	17·21	49·5	·5012262	·5012380	−19	− 93	+13	+ 99	− 2	− 9	·5012253	·5012270	
" 16.....	7	3	R	1	204·78	203·52	7·9	1·6	16·84	51·0	·5012238	·5012314	−17	− 77	+12	+ 99	− 2	− 9	·5012246	·5012221	
" 16-17.....	8	3	R	1	204·18	202·81	8·0	2·0	17·52	51·8	·5012274	·5012358	−19	− 106	+11	+ 99	− 2	− 9	·5012250	·5012233	
" 17.....	9	3	R	1	204·66	202·91	8·1	1·4	17·04	53·0	·5012245	·5012351	−16	− 85	+10	+ 99	− 2	− 9	·5012244	·5012249	
" 17-18.....	10	3	R	1	205·07	203·23	7·7	1·9	16·58	53·7	·5012221	·5012332	−17	− 66	+ 9	+ 99	− 2	− 9	·5012237	·5012247	
																Mean.	.....	....	·5012248	·5012248	·5012248
" 18.....	11	3	R	1	205·06	203·51	8·1	1·5	16·18	54·7	·5012221	·5012315	−17	− 49	+ 8	+ 93	+ 3	− 9	·5012247	·5012251	
" 18-19.....	12	3	R	1	205·27	203·80	8·0	1·6	15·88	56·8	·5012209	·5012297	−17	− 37	+ 6	+ 93	+ 3	− 9	·5012245	·5012243	
" 19.....	13	3	R	1	205·43	203·98	8·3	2·0	15·49	58·5	·5012199	·5012286	−20	− 21	+ 4	+ 93	+ 3	− 9	·5012246	·5012243	
																Mean.	.....	....	·5012246	·5012246	·5012246
" 19-20.....	14	3	R	1	205·46	203·96	8·4	1·2	15·52	61·0	·5012198	·5012287	−16	− 22	+ 2	+ 86	− 8	− 9	·5012239	·5012234	·5012237
" 20.....	15	3	R	1	206·14	204·53	7·7	2·0	14·78	63·4	·5012157	·5012253	−18	+ 9	0	+ 104	+ 17	− 9	·5012243	·5012252	·5012248

TABLE VII—*Concluded*

PENDULUM OBSERVATIONS AND REDUCTIONS

STATION: MASSETT, BRITISH COLUMBIA. OBSERVER: A. H. MILLER

Date	Swing number	Pendulum	Position	Knife-edge	Coincidence Interval: Chronometer: Bond No. 627	Coincidence Interval: Chronometer: Dent No. 56182	Arc: Initial	Arc: Final	Temperature	Pressure	Period Uncorrected: Chronometer: Bond No. 627	Period Uncorrected: Chronometer: Dent No. 56182	Corrections (7th Decimal Place): Arc	Corrections: Temp.	Corrections: Pressure	Corrections: Rate: Bond No. 627	Corrections: Rate: Dent No. 56182	Corrections: Flexure	Period Corrected: Chronometer: Bond No. 627	Period Corrected: Chronometer: Dent No. 56182	Period Corrected: Mean
1926																					
Aug. 27	1	3	R	1	206·83	204·90	8·0	2·4	13·93	43·1	·5012116	·5012231	−21	+ 45	+19	+ 132	+ 15	−11	·5012280	·5012278	·5012279
" 27-28	2	3	R	1	206·66	204·81	8·4	1·8	14·37	43·6	·5012126	·5012236	−20	+ 26	+18	+ 137	+ 24	−11	·5012276	·5012273	
" 28	3	3	R	1	206·22	204·22	8·2	2·2	14·70	46·0	·5012153	·5012272	−21	+ 13	+17	+ 137	+ 24	−11	·5012288	·5012294	
																Mean	.....	....	·5012282	·5012284	·5012283
" 28-29	4	3	R	1	206·39	204·46	8·1	1·5	14·50	49·6	·5012143	·5012257	−17	+ 21	+13	+ 138	+ 19	−11	·5012287	·5012282	·5012285
" 29	5	2	D	1	201·32	200·58	8·3	2·5	14·31	48·6	·5012449	·5012495	−23	+ 29	+14	+ 95	+ 43	−11	·5012553	·5012547	·5012550
" 29-30	6	2	D	1	201·65	200·80	8·0	1·4	14·09	49·2	·5012428	·5012481	−15	+ 38	+14	+ 97	+ 42	−11	·5012551	·5012549	·5012550

STATION: OCEAN FALLS, BRITISH COLUMBIA. OBSERVER: A. H. MILLER

1926																					
Sept. 5	1	2	D	1	191·70	190·31	8·1	2·4	17·42	46·0	·5013075	·5013171	−22	− 101	+17	+ 102	+ 11	− 8	·5013063	·5013068	·5013066
" 5-6	2	2	D	1	191·60	190·23	8·1	1·4	17·75	49·0	·5013082	·5013177	−16	− 115	+14	+ 98	+ 1	− 8	·5013055	·5013053	·5013054
" 6	3	2	D	1	191·30	190·46	8·2	2·2	17·29	52·0	·5013067	·5013161	−21	− 96	+11	+ 107	+ 15	− 8	·5013060	·5013062	·5013061
" 6-7	4	2	D	1	191·53	190·03	8·0	1·3	17·68	55·0	·5013087	·5013191	−15	− 112	+ 8	+ 126	+ 24	− 8	·5013086	·5013088	·5013087
" 7	5	3	R	1	195·78	194·34	8·0	2·3	17·41	46·8	·5012802	·5012897	−21	− 101	+16	+ 104	+ 3	− 8	·5012792	·5012786	·5012789
" 7-8	6	3	R	1	195·81	194·50	8·1	1·7	17·29	49·5	·5012800	·5012887	−18	− 96	+13	+ 103	+ 22	− 8	·5012799	·5012801	·5012800

STATION: VICTORIA, BRITISH COLUMBIA. OBSERVER, A. H. MILLER

1926																						
Sept. 16.....	1	2	D	1	181·51	180·53	8·0	2·2	17·45	50·0	·5013811	·5013887	−20	− 103	+13	+ 97	+ 17	− 9	·5013789	·5013785	·5013787
" 16-17.....	2	2	D	1	181·56	180·61	8·1	1·5	17·54	51·5	·5013808	·5013880	−17	− 106	+11	+ 77	0	− 9	·5013764	·5013759	·5013762
" 17.....	3	3	R	1	185·02	184·17	7·6	2·1	17·53	46·5	·5013549	·5013611	−19	− 106	+16	+ 94	+ 32	− 9	·5013525	·5013525	
" 17-18.....	4	3	R	1	184·85	184·00	8·1	1·9	17·71	47·3	·5013561	·5013624	−19	− 114	+16	+ 94	+ 32	− 9	·5013529	·5013530	
																Mean.....		....	·5013527	·5013528	·5013527

STATION: OTTAWA, ONTARIO. OBSERVER: A. H. MILLER

1927																						
Jan. 10-11.....	1	1	D	1	187·36	186·04	7·7	1·6	16·28	55·5	·5013379	·5013474	−16	− 54	+ 7	+ 96	+ 3	− 9	·5013403	·5013405	
" 11.....	2	1	D	1	188·55	187·24	7·9	1·5	14·22	66·0	·5013294	·5013387	−16	+ 33	− 3	+ 96	+ 3	− 9	·5013395	·5013395	
																Mean.....		....	·5013399	·5013400	·5013400
" 11-12.....	3	1	D	1	189·56	187·80	8·0	1·9	13·22	46·5	·5013224	·5013348	−18	+ 75	+15	+ 119	0	− 9	·5013406	·5013411	
" 12.....	4	1	D	1	190·06	188·41	8·0	1·8	12·49	46·5	·5013189	·5013305	−18	+ 105	+15	+ 119	0	− 9	·5013401	·5013398	
																Mean.....		....	·5013404	·5013405	·5013404
" 12-13.....	5	2	D	1	173·88	172·63	8·0	1·9	12·39	46·0	·5014420	·5014524	−18	+ 109	+16	+ 95	− 6	− 9	·5014613	·5014616	
" 13.....	6	2	D	1	173·97	172·79	7·8	1·7	12·24	46·0	·5014412	·5014510	−17	+ 116	+16	+ 95	− 6	− 9	·5014613	·5014610	
																Mean.....		....	·5014613	·5014613	·5014613
" 13-14.....	7	2	D	1	173·93	172·86	8·0	1·7	12·19	46·0	·5014416	·5014505	−17	+ 118	+16	+ 95	+ 1	− 9	·5014619	·5014614	
" 14.....	8	2	D	1	173·98	172·91	8·0	1·7	12·09	46·0	·5014411	·5014500	−17	+ 122	+16	+ 95	+ 1	− 9	·5014618	·5014613	
																Mean.....		....	·5014619	·5014614	·5014616
" 14-15.....	9	3	R	1	177·30	175·95	7·7	1·7	12·00	52·0	·5014140	·5014249	−16	+ 126	+10	+ 101	− 5	− 9	·5014352	·5014355	
" 15.....	10	3	R	1	177·59	176·28	8·0	1·7	11·57	52·0	·5014117	·5014222	−17	+ 144	+10	+ 101	− 5	− 9	·5014346	·5014345	
																Mean.....		....	·5014349	·5014350	·5014350
" 15-16.....	11	3	R	1	177·60	176·40	8·2	1·8	11·35	52·0	·5014116	·5014213	−19	+ 153	+10	+ 105	+ 12	− 9	·5014356	·5014360	
" 16.....	12	3	R	1	177·94	176·71	7·7	1·5	11·06	52·0	·5014089	·5014187	−15	+ 165	+10	+ 105	+ 12	− 9	·5014345	·5014350	
																Mean.....		....	·5014351	·5014355	·5014353

TABLE VIII

AVERAGE ELEVATIONS AND CORRECTIONS FOR TOPOGRAPHY AND COMPENSATION FOR SEPARATE ZONES

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Winnipeg, Manitoba, No. 31				Brandon, Manitoba, No. 32			
A	754	+ 2	0	+ 2	1,216	+ 2	0	+ 2
B	765	+ 58	0	+ 58	1,225	+ 63	0	+ 63
C	765	+ 84	0	+ 84	1,235	+110	0	+110
D	764	+ 56	0	+ 56	1,235	+108	0	+108
E	758	+ 22	0	+ 22	1,230	+ 58	0	+ 58
F	757	+ 9	0	+ 9	1,240	+ 22	0	+ 22
G	758	0	0	0	1,262	+ 6	0	+ 6
H	762	0	0	0	1,278	+ 9	− 9	0
I	764	0	0	0	1,296	+ 12	− 12	0
J	770	0	− 12	− 12	1,308	0	− 16	− 16
K	775	0	− 16	− 16	1,362	0	− 20	− 20
L	785	0	− 19	− 19	1,420	0	− 34	− 34
M	785	0	− 44	− 44	1,500	0	− 84	− 84
N	785	0	− 41	− 41	1,495	0	− 77	− 77
O	1,070	0	− 60	− 60	1,418	0	− 80	− 80
18	...	...	...	− 12	...	...	...	− 14
17	...	...	...	− 13	...	...	...	− 15
16	...	...	...	− 13	...	...	...	− 16
15	...	...	...	− 13	...	...	...	− 16
14	...	...	...	− 14	...	...	...	− 17
13	...	...	...	− 23	...	...	...	− 28*
12	...	...	...	− 18	...	...	...	− 24*
11	...	...	...	− 14	...	...	...	− 18*
10	...	...	...	− 11	...	...	...	− 13*
9	...	...	...	− 10	...	...	...	− 11*
8	...	...	...	− 9	...	...	...	− 7*
7	...	...	...	+ 4	...	...	...	+ 5*
6	...	...	...	+ 8	...	...	...	+ 8*
5	...	...	...	+ 10	...	...	...	+ 10*
4	...	...	...	+ 5	...	...	...	+ 5*
3	...	...	...	+ 3	...	...	...	+ 3*
2	...	...	...	+ 2	...	...	...	+ 2*
1	...	...	...	+ 1	...	...	...	+ 1*
Total				− 78				− 87

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Moosejaw, Saskatchewan, No. 33				Medicine Hat, Alberta, No. 34			
A	1,775	+ 2	0	+ 2	2,178	+ 2	0	+ 2
B	1,800	+ 59	0	+ 59	2,180	+ 68	0	+ 68
C	1,800	+134	0	+134	2,180	+141	0	+141
D	1,800	+166	0	+166	2,173	+191	0	+191
E	1,809	+112	0	+112	2,199	+159	− 8	+151
F	1,825	+ 57	− 6	+ 51	2,239	+ 82	− 10	+ 72
G	1,836	+ 28	− 8	+ 20	2,278	+ 45	− 12	+ 33
H	1,852	+ 16	− 16	0	2,306	+ 26	− 16	+ 10
I	1,870	+ 20	− 20	0	2,339	+ 20	− 20	0
J	1,902	0	− 16	− 16	2,374	+ 6	− 16	− 10
K	1,937	0	− 20	− 20	2,466	0	− 30	− 30
L	2,028	0	− 49	− 49	2,581	0	− 62	− 62
M	1,865	0	−115	−115	2,710	+ 6	−161	−155
N	2,086	0	−107	−107	2,710	0	−138	−138
O	2,120	0	−105	−105	2,850	0	−131	−131
18	.....	.....	.....	− 21	.....	.....	.....	− 31
17	.....	.....	.....	− 21*	.....	.....	.....	− 31
16	.....	.....	.....	− 21*	.....	.....	.....	− 31
15	.....	.....	.....	− 23*	.....	.....	.....	− 34
14	.....	.....	.....	− 22*	.....	.....	.....	− 35
13	.....	.....	.....	− 38*	.....	.....	.....	− 63
12	.....	.....	.....	− 33*	.....	.....	.....	− 41
11	.....	.....	.....	− 24*	.....	.....	.....	− 27
10	.....	.....	.....	− 16*	.....	.....	.....	− 18
9	.....	.....	.....	− 12*	.....	.....	.....	− 9
8	.....	.....	.....	− 2*	.....	.....	.....	+ 3*
7	.....	.....	.....	+ 5*	.....	.....	.....	+ 5*
6	.....	.....	.....	+ 7*	.....	.....	.....	+ 7*
5	.....	.....	.....	+ 10*	.....	.....	.....	+ 10*
4	.....	.....	.....	+ 6*	.....	.....	.....	+ 6*
3	.....	.....	.....	+ 3*	.....	.....	.....	+ 3*
2	.....	.....	.....	+ 2*	.....	.....	.....	+ 2*
1	.....	.....	.....	+ 1*	.....	.....	.....	+ 1*
	Total			− 67				−141

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Calgary, Alberta, No. 35				Banff, Alberta, No. 36			
A	3,433	+ 2	0	+ 2	4,514	+ 2	0	+ 2
B	3,430	+ 66	0	+ 66	4,520	+ 68	0	+ 68
C	3,435	+156	0	+156	4,525	+160	0	+160
D	3,450	+259	− 6	+253	4,526	+288	− 6	+282
E	3,450	+266	− 8	+258	4,566	+343	− 8	+335
F	3,478	+165	− 10	+155	4,891	+242	− 13	+229
G	3,487	+ 84	− 12	+ 72	5,223	+129	− 20	+109
H	3,503	+ 48	− 16	+ 32	5,670	+ 80	− 28	+ 52
I	3,547	+ 60	− 40	+ 20	6,146	+ 51	− 52	− 1
J	3,580	+ 26	− 42	− 16	6,430	+ 38	− 67	− 29
K	3,584	+ 13	− 52	− 39	6,904	+ 25	−120	− 95
L	3,640	+ 16	− 88	− 72	7,250	+ 12	−173	−161
M	3,780	+ 10	−224	−214	6,770	+ 8	−390	−382
N	4,160	+ 6	−216	−210	5,760	+ 9	−298	−289
O	4,270	0	−207	−207	5,410	+ 1	−262	−261
18	.....	.....	.....	− 43	.....	.....	.....	− 47
17	.....	.....	.....	− 44	.....	.....	.....	− 48
16	.....	.....	.....	− 43	.....	.....	.....	− 48*
15	.....	.....	.....	− 45	.....	.....	.....	− 49*
14	.....	.....	.....	− 41	.....	.....	.....	− 50*
13	.....	.....	.....	− 55	.....	.....	.....	− 70*
12	.....	.....	.....	− 37	.....	.....	.....	− 36*
11	.....	.....	.....	− 25	.....	.....	.....	− 25*
10	.....	.....	.....	− 15	.....	.....	.....	− 13*
9	.....	.....	.....	− 5	.....	.....	.....	− 4*
8	.....	.....	.....	+ 5*	.....	.....	.....	+ 5*
7	.....	.....	.....	+ 5*	.....	.....	.....	+ 5*
6	.....	.....	.....	+ 7*	.....	.....	.....	+ 6*
5	.....	.....	.....	+ 9*	.....	.....	.....	+ 9*
4	.....	.....	.....	+ 6*	.....	.....	.....	+ 6*
3	.....	.....	.....	+ 3*	.....	.....	.....	+ 3*
2	.....	.....	.....	+ 2*	.....	.....	.....	+ 2*
1	.....	.....	.....	+ 1*	.....	.....	.....	+ 1*
Total				− 59				−334

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Field, B.C., No. 37				Glacier, B.C., No. 38			
A	4,065	+ 2	0	+ 2	4,094	+ 2	0	+ 2
B	4,070	+ 64	0	+ 64	4,105	+ 66	0	+ 66
C	4,110	+160	0	+160	4,160	+157	0	+157
D	4,250	+270	− 6	+264	4,476	+266	− 6	+260
E	4,595	+294	− 8	+286	4,784	+288	− 8	+280
F	5,529	+166	− 18	+148	5,425	+173	− 15	+158
G	6,100	+ 83	− 23	+ 60	6,083	+ 76	− 22	+ 54
H	6,030	+ 44	− 30	+ 14	6,600	+ 36	− 34	+ 2
I	5,960	+ 35	− 50	− 15	6,575	+ 24	− 57	− 33
J	6,510	+ 32	− 72	− 40	6,200	+ 34	− 66	− 32
K	7,215	+ 9	−113	−104	6,140	+ 17	−102	− 85
L	7,000	+ 7	−163	−156	6,910	+ 5	−162	−157
M	6,970	+ 1	−403	−402	5,680	+ 7	−332	−325
N	6,850	+ 10	−365	−355	6,400	+ 13	−337	−324
O	5,440	0	−264	−264	5,640	0	−272	−272
18	.....	.....	.....	− 49	.....	.....	.....	− 49
17	.....	.....	.....	− 46	.....	.....	.....	− 48
16	.....	.....	.....	− 45	.....	.....	.....	− 47
15	.....	.....	.....	− 44	.....	.....	.....	− 42*
14	.....	.....	.....	− 42	.....	.....	.....	− 43*
13	.....	.....	.....	− 62	.....	.....	.....	− 61*
12	.....	.....	.....	− 35	.....	.....	.....	− 31*
11	.....	.....	.....	− 24	.....	.....	.....	− 20*
10	.....	.....	.....	− 11	.....	.....	.....	− 9*
9	.....	.....	.....	− 3*	.....	.....	.....	− 2*
8	.....	.....	.....	+ 5*	.....	.....	.....	+ 6*
7	.....	.....	.....	+ 5*	.....	.....	.....	+ 5*
6	.....	.....	.....	+ 6*	.....	.....	.....	+ 6*
5	.....	.....	.....	+ 9*	.....	.....	.....	+ 9*
4	.....	.....	.....	+ 6*	.....	.....	.....	+ 7*
3	.....	.....	.....	+ 3*	.....	.....	.....	+ 3*
2	.....	.....	.....	+ 2*	.....	.....	.....	+ 2*
1	.....	.....	.....	+ 1*	.....	.....	.....	+ 1*
	Total			− 662				−562

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Revelstoke, B.C., No. 39				Kamloops, B.C., No. 40			
A	1,484	+ 2	0	+ 2	1,155	+ 2	0	+ 2
B	1,497	+ 62	0	+ 62	1,160	+ 60	0	+ 60
C	1,499	+124	0	+124	1,160	+112	0	+112
D	1,573	+136	0	+136	1,171	+102	0	+102
E	1,720	+ 76	− 2	+ 74	1,225	+ 48	0	+ 48
F	1,870	+ 34	− 3	+ 31	1,325	+ 23	0	+ 23
G	2,160	+ 7	− 6	+ 1	1,633	+ 5	− 6	− 1
H	2,670	0	− 18	− 18	1,885	+ 8	− 12	− 4
I	3,530	− 12	− 31	− 43	2,385	− 6	− 19	− 25
J	4,528	− 7	− 52	− 59	2,640	0	− 28	− 28
K	4,985	− 27	− 84	−111	2,725	− 20	− 35	− 55
L	5,315	− 15	−126	−141	3,100	0	− 78	− 78
M	5,410	− 16	−313	−329	3,370	− 4	−200	−204
N	5,220	+ 8	−277	−269	3,390	+ 1	−176	−175
O	5,450	0	−266	−266	4,160	0	−204	−204
18	.....	.....	.....	− 56	.....	.....	.....	− 42
17	.....	.....	.....	− 53	.....	.....	.....	− 51
16	.....	.....	.....	− 47	.....	.....	.....	− 51
15	.....	.....	.....	− 42	.....	.....	.....	− 50
14	.....	.....	.....	− 42	.....	.....	.....	− 40*
13	.....	.....	.....	− 59*	.....	.....	.....	− 51*
12	.....	.....	.....	− 29*	.....	.....	.....	− 27*
11	.....	.....	.....	− 19*	.....	.....	.....	− 15*
10	.....	.....	.....	− 8*	.....	.....	.....	− 7*
9	.....	.....	.....	− 1*	.....	.....	.....	+ 2*
8	.....	.....	.....	+ 6*	.....	.....	.....	+ 7*
7	.....	.....	.....	+ 5*	.....	.....	.....	+ 5*
6	.....	.....	.....	+ 6*	.....	.....	.....	+ 6*
5	.....	.....	.....	+ 9*	.....	.....	.....	+ 9*
4	.....	.....	.....	+ 7*	.....	.....	.....	+ 7*
3	.....	.....	.....	+ 3*	.....	.....	.....	+ 3*
2	.....	.....	.....	+ 2*	.....	.....	.....	+ 2*
1	.....	.....	.....	+ 1*	.....	.....	.....	+ 1*
	Total			−1123				−719

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Vancouver, B.C., No. 42				Dauphin, Man., No. 52			
A	20	+ 2	0	+ 2	963	+ 2	0	+ 2
B	20	+ 4	0	+ 4	970	+ 62	0	+ 62
C	−18	− 2	0	− 2	970	+104	0	+104
D	−18	0	0	0	955	+ 78	0	+ 78
E	− 8	0	0	0	956	+ 40	0	+ 40
F	− 6	0	0	0	962	+ 10	0	+ 10
G	6	0	0	0	960	0	0	0
H	92	0	0	0	962	0	0	0
I	150	0	0	0	980	0	0	0
J	150	0	− 4	− 4	990	0	− 16	− 16
K	150	− 5	− 5	− 10	1,072	0	− 20	− 20
L	900	0	− 25	− 25	1,205	0	− 31	− 31
M	1,795	− 9	−108	−117	1,480	0	− 86	− 86
N	2,040	+ 3	−110	−107	1,390	0	− 72	− 72
O	2,750	0	−141	−141	1,203	0	− 69	− 69
18	...	...	...	− 33	...	...	...	− 12
17	...	...	...	− 34	...	...	...	− 13
16	...	...	...	− 28	...	...	...	− 13
15	...	...	...	− 19	...	...	...	− 13
14	...	...	...	− 18	...	...	...	− 16*
13	...	...	...	− 31	...	...	...	− 25*
12	...	...	...	− 15	...	...	...	− 20*
11	...	...	...	− 8	...	...	...	− 15*
10	...	...	...	− 2	...	...	...	− 13*
9	...	...	...	+ 5	...	...	...	− 10*
8	...	...	...	+ 9	...	...	...	− 7*
7	...	...	...	+ 5	...	...	...	+ 4*
6	...	...	...	+ 7	...	...	...	+ 7*
5	...	...	...	+ 9	...	...	...	+ 10*
4	...	...	...	+ 7	...	...	...	+ 6*
3	...	...	...	+ 3	...	...	...	+ 3*
2	...	...	...	+ 2	...	...	...	+ 2*
1	...	...	...	+ 1	...	...	...	+ 1*
Total				−540				− 122

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Swan River, Manitoba, No. 53				The Pas, Manitoba, No. 54			
A	1,107	+ 2	0	+ 2	872	+ 2	0	+ 2
B	1,115	+ 60	0	+ 60	880	+ 59	0	+ 59
C	1,115	+104	0	+104	880	+ 96	0	+ 96
D	1,115	+ 96	0	+ 96	863	+ 68	0	+ 68
E	1,123	+ 48	0	+ 48	868	+ 29	0	+ 29
F	1,105	+ 18	0	+ 18	875	+ 14	0	+ 14
G	1,121	+ 3	0	+ 3	875	0	0	0
H	1,122	+ 4	− 4	0	875	0	0	0
I	1,134	+ 5	− 5	0	875	0	0	0
J	1,145	0	− 16	− 16	863	0	− 14	− 14
K	1,226	0	− 20	− 20	863	0	− 17	− 17
L	1,412	0	− 34	− 34	863	0	− 21	− 21
M	1,650	0	− 95	− 95	900	0	− 50	− 50
N	1,345	0	− 68	− 68	868	0	− 42	− 42
O	1,263	0	− 71	− 71	1,090	0	− 61	− 61
18				− 12				− 12
17				− 12				− 12
16				− 12				− 12
15				− 15*				− 13
14				− 15*				− 13
13				− 25*				− 21
12				− 19*				− 14
11				− 15*				− 12
10				− 13*				− 13
9				− 10*				− 9
8				− 6*				− 6*
7				+ 4*				+ 4*
6				+ 7*				+ 6*
5				+ 10*				+ 10*
4				+ 6*				+ 6*
3				+ 3*				+ 3*
2				+ 3*				+ 3*
1				+ 1*				+ 1*
Total				− 93				− 41

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Prince Albert, Saskatchewan, No. 55				Saskatoon, Saskatchewan, No. 56			
A	1,398	+ 2	0	+ 2	1,629	+ 2	0	+ 2
B	1,405	+ 64	0	+ 64	1,635	+ 64	0	+ 64
C	1,405	+124	0	+124	1,650	+130	0	+130
D	1,400	+132	0	+132	1,650	+153	0	+153
E	1,419	+ 74	0	+ 74	1,630	+ 91	0	+ 91
F	1,430	+ 32	0	+ 32	1,632	+ 43	0	+ 43
G	1,450	+ 12	0	+ 12	1,635	+ 18	− 4	+ 14
H	1,460	+ 16	− 16	0	1,625	+ 16	− 16	0
I	1,480	+ 20	− 20	0	1,643	+ 20	− 20	0
J	1,483	0	− 16	− 16	1,675	0	− 16	− 16
K	1,494	0	− 20	− 20	1,683	0	− 20	− 20
L	1,527	0	− 37	− 37	1,690	0	− 41	− 41
M	1,540	0	− 86	− 86	1,700	0	− 95	− 95
N	1,560	0	− 83	− 83	1,694	0	− 86	− 86
O	1,643	0	− 90	− 90	1,765	0	− 94	− 94
18				− 17				− 19
17				− 17				− 19
16				− 16				− 20
15				− 17				− 21*
14				− 18				− 20*
13				− 29*				− 34*
12				− 23*				− 29*
11				− 19*				− 22*
10				− 15*				− 16*
9				− 10*				− 11*
8				− 2*				− 1*
7				+ 4*				+ 4*
6				+ 6*				+ 7*
5				+ 10*				+ 10*
4				+ 6*				+ 6*
3				+ 3*				+ 3*
2				+ 3*				+ 3*
1				+ 1*				+ 1*
Total				− 42				− 33

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Vermilion, Alberta, No. 57				Edmonton, Alberta, No. 58			
A	2,015	+ 2	0	+ 2	2,197	+ 2	0	+ 2
B	2,020	+ 66	0	+ 66	2,200	+ 68	0	+ 68
C	1,983	+140	0	+140	2,200	+143	0	+143
D	1,977	+181	0	+181	2,238	+192	0	+192
E	1,978	+138	− 7	+131	2,131	+157	− 8	+149
F	1,995	+ 69	− 9	+ 60	2,125	+ 80	− 10	+ 70
G	2,015	+ 35	− 12	+ 23	2,150	+ 40	− 12	+ 28
H	2,052	+ 18	− 16	+ 2	2,170	+ 22	− 16	+ 6
I	2,079	+ 20	− 20	0	2,200	+ 20	− 20	0
J	2,070	+ 1	− 17	− 16	2,244	+ 4	− 14	− 10
K	2,080	0	− 22	− 22	2,278	0	− 26	− 26
L	2,130	0	− 51	− 51	2,295	0	− 55	− 55
M	2,106	+ 2	−116	−114	2,386	+ 5	−137	−132
N	2,090	0	−102	−102	2,420	0	−124	−124
O	2,190	0	−107	−107	2,530	0	−122	−122
18	...	...	...	− 23	...	...	...	− 26
17	...	...	...	− 23	...	...	...	− 28
16	...	...	...	− 23	...	...	...	− 30
15	...	...	...	− 22	...	...	...	− 32
14	...	...	...	− 28*	...	...	...	− 35
13	...	...	...	− 45*	...	...	...	− 51
12	...	...	...	− 27*	...	...	...	− 28
11	...	...	...	− 24*	...	...	...	− 23
10	...	...	...	− 15*	...	...	...	− 14
9	...	...	...	− 8*	...	...	...	− 5
8	...	...	...	+ 2*	...	...	...	+ 3*
7	...	...	...	+ 4*	...	...	...	+ 4*
6	...	...	...	+ 6*	...	...	...	+ 6*
5	...	...	...	+ 10*	...	...	...	+ 10*
4	...	...	...	+ 6 *	...	...	...	+ 6*
3	...	...	...	+ 3*	...	...	...	+ 3*
2	...	...	...	+ 3*	...	...	...	+ 3*
1	...	...	...	+ 1*	...	...	...	+ 1*
Total				− 10				− 47

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Grande Prairie, Alberta, No. 59				Kinuso, Alberta, No. 60			
A	2,154	+ 2	0	+ 2	1,922	+ 2	0	+ 2
B	2,160	+ 66	0	+ 66	1,928	+ 66	0	+ 66
C	2,160	+142	0	+142	1,930	+138	0	+138
D	2,160	+190	0	+190	1,930	+176	0	+176
E	2,160	+155	− 8	+147	1,930	+128	− 5	+123
F	2,183	+ 79	− 10	+ 69	1,950	+ 66	− 9	+ 57
G	2,198	+ 41	− 12	+ 29	1,950	+ 34	− 11	+ 23
H	2,194	+ 22	− 16	+ 6	1,953	+ 16	− 16	0
I	2,196	+ 20	− 20	0	1,956	+ 20	− 20	0
J	2,186	+ 3	− 19	− 16	1,985	+ 1	− 17	− 16
K	2,261	0	− 26	− 26	2,083	0	− 23	− 23
L	2,307	0	− 56	− 56	2,220	0	− 54	− 54
M	2,489	+ 6	−145	−139	2,570	+ 3	−156	−153
N	2,590	0	−131	−131	2,490	0	−125	−125
O	3,060	0	−151	−151	2,270	0	−115	−115
18				− 37				− 22
17				− 37				− 23
16				− 35				− 24
15				− 35				− 26
14				− 34				− 32
13				− 55				− 45*
12				− 37				− 31*
11				− 20				− 21*
10				− 5				− 10*
9				− 1				− 3*
8				+ 4*				+ 3*
7				+ 4*				+ 4*
6				+ 5*				+ 5*
5				+ 9*				+ 9*
4				+ 7*				+ 7*
3				+ 3*				+ 3*
2				+ 3*				+ 3*
1				+ 1*				+ 1*
Total				−128				−103

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Lac la Biche, Alberta, No. 61				Waterways, Alberta, No. 62			
A	1,801	+ 2	0	+ 2	820	+ 2	0	+ 2
B	1,795	+ 65	0	+ 65	820	+ 61	0	+ 61
C	1,793	+136	0	+136	820	+ 90	0	+ 90
D	1,793	+167	0	+167	828	+ 62	0	+ 62
E	1,809	+111	0	+111	910	+ 27	0	+ 27
F	1,813	+ 55	− 5	+ 50	1,000	+ 10	0	+ 10
G	1,839	+ 28	− 9	+ 19	1,088	0	0	0
H	1,840	+ 16	− 16	0	1,162	+ 6	− 6	0
I	1,853	+ 20	− 20	0	1,190	+ 1	− 8	− 7
J	1,861	0	− 16	− 16	1,230	0	− 16	− 16
K	1,877	0	− 20	− 20	1,298	0	− 20	− 20
L	1,945	0	− 47	− 47	1,389	0	− 34	− 34
M	2,042	+ 1	−114	−113	1,650	0	− 93	− 93
N	2,100	0	−102	−102	1,612	0	− 85	− 85
O	2,114	0	−111	−111	1,810	0	− 95	− 95
18				− 21				− 18
17				− 21				− 17
16				− 21				− 16
15				− 21				− 16
14				− 27*				− 17
13				− 40*				− 28
12				− 25*				− 24
11				− 22*				− 21
10				− 15*				− 14
9				− 7*				− 7
8				+ 2*				+ 1
7				+ 4*				+ 3
6				+ 5*				+ 4
5				+ 10*				+ 10
4				+ 7*				+ 7
3				+ 3*				+ 4
2				+ 3*				+ 3
1				+ 1*				0
Total				− 44				−244

*These values have been interpolated from those obtained for neighbouring stations

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Edson, Alberta, No. 63				Jasper, Alberta, No. 64			
A	3,038	+ 2	0	+ 2	3,476	+ 2	0	+ 2
B	3,040	+ 68	0	+ 68	3,484	+ 67	0	+ 67
C	3,035	+152	0	+152	3,480	+156	0	+156
D	3,035	+242	− 1	+241	3,468	+258	− 6	+252
E	3,025	+234	− 8	+226	3,507	+270	− 8	+262
F	3,000	+130	− 10	+120	3,555	+166	− 10	+156
G	3,000	+ 72	− 12	+ 60	3,690	+ 79	− 12	+ 67
H	3,000	+ 48	− 16	+ 32	4,006	+ 48	− 18	+ 30
I	3,010	+ 25	− 22	+ 3	4,853	+ 28	− 43	− 15
J	3,080	+ 17	− 33	− 16	5,930	+ 19	− 64	− 45
K	3,160	+ 4	− 43	− 39	6,445	+ 2	−112	−110
L	3,330	+ 8	− 80	− 72	5,950	0	−144	−144
M	3,520	+ 5	−216	−211	6,660	− 1	−387	−388
N	3,510	+ 3	−184	−181	6,060	+ 11	−321	−310
O	4,270	0	−204	−204	5,395	+ 1	−262	−261
18	.....	.....	.....	− 45	.....	.....	.....	− 46
17	.....	.....	.....	− 41	.....	.....	.....	− 44
16	.....	.....	.....	− 40	.....	.....	.....	− 40
15	.....	.....	.....	− 39	.....	.....	.....	− 38
14	.....	.....	.....	− 35*	.....	.....	.....	− 35
13	.....	.....	.....	− 55*	.....	.....	.....	− 59
12	.....	.....	.....	− 31*	.....	.....	.....	− 32
11	.....	.....	.....	− 21*	.....	.....	.....	− 20
10	.....	.....	.....	− 10*	.....	.....	.....	− 9
9	.....	.....	.....	− 3*	.....	.....	.....	− 2*
8	.....	.....	.....	+ 4*	.....	.....	.....	+ 5*
7	.....	.....	.....	+ 4*	.....	.....	.....	+ 4*
6	.....	.....	.....	+ 5*	.....	.....	.....	+ 5*
5	.....	.....	.....	+ 9*	.....	.....	.....	+ 9*
4	.....	.....	.....	+ 7*	.....	.....	.....	+ 7*
3	.....	.....	.....	+ 3*	.....	.....	.....	+ 3*
2	.....	.....	.....	+ 3*	.....	.....	.....	+ 3*
1	.....	.....	.....	+ 1*	.....	.....	.....	+ 1*
Total				−103				−569

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Mt. Olie, British Columbia, No. 65				Princeton, British Columbia, No. 66			
A	1,269	+ 2	0	+ 2	2,086	+ 2	0	+ 2
B	1,275	+ 60	0	+ 60	2,090	+ 68	0	+ 68
C	1,275	+120	0	+120	2,093	+142	0	+142
D	1,278	+119	0	+119	2,127	+184	0	+184
E	1,371	+ 64	0	+ 64	2,185	+152	− 8	+144
F	1,700	+ 26	− 5	+ 21	2,295	+ 79	− 10	+ 69
G	2,246	+ 8	− 10	− 2	2,470	+ 38	− 12	+ 26
H	2,394	+ 12	− 16	− 4	2,750	+ 19	− 16	+ 3
I	2,310	+ 2	− 22	− 20	2,920	+ 5	− 20	− 15
J	3,590	− 4	− 36	− 40	3,900	+ 16	− 42	− 26
K	3,100	− 20	− 50	− 70	4,550	− 18	− 71	− 89
L	3,200	0	− 84	− 84	5,400	− 8	−126	−134
M	3,260	0	−195	−195	4,830	− 6	−283	−289
N	3,330	0	−171	−171	3,140	+ 5	−164	−159
O	4,090	0	−198	−198	3,280	0	−159	−159
18				− 56				− 28
17				− 58				− 30
16				− 55				− 33
15				− 57				− 28
14				− 46				− 28
13				− 54				− 40*
12				− 29				− 21*
11				− 14				− 14*
10				− 7				− 6*
9				+ 1				+ 2*
8				+ 7				+ 8*
7				+ 5*				+ 5*
6				+ 6*				+ 6*
5				+ 9*				+ 9*
4				+ 7*				+ 7*
3				+ 3*				+ 3*
2				+ 3*				+ 2*
1				+ 1*				+ 1*
Total				−732				−418

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Phoenix, British Columbia, No. 67				Nelson, British Columbia, No. 68			
A	4,537	+ 2	0	+ 2	1,823	+ 2	0	+ 2
B	4,541	+ 65	0	+ 65	1,825	+ 66	0	+ 66
C	4,515	+162	− 2	+160	1,829	+135	0	+135
D	4,620	+295	− 6	+289	1,834	+169	0	+169
E	4,713	+340	− 8	+332	1,925	+116	− 3	+113
F	4,345	+240	− 10	+230	2,390	+ 52	− 10	+ 42
G	3,942	+129	− 12	+117	3,000	+ 14	− 13	+ 1
H	3,520	+ 77	− 16	+ 61	3,740	− 9	− 20	− 29
I	3,510	+ 71	− 33	+ 38	4,255	− 17	− 36	− 53
J	3,300	+ 42	− 35	+ 7	4,560	+ 4	− 48	− 44
K	4,350	+ 25	− 65	− 40	5,115	− 21	− 87	−108
L	4,350	+ 12	−102	− 90	5,320	− 18	−119	−137
M	4,010	+ 22	−238	−216	4,800	− 12	−280	−292
N	3,800	+ 4	−199	−195	5,170	+ 12	−272	−260
O	4,050	0	−194	−194	4,850	0	−232	−232
18				− 40				− 46
17				− 40				− 50
16				− 43				− 51
15				− 47				− 37
14				− 39				− 39
13				− 56				− 57
12				− 29				− 36
11				− 20				− 22*
10				− 10				− 12*
9				+ 1				− 1*
8				+ 7*				+ 6*
7				+ 5*				+ 5*
6				+ 6*				+ 6*
5				+ 9*				+ 9*
4				+ 6*				+ 6*
3				+ 3*				+ 3*
2				+ 2*				+ 2*
1				+ 1*				+ 1*
Total				+282				−940

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Cranbrook, British Columbia, No. 69				Blairmore, Alberta, No. 70			
A	3,004	+ 2	0	+ 2	4,222	+ 2	0	+ 2
B	3,010	+ 66	0	+ 66	4,230	+ 66	0	+ 66
C	3,015	+152	0	+152	4,245	+160	0	+160
D	3,015	+240	0	+240	4,404	+280	− 6	+274
E	3,015	+232	− 8	+224	4,450	+321	− 8	+313
F	3,145	+136	− 10	+126	4,815	+216	− 13	+203
G	3,271	+ 72	− 12	+ 60	5,110	+114	− 20	+ 94
H	3,450	+ 41	− 16	+ 25	4,990	+ 79	− 26	+ 53
I	3,573	+ 40	− 36	+ 4	5,305	+ 43	− 40	+ 3
J	3,740	+ 24	− 43	− 19	5,450	+ 43	− 58	− 15
K	4,250	− 2	− 65	− 67	5,588	+ 26	− 93	− 67
L	5,175	− 2	−115	−117	5,925	+ 15	−142	−127
M	6,300	− 10	−367	−377	5,610	+ 7	−328	−321
N	5,680	+ 14	−301	−287	5,370	+ 10	−284	−274
O	5,230	0	−255	−255	5,050	0	−244	−244
18	...	...	...	− 46	...	...	...	− 41
17	...	...	...	− 47	...	...	...	− 45
16	...	...	...	− 45	...	...	...	− 43
15	...	...	...	− 39*	...	...	...	− 43
14	...	...	...	− 39*	...	...	...	− 43
13	...	...	...	− 57*	...	...	...	− 62
12	...	...	...	− 33*	...	...	...	− 37
11	...	...	...	− 25*	...	...	...	− 28
10	...	...	...	− 14*	...	...	...	− 17
9	...	...	...	− 3*	...	...	...	− 5
8	...	...	...	+ 6*	...	...	...	+ 6
7	...	...	...	+ 5*	...	...	...	+ 5*
6	...	...	...	+ 6*	...	...	...	+ 6*
5	...	...	...	+ 9*	...	...	...	+ 9*
4	...	...	...	+ 6*	...	...	...	+ 6*
3	...	...	...	+ 3*	...	...	...	+ 3*
2	...	...	...	+ 2*	...	...	...	+ 2*
1	...	...	...	+ 1*	...	...	...	+ 1*
Total				−533				−206

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Lethbridge, Alberta, No. 71				Riverton, Manitoba, No. 72			
A	2,971	+ 2	0	+ 2	724	+ 2	0	+ 2
B	2,975	+ 67	0	+ 67	722	+ 60	0	+ 60
C	2,975	+152	0	+152	720	+ 80	0	+ 80
D	2,975	+240	0	+240	723	+ 48	0	+ 48
E	2,962	+230	− 8	+222	725	+ 21	0	+ 21
F	2,911	+132	− 10	+122	731	+ 10	0	+ 10
G	2,927	+ 71	− 12	+ 59	733	0	0	0
H	2,980	+ 48	− 16	+ 32	731	0	0	0
I	2,999	+ 20	− 20	0	731	0	0	0
J	2,960	+ 16	− 32	− 16	737	0	− 12	− 12
K	3,007	0	− 40	− 40	741	0	− 15	− 15
L	3,070	+ 2	− 74	− 72	751	0	− 18	− 18
M	3,260	+ 7	−193	−186	794	0	− 46	− 46
N	3,570	0	−184	−184	803	0	− 43	− 43
O	4,200	0	−201	−201	883	0	− 49	− 49
18				− 41				− 10
17				− 40				− 12*
16				− 39				− 12*
15				− 43				− 11*
14				− 40*				− 13*
13				− 62*				− 20*
12				− 39*				− 15*
11				− 28*				− 11*
10				− 17*				− 11*
9				− 7*				− 10*
8				+ 5*				− 9*
7				+ 5*				+ 4*
6				+ 7*				+ 7*
5				+ 9*				+ 10*
4				+ 6*				+ 5*
3				+ 3*				+ 3*
2				+ 2*				+ 2*
1				+ 1*				+ 1*
Total				−121				− 64

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Gypsumville, Manitoba, No. 73				Manitou, Manitoba, No. 74			
A	857	+ 2	0	+ 2	1,606	+ 2	0	+ 2
B	858	+ 60	0	+ 60	1,613	+ 64	0	+ 64
C	856	+ 92	0	+ 92	1,611	+128	0	+128
D	860	+ 66	0	+ 66	1,600	+150	0	+150
E	857	+ 32	0	+ 32	1,600	+ 88	0	+ 88
F	855	+ 10	0	+ 10	1,600	+ 40	0	+ 40
G	856	0	0	0	1,600	+ 17	− 2	+ 15
H	852	0	0	0	1,597	+ 16	− 16	0
I	846	0	0	0	1,566	+ 20	− 20	0
J	840	0	− 14	− 14	1,556	0	− 16	− 16
K	826	0	− 16	− 16	1,536	0	− 20	− 20
L	824	0	− 19	− 19	1,440	0	− 35	− 35
M	841	0	− 46	− 46	1,308	0	− 75	− 75
N	825	0	− 43	− 43	1,195	0	− 63	− 63
O	945	0	− 54	− 54	1,190	0	− 67	− 67
18				− 11				− 12
17				− 11				− 12
16				− 11				− 13
15				− 13*				− 15*
14				− 14*				− 17*
13				− 21*				− 27*
12				− 15*				− 22*
11				− 13*				− 17*
10				− 12*				− 12*
9				− 10*				− 10*
8				− 8*				− 8*
7				+ 4*				+ 5*
6				+ 7*				+ 8*
5				+ 10*				+ 10*
4				+ 6*				+ 5*
3				+ 3*				+ 3*
2				+ 3*				+ 2*
1				+ 1*				+ 1*
Total				− 35				+ 80

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Melita, Manitoba, No. 75				Estevan, Saskatchewan, No. 76			
A	1,452	+ 2	0	+ 2	1,860	+ 2	0	+ 2
B	1,455	+ 65	0	+ 65	1,865	+ 68	0	+ 68
C	1,453	+125	0	+125	1,870	+138	0	+138
D	1,440	+135	0	+135	1,865	+173	0	+173
E	1,442	+ 76	0	+ 76	1,864	+120	− 3	+117
F	1,442	+ 32	0	+ 32	1,855	+ 60	− 7	+ 53
G	1,447	+ 11	0	+ 11	1,842	+ 28	− 8	+ 20
H	1,457	+ 14	− 14	0	1,850	+ 16	− 16	0
I	1,467	+ 18	− 18	0	1,866	+ 20	− 20	0
J	1,482	0	− 16	− 16	1,880	0	− 16	− 16
K	1,496	0	− 20	− 20	1,894	0	− 20	− 20
L	1,515	0	− 37	− 37	1,825	0	− 44	− 44
M	1,528	0	− 86	− 86	1,900	0	−112	−112
N	1,603	0	− 85	− 85	2,180	0	−111	−111
O	1,790	0	− 94	− 94	2,026	0	−103	−103
18				− 17				− 20
17				− 16				− 20
16				− 16				− 20
15				− 16				− 21
14				− 16				− 20
13				− 31*				− 29
12				− 26*				− 31*
11				− 21*				− 24*
10				− 13*				− 14*
9				− 11*				− 12*
8				− 6*				− 4*
7				+ 5*				+ 5*
6				+ 8*				+ 8*
5				+ 10*				+ 10*
4				+ 5*				+ 5*
3				+ 3*				+ 3*
2				+ 2*				+ 2*
1				+ 1*				+ 1*
Total				− 47				− 16

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topo-graphy	Compen-sation	Topo-graphy and Compen-sation	Elevation in Feet	Topo-graphy	Compen-sation	Topo-graphy and Compen-sation
	Indian Head, Saskatchewan, No. 77				Moosomin, Saskatchewan, No. 78			
A	1,919	+ 2	0	+ 2	1,892	+ 2	0	+ 2
B	1,923	+ 67	0	+ 67	1,898	+ 66	0	+ 66
C	1,925	+138	0	+138	1,898	+138	0	+138
D	1,925	+176	0	+176	1,904	+173	0	+173
E	1,922	+125	− 5	+120	1,883	+122	− 4	+118
F	1,928	+ 64	− 9	+ 55	1,879	+ 60	− 7	+ 53
G	1,930	+ 33	− 11	+ 22	1,870	+ 30	− 9	+ 21
H	1,942	+ 16	− 16	0	1,860	+ 16	− 16	0
I	1,971	+ 20	− 20	0	1,843	+ 20	− 20	0
J	1,980	0	− 17	− 17	1,829	0	− 16	− 16
K	2,005	0	− 22	− 22	1,825	0	− 20	− 20
L	2,040	0	− 50	− 50	1,820	0	− 44	− 44
M	2,010	0	−114	−114	1,740	0	− 98	− 98
N	1,870	0	− 96	− 96	1,690	0	− 88	− 88
O	1,795	0	− 95	− 95	1,693	0	− 94	− 94
18	.....	.....	.....	− 18	.....	.....	.....	− 17
17	.....	.....	.....	− 20	.....	.....	.....	− 16
16	.....	.....	.....	− 20	.....	.....	.....	− 16
15	.....	.....	.....	− 18	.....	.....	.....	− 16
14	.....	.....	.....	− 18	.....	.....	.....	− 16
13	.....	.....	.....	− 33*	.....	.....	.....	− 31*
12	.....	.....	.....	− 28*	.....	.....	.....	− 26*
11	.....	.....	.....	− 21*	.....	.....	.....	− 20*
10	.....	.....	.....	− 15*	.....	.....	.....	− 14*
9	.....	.....	.....	− 11*	.....	.....	.....	− 11*
8	.....	.....	.....	− 4*	.....	.....	.....	− 5*
7	.....	.....	.....	+ 5*	.....	.....	.....	+ 5*
6	.....	.....	.....	+ 7*	.....	.....	.....	+ 8*
5	.....	.....	.....	+ 10*	.....	.....	.....	+ 10*
4	.....	.....	.....	+ 6*	.....	.....	.....	+ 5*
3	.....	.....	.....	+ 3*	.....	.....	.....	+ 3*
2	.....	.....	.....	+ 2*	.....	.....	.....	+ 2*
1	.....	.....	.....	+ 1*	.....	.....	.....	+ 1*
Total				+ 14				+ 57

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Yorkton, Saskatchewan, No. 79				Elbow, Saskatchewan, No. 80			
A	1,650	+ 2	0	+ 2	1,929	+ 2	0	+ 2
B	1,655	+ 64	0	+ 64	1,935	+ 66	0	+ 66
C	1,655	+130	0	+130	1,934	+138	0	+138
D	1,660	+154	0	+154	1,931	+176	0	+176
E	1,657	+ 96	0	+ 96	1,920	+128	− 5	+123
F	1,662	+ 45	− 2	+ 43	1,880	+ 63	− 8	+ 55
G	1,665	+ 20	− 4	+ 16	1,855	+ 31	− 9	+ 22
H	1,665	+ 16	− 16	0	1,868	+ 16	− 16	0
I	1,661	+ 20	− 20	0	1,900	+ 20	− 20	0
J	1,661	0	− 16	− 16	1,910	0	− 16	− 16
K	1,676	0	− 20	− 20	1,904	0	− 20	− 20
L	1,698	0	− 41	− 41	1,940	0	− 47	− 47
M	1,620	0	− 91	− 91	1,920	0	−110	−110
N	1,635	0	− 86	− 86	1,796	0	− 92	− 92
O	1,810	0	− 98	− 98	1,976	0	−100	−100
18	.....	.....	.....	− 16	.....	.....	.....	− 21
17	.....	.....	.....	− 14	.....	.....	.....	− 21*
16	.....	.....	.....	− 14	.....	.....	.....	− 21*
15	.....	.....	.....	− 15	.....	.....	.....	− 22*
14	.....	.....	.....	− 17*	.....	.....	.....	− 22*
13	.....	.....	.....	− 30*	.....	.....	.....	− 37*
12	.....	.....	.....	− 24*	.....	.....	.....	− 31*
11	.....	.....	.....	− 19*	.....	.....	.....	− 24*
10	.....	.....	.....	− 14*	.....	.....	.....	− 16*
9	.....	.....	.....	− 11*	.....	.....	.....	− 11*
8	.....	.....	.....	− 5*	.....	.....	.....	− 1*
7	.....	.....	.....	+ 4*	.....	.....	.....	+ 5*
6	.....	.....	.....	+ 7*	.....	.....	.....	+ 7*
5	.....	.....	.....	+ 10*	.....	.....	.....	+ 10*
4	.....	.....	.....	+ 6*	.....	.....	.....	+ 6*
3	.....	.....	.....	+ 3*	.....	.....	.....	+ 3*
2	.....	.....	.....	+ 2*	.....	.....	.....	+ 2*
1	.....	.....	.....	+ 1*	.....	.....	.....	+ 1*
Total				+ 7				+ 4

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Swift Current, Saskatchewan, No. 81				Bassano, Alberta, No. 82			
A	2,498	+ 2	0	+ 2	2,601	+ 2	0	+ 2
B	2,498	+ 67	0	+ 67	2,595	+ 66	0	+ 66
C	2,495	+148	0	+148	2,600	+149	0	+149
D	2,463	+207	0	+207	2,600	+216	0	+216
E	2,483	+184	− 8	+176	2,600	+192	− 8	+184
F	2,474	+101	− 10	+ 91	2,603	+110	− 10	+100
G	2,492	+ 48	− 12	+ 36	2,610	+ 54	− 12	+ 42
H	2,537	+ 32	− 16	+ 16	2,623	+ 36	− 16	+ 20
I	2,588	+ 20	− 20	0	2,638	+ 20	− 20	0
J	2,600	+ 14	− 30	− 16	2,610	+ 11	− 27	− 16
K	2,500	0	− 30	− 30	2,686	0	− 34	− 34
L	2,500	0	− 60	− 60	2,740	0	− 66	− 66
M	2,430	+ 10	−147	−137	2,740	+ 10	−164	−154
N	2,420	0	−125	−125	2,820	0	−144	−144
O	2,420	0	−115	−115	3,070	0	−143	−143
18	...	...	...	− 24	...	...	...	− 38
17	...	...	...	− 23	...	...	...	− 39
16	...	...	...	− 23	...	...	...	− 41
15	...	...	...	− 25	...	...	...	− 40*
14	...	...	...	− 24	...	...	...	− 37*
13	...	...	...	− 41	...	...	...	− 58*
12	...	...	...	− 36	...	...	...	− 39*
11	...	...	...	− 27	...	...	...	− 26*
10	...	...	...	− 17	...	...	...	− 16*
9	...	...	...	− 12	...	...	...	− 7*
8	...	...	...	0*	...	...	...	+ 4*
7	...	...	...	+ 5*	...	...	...	+ 5*
6	...	...	...	+ 7*	...	...	...	+ 7*
5	...	...	...	+ 10*	...	...	...	+ 10*
4	...	...	...	+ 6*	...	...	...	+ 6*
3	...	...	...	+ 3*	...	...	...	+ 3*
2	...	...	...	+ 2*	...	...	...	+ 2*
1	...	...	...	+ 1*	...	...	...	+ 1*
Total				+ 42				− 81

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Tables is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Red Deer, Alberta, No. 83				Coronation, Alberta, No. 84			
A	2,810	+ 2	0	+ 2	2,593	+ 2	0	+ 2
B	2,815	+ 66	0	+ 66	2,599	+ 66	0	+ 66
C	2,816	+150	0	+150	2,599	+149	0	+149
D	2,818	+228	0	+228	2,575	+215	0	+215
E	2,843	+217	− 8	+209	2,581	+190	− 8	+182
F	2,864	+121	− 10	+111	2,573	+107	− 10	+ 97
G	2,891	+ 66	− 12	+ 54	2,565	+ 51	− 12	+ 39
H	2,908	+ 45	− 16	+ 29	2,580	+ 35	− 16	+ 19
I	2,961	+ 20	− 20	0	2,566	+ 20	− 20	0
J	2,980	+ 16	− 32	− 16	2,551	+ 9	− 25	− 16
K	3,034	+ 1	− 41	− 40	2,553	0	− 31	− 31
L	3,130	+ 4	− 75	− 71	2,572	0	− 62	− 62
M	3,064	+ 5	−183	−178	2,500	+ 7	−148	−141
N	3,025	0	−154	−154	2,525	0	−130	−130
O	3,210	0	−150	−150	2,460	0	−116	−116
18	...	...	...	− 41	...	...	...	− 26
17	...	...	...	− 39	...	...	...	− 26
16	...	...	...	− 39	...	...	...	− 27
15	...	...	...	− 41	...	...	...	− 27
14	...	...	...	− 38*	...	...	...	− 32*
13	...	...	...	− 53*	...	...	...	− 48*
12	...	...	...	− 32*	...	...	...	− 32*
11	...	...	...	− 24*	...	...	...	− 25*
10	...	...	...	− 15*	...	...	...	− 15*
9	...	...	...	− 5*	...	...	...	− 8*
8	...	...	...	+ 4*	...	...	...	+ 2*
7	...	...	...	+ 5*	...	...	...	+ 4*
6	...	...	...	+ 6*	...	...	...	+ 6*
5	...	...	...	+ 9*	...	...	...	+ 10*
4	...	...	...	+ 6*	...	...	...	+ 6*
3	...	...	...	+ 3*	...	...	...	+ 3*
2	...	...	...	+ 3*	...	...	...	+ 3*
1	...	...	...	+ 1*	...	...	...	+ 1*
Total				− 50				+ 42

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Paradise Mine, British Columbia, No. 85				Invermere, British Columbia, No. 86			
A	7,470	+ 2	0	+ 2	2,615	+ 2	0	+ 2
B	7,463	+ 62	0	+ 62	2,725	+ 64	0	+ 64
C	7,508	+163	− 4	+159	2,726	+150	0	+150
D	7,940	+303	− 6	+297	2,705	+220	0	+220
E	8,025	+463	− 16	+447	2,716	+208	− 8	+200
F	7,180	+431	− 20	+411	2,710	+113	− 10	+103
G	6,750	+286	− 25	+261	2,860	+ 57	− 12	+ 45
H	6,730	+207	− 34	+173	3,006	+ 36	− 16	+ 20
I	6,665	+177	− 55	+122	3,600	+ 18	− 34	− 16
J	6,415	+103	− 67	+ 36	4,660	+ 18	− 52	− 34
K	6,135	+ 84	−104	− 20	6,475	− 15	−110	−125
L	6,600	+ 54	−156	−102	6,125	− 7	−142	−149
M	5,730	+ 55	−335	−280	6,790	− 16	−394	−410
N	6,560	+ 24	−347	−323	6,530	+ 12	−344	−332
O	5,600	0	−273	−273	5,560	0	−270	−270
18	.....	.....	.....	− 50	.....	.....	.....	− 48
17	.....	.....	.....	− 46	.....	.....	.....	− 50
16	.....	.....	.....	− 42	.....	.....	.....	− 43
15	.....	.....	.....	− 39	.....	.....	.....	− 44*
14	.....	.....	.....	− 44*	.....	.....	.....	− 45*
13	.....	.....	.....	− 62*	.....	.....	.....	− 63*
12	.....	.....	.....	− 33*	.....	.....	.....	− 34*
11	.....	.....	.....	− 23*	.....	.....	.....	− 23*
10	.....	.....	.....	− 12*	.....	.....	.....	− 12*
9	.....	.....	.....	− 3*	.....	.....	.....	− 3*
8	.....	.....	.....	+ 6*	.....	.....	.....	+ 6*
7	.....	.....	.....	+ 5*	.....	.....	.....	+ 5*
6	.....	.....	.....	+ 6*	.....	.....	.....	+ 6*
5	.....	.....	.....	+ 9*	.....	.....	.....	+ 9*
4	.....	.....	.....	+ 6*	.....	.....	.....	+ 6*
3	.....	.....	.....	+ 3*	.....	.....	.....	+ 3*
2	.....	.....	.....	+ 2*	.....	.....	.....	+ 2*
1	.....	.....	.....	+ 1*	.....	.....	.....	+ 1*
	Total			+656				−859

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Vernon, British Columbia, No. 87				Barkerville, British Columbia, No. 88			
A	1,236	+ 2	0	+ 2	4,227	+ 2	0	+ 2
B	1,240	+ 62	0	+ 62	4,235	+ 66	0	+ 66
C	1,243	+112	0	+112	4,275	+159	0	+159
D	1,257	+111	0	+111	4,396	+275	− 6	+269
E	1,334	+ 62	0	+ 62	4,556	+320	− 8	+312
F	1,450	+ 24	0	+ 24	4,745	+219	− 13	+206
G	1,580	+ 4	− 2	+ 2	4,850	+115	− 19	+ 96
H	1,740	+ 12	− 16	− 4	4,830	+ 81	− 25	+ 56
I	2,000	+ 5	− 21	− 16	5,010	+ 57	− 40	+ 17
J	2,460	+ 2	− 27	− 25	4,860	+ 36	− 49	− 13
K	3,000	− 30	− 40	− 70	4,640	+ 34	− 78	− 44
L	3,250	− 5	− 78	− 83	4,200	+ 21	−103	− 82
M	3,620	− 7	−212	−219	4,240	+ 15	−248	−233
N	4,210	+ 7	−222	−215	4,570	+ 8	−242	−234
O	4,030	0	−197	−197	4,530	0	−219	−219
18				− 42				− 47
17				− 42				− 45
16				− 44				− 45
15				− 42				− 43
14				− 38				− 45
13				− 53				− 63
12				− 28				− 25
11				− 17*				− 12
10				− 9*				− 1
9				0*				+ 2
8				+ 7*				+ 6
7				+ 5*				+ 4*
6				+ 6*				+ 6*
5				+ 9*				+ 9*
4				+ 7*				+ 7*
3				+ 3*				+ 3*
2				+ 2*				+ 3*
1				+ 1*				+ 1*
Total				−729				+ 73

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Tyaughton Creek, B.C., No. 89				Union Bay, British Columbia, No. 90			
A	2,084	+ 2	0	+ 2	10	+ 2	0	+ 2
B	2,098	+ 64	0	+ 64	16	+ 1	0	+ 1
C	2,140	+136	0	+136	25	0	0	0
D	2,218	+177	0	+177	22	− 1	0	− 1
E	2,470	+133	− 8	+125	50	− 3	0	− 3
F	3,025	+ 47	− 10	+ 37	60	0	0	0
G	3,608	+ 13	− 14	− 1	117	0	0	0
H	4,160	− 6	− 20	− 26	250	0	0	0
I	4,933	− 32	− 43	− 75	279	0	− 1	− 1
J	5,860	− 18	− 62	− 80	350	0	− 4	− 4
K	6,065	− 20	−107	−127	1,360	− 3	− 21	− 24
L	6,600	− 14	−156	−170	1,674	− 3	− 41	− 44
M	6,000	− 17	−349	−366	2,140	− 7	−128	−135
N	4,400	+ 7	−233	−226	2,220	− 1	−114	−115
O	3,900	0	−193	−193	1,810	0	− 95	− 95
18				− 29				− 20
17				− 29				− 13
16				− 38				− 13
15				− 38				− 7
14				− 28				− 6
13				− 36				− 7
12				− 13				− 3
11				− 5				0
10				− 1				+ 2
9				+ 4*				+ 7*
8				+ 8*				+ 9*
7				+ 5*				+ 5*
6				+ 6*				+ 7*
5				+ 9*				+ 9*
4				+ 7*				+ 7*
3				+ 3*				+ 3*
2				+ 2*				+ 2*
1				+ 1*				+ 1*
Total				−895				−436

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Cloverdale, British Columbia, No. 91				Victoria, British Columbia, No. 92			
A	10	+ 2	0	+ 2	219	+ 2	0	+ 2
B	14	0	0	0	215	+ 51	0	+ 51
C	15	0	0	0	148	+ 16	0	+ 16
D	20	0	0	0	51	+ 3	0	+ 3
E	40	0	0	0	− 14	− 1	0	− 1
F	71	0	0	0	− 27	0	0	0
G	62	0	0	0	− 62	0	0	0
H	58	0	0	0	− 73	0	0	0
I	144	0	0	0	− 61	0	0	0
J	146	0	0	0	− 25	0	− 1	− 1
K	100	0	− 5	− 5	− 25	0	− 1	− 1
L	63	0	− 6	− 6	17	0	− 2	− 2
M	766	− 3	− 51	− 54	560	0	− 31	− 31
N	1,870	+ 1	−100	− 99	813	0	− 43	− 43
O	3,090	0	−156	−156	1,590	0	− 79	− 79
18	...	...	...	− 35	...	...	...	− 19
17	...	...	...	− 29	...	...	...	− 18
16	...	...	...	− 24	...	...	...	− 19
15	...	...	...	− 18*	...	...	...	− 12
14	...	...	...	− 17*	...	...	...	− 10
13	...	...	...	− 30*	...	...	...	− 12
12	...	...	...	− 15*	...	...	...	− 12
11	...	...	...	− 9*	...	...	...	− 7
10	...	...	...	− 3*	...	...	...	+ 5
9	...	...	...	+ 5*	...	...	...	+ 3
8	...	...	...	+ 9*	...	...	...	+ 10*
7	...	...	...	+ 5*	...	...	...	+ 6*
6	...	...	...	+ 7*	...	...	...	+ 7*
5	...	...	...	+ 9*	...	...	...	+ 9*
4	...	...	...	+ 7*	...	...	...	+ 7*
3	...	...	...	+ 3*	...	...	...	+ 3*
2	...	...	...	+ 2*	...	...	...	+ 2*
1	...	...	...	+ 1*	...	...	...	+ 1*
Total				−450				−142

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Banfield, British Columbia, No. 93				Nootka, British Columbia, No. 94			
A	30	+ 2	0	+ 2	75	+ 2	0	+ 2
B	25	+ 4	0	+ 4	39	+ 11	0	+ 11
C	− 6	− 2	0	− 2	− 9	0	0	0
D	− 40	− 3	0	− 3	− 91	− 3	0	− 3
E	− 31	− 3	0	− 3	−138	− 5	0	− 5
F	5	0	0	0	− 88	0	0	0
G	342	0	0	0	− 40	0	0	0
H	403	0	0	0	77	0	0	0
I	390	0	0	0	175	0	0	0
J	250	0	− 5	− 5	300	0	− 6	− 6
K	273	0	− 6	− 6	462	0	− 10	− 10
L	272	0	− 8	− 8	456	0	− 12	− 12
M	808	0	− 51	− 51	1,190	− 4	− 66	− 70
N	928	− 1	− 53	− 54	1,002	− 3	− 68	− 71
O	−783	0	+ 8	+ 8	−2,380	0	+ 56	+ 56
18	.....	.....	.....	0	.....	.....	.....	+ 1
17	.....	.....	.....	0	.....	.....	.....	+ 4
16	.....	.....	.....	+ 2	.....	.....	.....	+ 4
15	.....	.....	.....	− 5	.....	.....	.....	+ 2*
14	.....	.....	.....	− 5	.....	.....	.....	+ 2*
13	.....	.....	.....	+ 1	.....	.....	.....	+ 8*
12	.....	.....	.....	− 1	.....	.....	.....	+ 5*
11	.....	.....	.....	− 1	.....	.....	.....	+ 6*
10	.....	.....	.....	+ 4	.....	.....	.....	+ 6*
9	.....	.....	.....	+ 5	.....	.....	.....	+ 7*
8	.....	.....	.....	+ 10*	.....	.....	.....	+ 9*
7	.....	.....	.....	+ 6*	.....	.....	.....	+ 6*
6	.....	.....	.....	+ 7*	.....	.....	.....	+ 7*
5	.....	.....	.....	+ 9*	.....	.....	.....	+ 8*
4	.....	.....	.....	+ 7*	.....	.....	.....	+ 7*
3	.....	.....	.....	+ 3*	.....	.....	.....	+ 3*
2	.....	.....	.....	+ 2*	.....	.....	.....	+ 2*
1	.....	.....	.....	+ 1*	.....	.....	.....	+ 1*
Total				− 73				− 20

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Quatsino, British Columbia, No. 95				Prince Rupert, British Columbia, No. 96			
A	41	+ 2	0	+ 2	79	+ 2	0	+ 2
B	29	+ 6	0	+ 6	89	+ 17	0	+ 17
C	30	0	0	0	86	+ 4	0	+ 4
D	10	− 3	0	− 3	68	0	0	0
E	− 53	− 4	0	− 4	− 2	0	0	0
F	45	0	0	0	98	0	0	0
G	323	0	0	0	493	− 3	0	− 3
H	∠1,000	0	0	0	255	0	0	0
I	∠1,000	0	0	0	∠1,000	0	0	0
J	750	0	− 13	− 13	500	0	− 8	− 8
K	1,500	0	− 20	− 20	300	0	− 6	− 6
L	1,500	0	− 36	− 36	331	0	− 11	− 11
M	995	− 2	− 63	− 65	1,077	− 3	− 67	− 70
N	94	0	− 15	− 15	1,520	− 1	− 81	− 82
O	−905	0	+ 2	+ 2	1,360	0	− 73	− 73
18	.....	.....	.....	+ 1	.....	.....	.....	− 21
17	.....	.....	.....	+ 5	.....	.....	.....	− 21
16	.....	.....	.....	+ 3	.....	.....	.....	− 23
15	.....	.....	.....	+ 5	.....	.....	.....	− 18
14	.....	.....	.....	+ 4	.....	.....	.....	− 9
13	.....	.....	.....	+ 12	.....	.....	.....	− 8
12	.....	.....	.....	+ 9	.....	.....	.....	+ 5
11	.....	.....	.....	+ 10	.....	.....	.....	+ 10
10	.....	.....	.....	+ 8	.....	.....	.....	+ 12
9	.....	.....	.....	+ 9	.....	.....	.....	+ 5
8	.....	.....	.....	+ 9*	.....	.....	.....	+ 6*
7	.....	.....	.....	+ 6*	.....	.....	.....	+ 6*
6	.....	.....	.....	+ 7*	.....	.....	.....	+ 6*
5	.....	.....	.....	+ 8*	.....	.....	.....	+ 8*
4	.....	.....	.....	+ 7*	.....	.....	.....	+ 8*
3	.....	.....	.....	+ 3*	.....	.....	.....	+ 3*
2	.....	.....	.....	+ 2*	.....	.....	.....	+ 2*
1	.....	.....	.....	+ 1*	.....	.....	.....	+ 1*
	Total			− 37				−258

*These values have been interpolated from those obtained for neighbouring stations.

TABLE VIII—*Continued*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Stewart, British Columbia, No. 97				Masset, British Columbia, No. 98			
A	44	+ 2	0	+ 2	30	+ 2	0	+ 2
B	45	+ 12	0	+ 12	30	+ 8	0	+ 8
C	55	+ 2	0	+ 2	30	0	0	0
D	100	0	0	0	10	0	0	0
E	356	− 7	0	− 7	− 6	0	0	0
F	1,090	− 26	− 2	− 28	138	0	0	0
G	2,580	− 60	− 8	− 68	250	0	0	0
H	2,460	− 32	− 13	− 45	211	0	0	0
I	2,875	− 38	− 25	− 63	131	0	0	0
J	3,125	− 18	− 32	− 50	120	0	− 3	− 3
K	4,375	− 17	− 67	− 84	105	0	− 3	− 3
L	5,000	− 26	−115	−141	− 37	0	− 1	− 1
M	4,380	− 19	−258	−277	−186	0	+ 1	+ 1
N	3,410	− 3	−178	−181	−775	0	+ 26	+ 26
O	2,720	0	−135	−135	−2,150	0	+ 59	+ 59
18				− 32				+ 4
17				− 32				+ 7
16				− 30				+ 10
15				− 29				+ 11
14				− 27				+ 9
13				− 30				+ 17
12				− 7				+ 12
11				+ 3				+ 16
10				+ 7				+ 13
9				+ 6				+ 7
8				+ 5*				+ 7
7				+ 5*				+ 6
6				+ 6*				+ 6
5				+ 8*				+ 8
4				+ 8*				+ 8
3				+ 3*				+ 3
2				+ 3*				+ 2
1				0				+ 1
Total				−1,196				+236

*These values have been interpolated from those obtained for neighbouring stations

TABLE VIII—*Concluded*

The unit for the corrections in this Table is ·0001 dyne.

Zone	Elevation in Feet	Topography	Compensation	Topography and Compensation
	Ocean Falls, British Columbia, No. 99			
A	60	+ 2	0	+ 2
B	58	+ 8	0	+ 8
C	74	+ 1	0	+ 1
D	188	− 3	0	− 3
E	466	− 12	0	− 12
F	1,000	− 15	0	− 15
G	1,500	− 12	0	− 12
H	1,500	− 16	− 16	− 32
I	1,500	− 20	− 20	− 40
J	1,500	0	− 16	− 16
K	1,500	0	− 20	− 20
L	1,500	0	− 36	− 36
M	1,750	− 5	−105	−110
N	2,230	− 4	−117	−121
O	2,310	0	−119	−119
18	.....	.....	.....	− 22
17	.....	.....	.....	− 21
16	.....	.....	.....	− 22
15	.....	.....	.....	− 19
14	.....	.....	.....	− 16
13	.....	.....	.....	− 6
12	.....	.....	.....	+ 1
11	.....	.....	.....	+ 6
10	.....	.....	.....	+ 9
9	.....	.....	.....	+ 8
8	.....	.....	.....	+ 7*
7	.....	.....	.....	+ 6*
6	.....	.....	.....	+ 6*
5	.....	.....	.....	+ 8*
4	.....	.....	.....	+ 8*
3	.....	.....	.....	+ 3*
2	.....	.....	.....	+ 2*
1	.....	.....	.....	+ 1*
Total				−566

*These values have been interpolated from those obtained for neighbouring stations.

DESCRIPTIONS OF STATIONS

No. 52, Dauphin, Man. (1924).—The pendulum was set up in the northeasterly corner of the furnace room in the basement of St. Paul's church at the SE. corner of 1st St. SW. and 4th Avenue SW. The point is 93 feet in an easterly direction along 4th Avenue SW and 33 feet in a southerly direction, parallel to 1st Street SW., from the street corner mentioned. It was 4 feet 4 inches below the level of the rail in front of the C.N.R. station.

No. 53, Swan River, Man. (1924).—The pendulum was set up in the northeast corner of the basement of Mr. Agnew's drug store (lot 19 town of Swan River). By scaling from the plan of the town of Swan River the point was found to be 706 feet south and 1,380 feet east of the quarter-section corner on the east boundary of sec. 20, tp. 36, rge. 27, W. Pr. mer. It is 8 feet below the level of the rail in front of the C.N.R. station.

No. 54, The Pas, Man. (1924).—The pendulum was set up in the east end of the room on the south side of the basement of The Pas school. By scaling from the plan of The Pas the point was found to be 666 feet south, and 5,415 feet west of the I.P.M. near (20 chains south) the NW. cor,. sec. 11, tp. 56, rge. 26, W. Pr. mer. It is 8 feet 8 inches below the level of the Topographical Survey bench-mark on the southerly abutment of the railway bridge across Saskatchewan river.

No. 55, Prince Albert, Sask. (1924).—The pendulum was set up in the west end of sample room No. 6 on the south side of the basement of the Empress hotel at the corner of 11th St. and 1st Ave. W. By scaling from the plan of the city, the point was found to be 3,369 feet south and 35 feet east of the quarter-section corner on the east boundary of sec. 9, tp. 49, rge. 26, W. 2nd mer. It is 15 feet below the elevation of the rail in front of the C.N.R. station.

No. 56, Saskatoon, Sask. (1924).—The pendulum was set up in the southwest corner of the Physics laboratory in the southwest corner of the basement of the Physics building. The point is 782 feet north and 2,375 feet west of the southeast corner of sec. 34, tp. 36, rge. 5, W. 3rd mer., and its elevation, referred to the levels of the Geodetic Survey, is 1,629 feet. The information regarding the position and elevation of the station was supplied by the Engineering department of the University of Saskatchewan.

No. 57, Vermilion, Alta. (1924).—The pendulum was set up in the east side of the basement of Vermilion town hall. By scaling from the plan of Vermilion the point was found to be 1,354 feet north and 1,070 feet east of the northwest corner of sec. 29, tp. 50, rge. 6, W. 4th mer. It is 14 feet 7 inches below the level of the rail in front of the C.N.R. station.

No. 58, Edmonton, Alta. (1924).—The pendulum was set up in the southwest corner of the Physics laboratory, about 54 feet north and 7 feet east of the southwest corner of the south wing of the Arts building of the University of Alberta. The point was found to be 16 feet 6 inches below the elevation of the city bench-mark in front of Alberta College and also about 6 feet 4 inches below the level of the floor of the Industrial building of the University. The equation between the levels of the city and the Geodetic Survey was obtained by comparison of their bench-marks in the Edmonton post office.

No. 59, Grande Prairie, Alta. (1924).—The pendulum was set up in the south end of the basement in Grande Prairie school, about 10 feet north and 10 feet east of the southwest corner of the building. By scaling from a plan of Grande Prairie the point

was found to be 432 feet north and 791 feet east of the southwest corner of sec. 25, tp. 71, rge. 6, W. 6th mer. It is 4 inches below the Topographical Survey bench-mark on the grounds of the Dominion Lands office.

No. 60, Kinuso, Alta. (1924).—The pendulum was set up on a concrete block about 6 feet by 3·5 feet built for a gasoline engine base in the south end of the basement of Mr. H. Walker's store. By scaling from the plan of Kinuso the point was found to be 860 feet north and 620 feet east of the northeast corner of sec. 15, tp. 73, rge. 10, W. 5th mer. It is 7 feet 6 inches below the level of the rail in front of the E.D. & B.C. railway.

No. 61, Lac la Biche, Alta. (1924).—The pendulum was set up in the south side of the billiard room in the basement of the Lac la Biche inn. By scaling from the plan of lots 42 to 79 of Lac la Biche settlement the point was found to be 1,230 feet south and 1,700 feet west of the northerly I.P.M. on the eastern boundary of the Hudson's Bay Company's reserve. It is 35 feet below the level of the rail in front of the A. & G.W. railway station.

No. 62, Waterways, Alta. (1924).—The pendulum was set on a concrete block erected in the north end of a log building, the property of the A. & G.W. railway on the northeast corner of lot 8. By scaling from the railway plan the point was found to be 141 feet south and 951 feet west of the quarter-section corner on the east boundary of sec. 31, tp. 88, rge. 8, W. 5th mer. It is 7 inches below the level of the rail in front of the A. & G.W. railway station.

No. 63, Edson, Alta. (1924).—The pendulum was set up in the south end of the room in the northeast corner of the basement of Edson school. By scaling from the plan of Edson the point was found to be 780 feet north and 4,540 feet west of the northeast corner of sec. 15, tp. 53, rge. 17, W. 5th mer. It is 5 feet 5 inches below the Geodetic Survey bench-mark in the west wall of the school.

No. 64, Jasper, Alta. (1924).—The pendulum was set up in the south side of the basement of the Administration building of Jasper Park. By measurement on the ground the point was found to be about 175 yards east of the Topographical Survey monument marked R7-191-3 on the south side of the street. It was 7 feet 7 inches below the Geodetic Survey bench-mark on the wall of the office.

No. 65, Mt. Olie, B.C. (1924).—The pendulum was set up in the southeast corner of Mr. La Virtue's store. This building is shown on the Geological Survey map (Publication No. 1997). It is the second house from the river on the south side of the road from the ferry and is shown at the first road corner from the river. The point was 1·5 feet above the level of the rail in front of the C. N. R. station.

No. 66, Princeton, B.C. (1924).—The pendulum was placed in the northerly end of the store-room in the basement of the Princeton hotel. It was 6 feet 3 inches below the level of the Geodetic Survey bench-mark on the traffic bridge.

No. 67, Phoenix, B.C. (1924).—The pendulum was set up in the northeast corner of the store-room in the north end of the office building of the Granby Mining and Smelting Company, near the western end of Old Ironsides avenue. The point was 66 feet below the level of the rail in front of the C. P. R. station.

No. 68, Nelson, B.C. (1924).—The pendulum was set up in the north end of the examination warehouse of the Customs Department, this building being a one-storey

annex on the south side of Nelson post office. The point is 75 feet south and 22 feet east of the post office corner on Vernon and Ward streets and is estimated to be 3 feet above the Geodetic Survey bench-mark which was placed in the building during the season of 1925.

No. 69, Cranbrook, B.C. (1924).—The pendulum was placed in the west end of the hallway in the south end of the basement of Cranbrook post office, 55 feet south and 40 feet west of the southwest corner of Baker street and Norbury avenue. It is 8 feet 2 inches below the level of the Geodetic Survey bench-mark on the north side of the building.

No. 70, Blairmore, Alta. (1924).—The pendulum was set up in the south end of the room in the southeast corner of the basement of the Cosmopolitan hotel. The point is 6 feet north and 25 feet east of the corner of the hotel building on Sixth and Victoria streets, and is 13 feet 8 inches below the level of the rail in front of the C. P. R. station.

No. 71, Lethbridge, Alta. (1924).—The pendulum was placed in the basement store-room next to and just west of the motor-room in the basement of the Lethbridge post office. The point is 70 feet east and 5 feet south of the northwest corner of the building on Seventh street. It is 5 feet below the Geodetic Survey bench-mark on the west side of the post office.

No. 72, Riverton, Man. (1925).—The pendulum was set up on the concrete floor of Sigurdson & Thorvaldson Company's warehouse, about 1,500 feet north and 1,620 feet west of the northeast corner of sec. 17, tp. 23, rge. 4, E. Pr. mer. The point is 13 inches above the level of the rail in front of the C. P. R. station.

No. 73, Gypsumville, Man. (1925).—The pendulum was set up in the northwest corner of the granary belonging to the Manitoba Gypsum Company. By measurement on the ground the point was found to be 480 feet north and 765 feet west of the quarter-section corner on the north boundary of sec. 23, tp. 32, rge. 9, W. Pr. mer. It is 3 feet above the level of the rail in front of the C. N. R. station.

No. 74, Manitou, Man. (1925).—The point where the pendulum was set up at Manitou is in the southeasterly corner of the furnace room of the Normal school. By scaling from the plan of Manitou it was found to be 682 feet north and 1,250 feet east of the northeast corner of sec. 24, tp. 3, rge. 9, W. Pr. mer. It is 18 feet 4 inches above the level of the rail in front of the C. P. R. station.

No. 75, Melita, Man. (1925).—The pendulum was set up in the easterly end of the basement vault of the Municipal hall. By scaling from the plan of Melita the point was found to be 1,823 feet north and 1,429 feet west of the northeast corner of sec. 36, tp. 3, rge. 27, W. Pr. mer. It is 36 feet 5 inches above the level of the rail in front of the C. P. R. station.

No. 76, Estevan, Sask. (1925).—The pendulum was set up in the north side of the basement of Estevan post office. By scaling from the plan of Estevan the point was found to be 2,089 feet south and 1,377 feet east of the quarter-section corner on the north boundary of sec. 22, tp. 2, rge. 8, W. 2nd mer. It is 6 feet 3 inches below the Geodetic Survey bench-mark in the north side of the building.

No. 77, Indian Head, Sask. (1925).—The pendulum was set up in the northwesterly corner of the basement of Indian Head fire-hall. By scaling from the plan of Indian

Head the point was found to be 3,415 feet south and 2,700 feet west of the northeast corner of sec. 24, tp. 18, rge. 13, W. 2nd mer. It is 17 feet below the level of the rail in front of the C.P.R. station.

No. 78, Moosomin, Sask. (1925).—The pendulum was set up in the northwest portion of the basement of Moosomin High school. By scaling from the plan of Moosomin the point was found to be 1,455 feet north and 843 feet east of the southwest corner of sec. 33, tp. 13, rge. 31, W. Pr. mer. It is at the same height as the rail in front of the C.P.R. station.

No. 79, Yorkton, Sask. (1925).—The pendulum was set up in the west side of the basement of Yorkton post office. By scaling from the plan of Yorkton the point was found to be 324 feet north and 669 feet east of the quarter-section corner on the south boundary of sec. 2, tp. 26, rge. 4, W. 2nd mer. It is 6 feet 7 inches below the Geodetic Survey bench-mark on the front wall of the building.

No. 80, Elbow, Sask. (1925).—The pendulum was set up in the northeasterly corner of the basement on the southerly side of Elbow school. By scaling from the plan of Elbow the point was found to be 2,225 feet south and 1,740 feet west of the northeast corner of sec. 11, tp. 25, rge. 5, W. 3rd mer. It is 3 feet 5 inches below the level of the rail in front of the C.P.R. station.

No. 81, Swift Current, Sask. (1925).—The pendulum was set up in the southwest corner of the men's cell room in the basement of the court-house at the corner of Lorne St. and 1st Ave. W. By scaling from the plan of Swift Current the point was found to be 3,340 feet north and 2,387 feet west of the southeast corner of sec. 25, tp. 15, rge. 14, W. 3rd mer. It is 4 feet 6 inches below the Geodetic Survey bench-mark on the east wall of the building.

No. 82, Bassano, Alta. (1925).—The point at Bassano is on the west side of the furnace in the basement of Bassano Public school. By scaling from the plan of Bassano the pier was found to be 234 feet north and 748 feet east of the southwest corner of sec. 20, tp. 21, rge. 18, W. 4th mer. It is 4 inches above the Geodetic Survey bench-mark in the north wall of Bassano post office.

No. 83, Red Deer, Alta. (1925).—The pendulum was set up in the first room at the bottom of the landing in the south side of the basement of the armouries. The point was 25 feet north and 39 feet west of the intersection of the north boundary of 1st Ave. W. with the west boundary of 2nd St. E. and by scaling from the plan of Red Deer was found to be 2,130 feet south and 1,066 feet east of the northwest corner of sec. 16, tp. 38, rge. 27, W. 4th mer. It is 9 feet 2 inches below the level of the rail in front of the C.P.R. station.

No. 84, Coronation, Alta. (1925).—The pendulum was set up in the north side of the southwesterly room in the basement of Coronation Public school and was approximately 90 feet northerly and 150 feet easterly from the near corner of King and Norfolk streets. By scaling from the plan of Coronation the point was found to be 630 feet north and 90 feet east of the centre of sec. 13, tp. 36, rge. 11, W. 4th mer. It is 5 feet 11 inches above the level of the rail in front of the C.P.R. station.

No. 85, Paradise Mine, B.C. (1925).—The pendulum pier was a concrete block erected for the purpose in the northeasterly corner of the men's small bunk-house on the sidehill. Owing to its once having been occupied by members of a moving picture

cast the building was locally known as "Seena's Palace". It is roughly about 250 feet west of the Paradise Mine office building shown at the end of the road on Map 165A (Windermere), published by the Geological Survey. The elevation of the pier was obtained by angular measurement taken to the pier and to the peaks of Mounts Nelson and Coppercrown from two points on the rim of Paradise basin. The positions of these points with respect to the pier were determined by laying out a base line of 739 feet in the basin and by measurement of the required angles with a theodolite, which was also used to measure the angles already referred to.

No. 86, Invermere, B.C. (1925).—The pendulum was set up in the south end of the east room in the basement of Invermere hotel. The point is approximately 150 feet north and 120 feet west of the astronomical pier. The elevation of the point, which may be a few feet in error, was obtained from a contour map with 10-foot intervals supplied by the Columbia Valley Irrigation office. The equation between the levels shown on this map and those of the Geodetic Survey depends upon the elevation of lake Windermere.

No. 87, Vernon, B.C. (1925).—The pendulum was set up in the northeast corner of the main basement of Vernon post office. It is 7 feet below the Geodetic Survey bench-mark in the east wall of the building.

No. 88, Barkerville, B.C. (1925).—The pendulum pier is a concrete block erected for the purpose in a small log house belonging to Mrs. L. M. McKinnon. It is about 925 feet southwesterly along Main street and 100 feet southeasterly from the English church. The elevation of the pier was determined by aneroid readings from the bench-mark of the Geological Survey at the end near Hospital lakes of the Williams Creek base line, and also by measuring, with a theodolite, the vertical angle to Mount Greenberry.

No. 89, Tyaughton Creek, B.C. (1925).—The pendulum pier is a concrete block erected for the purpose in the first building on the north side of the road west of the Tyaughton Creek bridge and shown on the Bridge River map (Publication No. 1708 of the Geological Survey). The pier is 25 feet below the elevation of the B. C. Electric Railway bench-mark No. 11 on the south side of the road and a few yards west of the bridge across Tyaughton creek.

No. 90, Union Bay, B.C. (1925).—The pendulum was set up in the northeast corner of the basement of Nelson hotel about 15 feet south and 15 feet west of the hotel corner. It was 6 feet above high tide in front of the hotel at 4.45 p.m. on October 31, 1925.

No. 91, Cloverdale, B.C. (1925).—The pendulum was set up in the basement of Mr. M. J. Charbonneau's residence and is 4 feet below the Geodetic Survey bench-mark in Cloverdale municipal hall.

No. 92, Victoria, B.C. (1926).—The pendulum pier is the large concrete pier towards the south end of the large room on the west side of the basement of Gonzales Observatory. It is 4 feet 4 inches above the level of the Geological Survey bench-mark on Gonzales hill.

No. 93, Banfield, B.C. (1926).—The pendulum was set up in the room at the southerly end of the basement of the post office, on the front or southerly side of the building. It was found by triangulation to be 120 feet north and 1,170 feet west of

the astronomical pier. It was 26 feet 10 inches above high tide at the post office pier at about 3.15 p.m. on June 29, 1926.

No. 94, Nootka, B.C. (1926).—The pendulum was set up in the small basement store-room of Nootka lighthouse on San Rafael island. The point was 72 feet above high tide in Friendly cove at about 1.10 p.m. on July 10, 1926.

No. 95, Quatsino, B.C. (1926).—The pendulum pier is a concrete block erected for the purpose in the west end of the former home and abandoned house of Mr. Ed. Evenson. It is about 180 feet north of the post office on a knoll back from the water front. It was 37 feet above high tide at Evenson's pier at about 1.40 p.m. on July 25, 1926.

No. 96, Prince Rupert, B.C. (1926).—The pendulum was set up in the westerly end of the sample room in the northwesterly corner of the basement of Prince Rupert hotel. From information obtained at Prince Rupert City Engineer's office it was found to be, referred to the levels of the Geodetic Survey, 78 feet 6 inches above sea-level.

No. 97, Stewart, B.C. (1926).—The pendulum pier is a concrete block erected for the purpose in an abandoned house just across Bear river traffic bridge and about 150 feet south of the sharp turn in the road. The building is shown on Map No. 50A of the Geological Survey. The pier was found, by readings with the two aneroid barometers, to be 35 feet above high tide at Stewart at 1.30 p.m. on August 23, 1926.

No. 98, Masset, B.C. (1926).—The pendulum pier is a concrete block erected for the purpose in the northerly end of the basement of Mr. Wes. Singer's residence. It was 28 feet 7 inches above high tide at 8.45 a.m. at Masset dock on August 31, 1926.

No. 99, Ocean Falls, B.C. (1926).—The pendulum was set up at the entrance to the bowling alleys in the east end of the basement of the theatre. It was 55 feet above high tide at the dock at 2.11 p.m. on Spetember 9, 1926.

DEPARTMENT OF THE INTERIOR
CANADA

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Magnetic Results, 1924-1926

BY

C. A. FRENCH AND R. G. MADILL

OTTAWA
F. A. ACLAND
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1930

CONTENTS

	Page
Introduction	335
Instrumental equipment	336
Determination of the constants of magnetometer-earth inductor P.I.C. No. 104	337
Comparison of magnetic instruments with standards	339
Summary of results of declination comparisons	341
Summary of results of horizontal intensity comparisons	342
Summary of results of inclination comparisons	343
Astronomical observations and their reduction	347
Magnetic work	347
Diurnal variation and disturbance corrections	350
Special declination observations	350
Special declination-horizontal intensity observations	358
Summary of magnetic results	362
Selection and description of stations	363
Magnetic observations, 1924	364
Magnetic observations, 1925	369
Magnetic observations, 1926	376
Magnetic stations and descriptions	384

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MAGNETIC RESULTS, 1924-6

INTRODUCTION

An account of the progress of the magnetic survey of the Dominion of Canada carried on by the Dominion Observatory between 1907, the year the survey was inaugurated, and 1923 is given in Vol. V, No. 5 and Vol. VIII, No. 8 of Publications of the Dominion Observatory. The former contains a summary of the results obtained between 1907 and 1920, while the latter accounts for the work of the three years 1921 to 1923. In the present publication it is intended to deal briefly with the work accomplished during the three years 1924 to 1926.

During the earlier part of the period that the work of the survey has been in progress, the operations were confined to the older and more settled parts of the country along the railroads and main waterways, thus facilitating the problem of transportation. At the same time it was possible to obtain a fairly satisfactory distribution of stations. Some idea of the manner in which stations were distributed is conveyed in the report of the results of the observations for the year 1910 given in the Journal of the Royal Astronomical Society of Canada, Vol. V, 1911, p. 138. The report states: "The 44 stations of the first list are distributed over Western Ontario, from Napanee to Windsor, and are at intervals of 25 miles. . . . The 48 stations of the second list are all along the main line of the Canadian Pacific railway, and are about 25 miles apart." During recent years the work has been gradually extended to regions less readily accessible. It has been found impossible, however, to maintain in these regions the same uniformity as to the distribution as was aimed at in the beginning. The progress of the survey, so as to cover new territory, has suffered on account of the necessity of more time being spent in occupying repeat stations for secular change.

The program of work which commenced in 1924 and continued throughout 1925 and 1926, had for its main object the securing of secular change data. In addition to the repeat stations, which this involved, a number of new stations were occupied. Some of these were in the vicinity of repeat stations which were found unavailable, or appeared unlikely to be suitable for future use. Others were selected in localities where there were no stations, in accordance with the policy of improving, when it could conveniently be done, the uniformity of the distribution of stations.

During 1924 one observer only was in the field. Twenty-three stations, representing twenty distinct localities, were occupied. Of these, eight are in the Yukon Territory, four being exact and two approximate locations of stations occupied by the Carnegie Institution. The Yukon Territory is a region heretofore untouched by the Dominion Observatory. The remaining fifteen are in British Columbia, fourteen being along the Pacific coast, or on islands adjacent to the coast. Four of these are repeat stations.

The work during 1925 and 1926 was confined to the area lying between the Atlantic seaboard and longitude 100° W., and between the Canada–United States boundary and latitude 57° N. The work of 1925 included a number of stations in Labrador and one in Newfoundland. It was an unusual departure to thus extend the work to points outside the Dominion. In giving consideration to the needs of the work in Eastern Canada, in addition to occupying a number of stations along the St. Lawrence below Quebec, it was considered important at this time to extend the survey north of the St. Lawrence in the vicinity of the boundary between Canada and Labrador. Owing to the region being practically inaccessible, this was considered out of the question. An alternative program was to occupy a series of stations along the Labrador coast. The results at these stations would furnish data which would likely be of immediate practical use for purposes of navigation, as the stations would be in the vicinity of waters traversed by coastal and ocean-going vessels. The most of this traffic is, moreover, to and from Canadian ports. To do this work it was necessary to obtain the permission of the Newfoundland Government. This was arranged through the State Department at Ottawa, so that the work was carried out as planned. The total number of stations occupied during the two seasons, 1925–6, was seventy-two, comprising fifty-seven repeat and fifteen new stations, and representing sixty-three distinct localities. Two of the stations in Labrador had been occupied previously, one at Battle Harbour established by the Carnegie Institution, and the other at West Turnavik established by the United States Coast and Geodetic Survey.

INSTRUMENTAL EQUIPMENT

From 1924 to 1926 the magnetic results were obtained with instruments of the approved type for use in field work. For the most part they are similar to those used during preceding years. These types are so well known that anything like a detailed description seems unnecessary. In the summary which follows there are given, in addition to the name of the instrument, brief notes with reference to the history of the particular instrument, as well as references which will enable the reader to obtain any desired information regarding the type.

Combined magnetometer-dip circle C.I.W. No. 20.—This is, as the name indicates, one of the types designed by the Carnegie Institution. It was constructed in their workshop and purchased in 1916, having been used on field work prior to that date and reconditioned. It was used during the three seasons, 1924–6, for declination and horizontal intensity. Its use as a dip instrument was discontinued after 1924. This was due to the erratic behaviour of the dip needles. A detailed description of this type of instrument is given on pages 9–12 of the Journal of Terrestrial Magnetism and Atmospheric Electricity, Vol. XVI, 1911. In one respect the description does not apply, namely, in regard to the arrangement for determining total intensity by Lloyd's method; this is lacking.

Combined magnetometer-earth inductor, P.I.C. No. 104.—This, also, is one of the types designed by the Carnegie Institution, but was constructed by the Precise Instrument Company, Brooklyn, N.Y. The designation adopted corresponds to the name of

the maker. A description of this type of instrument is given on pages 9–12, Land Magnetic Observations,[1] 1911–1913, Vol. II, No. 175. It was received from the maker in August, 1925, and was used on field work during the remainder of that season and during 1926.

Cooke magnetometer No. 15.—On account of its size and weight magnetometer No. 15 has not been used regularly in field work. It was standardized at Agincourt in the spring of 1925, and used at Ottawa in making a series of observations during the summer. It was the intention to use it in field work during that season. The arrival of the new instrument, P.I.C. No. 104, made this unnecessary. A general description of this design is given in an article entitled "Magnetometer" in Encyclopædia Britannica, eleventh edition, Vol. XVII, pp. 386–388.

Dover dip circle No. 145,—Dover dip circle No. 145 was standardized in 1925 at Agincourt. It was intended that it, with magnetometer No. 15, should comprise the instrumental equipment of one party during that season. It was, however, used for dip observations only at Ottawa. It is of the Kew pattern and constructed by Dover. For a general description of the dip instrument, see an article on "Inclinometer" in Encyclopædia Britannica, eleventh edition, Vol. XIV, pp. 354–355.

Dover dip circle, No. 212.—This instrument is similar to Dover dip circle No. 145. It was used during 1925 and 1926 for inclination in place of C.I.W. No. 20.

Chronometers.—Two timepieces were carried by each observer. In all, five were used during the three seasons, namely: half-seconds pocket chronometer Kittel No. 261; half-seconds pocket chronometers Nardin No. 19726 and No. 19728; pocket watch Nardin No. 9015, which will produce seconds beats if connected with a relay and battery; and half-seconds standard chronometer Roskell No. 711.

Wireless receiving sets.—Each observer was provided with a wireless receiving set for determining the corrections to the chronometers from the time signals which are broadcast at certain times of the day. These sets, which were first used in 1923, were constructed by the Department of Naval Service of the Dominion Government, Ottawa.

DETERMINATION OF THE CONSTANTS OF MAGNETOMETER-EARTH INDUCTOR P.I.C. No. 104

The instrumental constants of magnetometer-earth inductor P.I.C. No. 104 were determined in 1925 after it was received from the maker. These determinations were, in fact, postponed until the end of the observing season, owing to the desire to make as much use of the instrument as possible during the time that would likely be favourable for field work. Furthermore, the desired assistance was not available at an earlier date.

The constants required for the reduction of the magnetometer observations are: value of one scale division of the diaphragm of the reading telescope; dimensions and mass of the auxiliary cylinder for determining the moment of inertia of the intensity magnet, and its suspension; distances between pairs of notches on the deflection bar; induction coefficient of the long or intensity magnet; the distribution coefficient P, assuming the second coefficient Q to be zero; and the temperature coefficient of the long magnet.

[1] Published by the Department of Terrestrial Magnetism, Carnegie Institution, Washington, D.C.

The length and diameter of the inertia cylinder, and the linear distances between three pairs of notches of the deflection bar, were determined at the Physical Testing Laboratory of the Topographical Surveys Branch, Department of the Interior. With the exception of the determination of the scale value, and the mass of the auxiliary weight, which was done at the Dominion Observatory, the remainder of the work was carried out by officials of the Dominion Observatory at the Agincourt Magnetic Observatory in conjunction with the standardizing observations.

With reference to the methods which were adopted for the determination of the constants, two publications only were consulted, namely: Directions for Magnetic Measurements, by Daniel L. Hazard, Washington, Government Printing Office, 1921; and Land Magnetic Observations, 1905–1910, by L. A. Bauer. The methods outlined in both are practically identical. With reference to the coefficient of induction, the latter refers specifically to two methods, while the former refers to only one. The method of Lamont, which is outlined in both, was used. The latter publication was especially helpful in regard to the construction of the apparatus for carrying out the observations necessary for the determination of this constant.

The values of the constants are summarized in Table I. There are also included the constants for the magnetometer-dip circle C.I.W. No. 20, which, in the main essentials, is quite similar to P.I.C. No. 104. The constants for C.I.W. No. 20 were furnished by the Carnegie Institution.

TABLE 1.—SUMMARY OF CONSTANTS OF MAGNETOMETERS

	Instrument	
	P.I.C. No. 104	C.I.W. No. 20
Scale division: 1 division	1′·88	2′·14
Deflection distances at 20° *C.*		
r_1	20·0237 cm.	20·0000 cm.
r_2	25·0174 "	25·0014 "
r_3	28·0091 "	28·0031 "
Log *C* at 20° *C.*		
r_1	6·40412	6·40596
r_2	6·11131	6·11233
r_3	5·96312	5·96357
For increase of 1° *C.* in temperature log *C* is diminished by	0·000025	0·0000235
Temperature coefficient: *q*	0·000466	0·000499
Induction coefficient: $\mu = mh$	2·54	2·62
m	268	283
h	0·0095	0·0093
Distribution coefficient: *P*	7·46	7·73
[1]Dimensions and mass of auxiliary inertia bar, or cylinder, at 20° *C.*:		
Length	5·6002 cm.	.....
Diameter	0·9100 "	.....
Mass	32·4271 gm.	.....
Moment of inertia of auxiliary inertia bar:		
log K_1 at 0° *C.*	1·93632	1·93612
" 10 "	649	629
" 20 "	665	645
" 30 "	682	662
" 40 "	698	678
Moment of inertia of magnet and suspension:		
log $\pi^2 K$ at 0° *C.*	2·80534	2·80593
" 10 "	544	603
" 20 "	554	613
" 30 "	564	623
" 40 "	574	633
Moment of inertia of magnet and suspension at 20° *C.*:		
log $\pi^2 K$, determined in 1916	.....	2·80671[2]
" " 1921	.....	613[3]
" " 1924	.....	562
" " 1926	.....	523

COMPARISON OF MAGNETIC INSTRUMENTS WITH STANDARDS

In accordance with the usual procedure the field instruments were compared in the spring and fall of each year, at the standard magnetic observatory at Agincourt, with the exception that there was but one comparison in 1925 between magnetometer-earth inductor No. 104 and standard. The first series of comparisons between this instrument and standards was made indirectly. In August, 1925, just after it was received from the maker, it was compared for declination and horizontal intensity with magnetometer

[1] The dimensions and mass of the auxiliary inertia bar No. 20 were not supplied with the constants accompanying the instrument. The values determined at the Physical Testing Laboratory and the Dominion Observatory are: $l=5·5996$ cm., $d=0·9100$ cm. and $w=32·4154$ gm. The length and diameter are given for 20° *C.* These give for log K_1 at 20° *C.* the value 1·93640. This is in good agreement with the value furnished by the Carnegie Institution, namely, 1·93645. The latter value has been used throughout in the computations for the determination of the moment of inertia of the magnet and suspension.

[2] This value was used in the computations from 1916 to 1920.

[3] This value, which was determined at Washington in 1921 was used in the computations from 1921 to 1926.

Cooke No. 15, and for inclination with earth inductor Toepfer No. 1911. The latter instruments were standardized, respectively, at Agincourt in June, 1925, and Washington D.C., in 1915. This series was carried out in tent stations at Ottawa.

The comparisons at Agincourt were made in a manner similar to that of preceding years. The field instrument is mounted on one of the piers of the absolute room of the observatory. Simultaneously with the observations taken with this instrument eye readings of the scale of the variometer are noted. The readings are reduced after the base-line value of the variometer has been determined. One disadvantage with this method is that the final values determined with the standard instruments are not known for at least, approximately, two months after the comparisons have been made. This makes it impossible to compare promptly the results with previous determinations. As a consequence, there is no opportunity to investigate causes of discrepancies, which sometimes occur.

During a series of comparisons adverse observing conditions are sometimes encountered. The two main causes contributing to these are poor visibility and magnetic disturbances. In order, therefore, to avoid the possibility of having to observe all of a particular series, say, of declination, under unfavourable conditions, the program is arranged so that the observations of each element are spread over a period of not less than two days. When two instruments are being standardized, as was the case in 1925 and 1926, the time is extended somewhat by observing with the two, alternately. There was one set of observations, however, that was not taken according to this program, namely, that with the earth inductor. This was due to the inconvenience encountered in mounting and dismounting the galvanometer, which was placed on a temporary support. The inclination observations were therefore completed, when once begun, before other work was undertaken.

The methods of observing the various elements were quite similar to those adopted in preceding years. In declinations, eight readings constitute a set. Two are taken with the magnet in the erect position, four in the reverse or inverted, and two in the erect. During 1924 and preceding years the interval between readings was usually somewhat less than a minute, or what was considered sufficiently long to obtain good results. Between readings taken before and after reversal of magnet the time required was, of course, longer. During 1925 and 1926 it was usual to allow a minute between readings with magnet in one position and two minutes at the time of reversal. The advantage of this method is that the observer reading the variometer is able to anticipate the signal from the obserever using the field instrument when to take a reading. It sometimes occurs, however, that a departure from this routine is advisable. For example, at the even hour and lasting for three minutes, the "cut-off" takes place, which is simply the closing of a shutter to intercept the light from registering on the recording paper of the variometer. When this occurs the magnets are disturbed, due to the electric current operating the shutter. An observation beginning at eight minutes before the hour would end, if this method were followed, at one minute after. Two readings would be taken when the variometer magnets were in a disturbed condition. Invariably under these conditions the time of the set is shortened so as to finish before the hour.

Horizontal intensity[1] observations were made in the usual way, that is by observing in the order: oscillations, deflections, deflections and oscillations. The magnets are

inverted between the first and second sets of deflections. Simultaneous eye-readings were taken on the H variometer. In all standardizing comparisons deflections were observed at three distances.

Inclination[1] with the dip circle and the earth inductor[2] was obtained according to the usual methods. Simultaneously with these observations eye readings were taken on the H and Z variometers, from which is deduced the value of the inclination from the relation, $\tan I = Z/H$, Z and H being, respectively, the vertical and horizontal intensity. With regard to the method of observing with the earth inductor, it may be pointed out that the coil of earth inductor No. 104 is not provided with a level, as in some types of earth inductor.[2] Circle readings with the coil vertical are thus dispensed with.

In order to utilize the deflection observations for determining a value of declination, a correction was determined for the short magnet for each of the two magnetometers, C.I.W. No. 20 and P.I.C. No. 104. This was not done, however, prior to 1926. The observations were carried out in two ways. While observing deflections, eye readings were taken alternately on the H variometer and on the D variometer, thus furnishing a declination value for every set of deflections. In addition, a number of comparisons were made in the ordinary direct way.

The observations for each of the elements were carried out with the foot screws of the instrument oriented in three positions.

The results of the standardizing comparisons for the three years, 1924–6, are summarized in Tables 2–4.

TABLE 2.—SUMMARY OF RESULTS OF DECLINATION COMPARISONS, 1924–6

(a) Results for Magnet 20*L* of Magnetometer No. 20

Date	I.M.S.–Mag'r	Number of Sets	Place of comparison
	′		
1924, April-May	−0·68	16	Agincourt
1924, October	−0·78	12	"
1925, June	−0·98	16	"
1925, November	−0·98	16	"
1926, June	−0·49	15	"
1926, October	−0·56	12	"

(b) Results for Magnet 20*S* of Magnetometer No. 20

Date	I.M.S.–Mag'r	Number of Sets	Place of comparison
	′		
1926, June	−1·75	7	Agincourt
1926, October	−1·24	13	"

[1] Publications of the Dominion Observatory, Vol. V, No. 5, pp. 137–139.
[2] Directions for Magnetic Measurements, by Daniel L. Hazard, Washington, Government Printing Office, 1921, pp. 67–68.

(c) Results for Magnet 15*L* of Magnetometer Cooke No. 15

Date	I.M.S.–Mag'r	Number of Sets	Place of comparison
	′		
1925, January	− 1·3	4	Agincourt
1925, June	− 1·5	14	"

(d) Results for Magnet 104*L* of Magnetometer No. 104

Date	I.M.S.–Mag'r	Number of Sets	Place of comparison
	′		
1925, August	−1·35[1]	11	Ottawa
1925, November	−1·32	15	Agincourt
1926, June	−0·90	15	"
1926, October	−0·97	12	"

(e) Results for Magnet 104*S* of Magnetometer No. 104

Date	I.M.S.–Mag'r	Number of Sets	Place of comparison
	′		
1926, June	−0·95	7	Agincourt
1926, October	−0·46	10	"

TABLE 3.—SUMMARY OF RESULTS OF HORIZONTAL INTENSITY COMPARISONS, 1924-6

(a) Results of Comparisons of Magnetometer No. 20

Date	I.M.S.–Mag'r	Number of Sets	Place of comparison
1924, April–May	− 19·4 γ = −0·00123 H	8	Agincourt
1924, October	− 13·7 γ = −0·00087 H	6	"
1925, May	− 17·3 γ = −0·00110 H	6	"
1925, November	− 14·5 γ = −0·00092 H	8	"
1926, June	− 13·3 γ = −0·00085 H	6	"
1926, October	− 17·5 γ = −0·00111 H	6	"

[1] I.M.S. values of declination were obtained with Dominion Observatory magnetometer Cooke No. 15, using the results obtained at Agincourt in January and June, 1925, namely:

(I.M.S.—Cooke No. 15) = −1′·4

(b) Results of Comparisons of Magnetometer Cooke No. 15

Date	I.M.S.–Mag'r	Number of Sets	Place of comparison
1925, May-June	+ 13·1 γ = +0·00083 *H*	10	Agincourt

(c) Results of Comparisons of Magnetometer No. 104

Date	I.M.S.–Mag'r	Number of Sets	Place of comparison
1925, August	+ 7·5[1] γ = +0·00050 *H*	2	Ottawa
1925, November	+ 9·0 γ = +0·00057 *H*	12	Agincourt
1926, June	+ 3·6 γ = +0·00023 *H*	12	"
1926, October	− 2·3 γ = −0·00018 *H*	6	"

TABLE 4.—SUMMARY OF RESULTS OF INCLINATION COMPARISONS, 1924-6

(a) Results of Comparisons of Magnetometer–Dip Circle No. 20

Date	I.M.S.–No. 20 Needle				Number of Sets	Place of comparison
	No. 1	No. 2	No. 5	No. 6		
	′	′	′	′		
1924, May	−0·8	−0·1	+1·6	+0·5	6	Agincourt
1924, October	+0·1	−5·9	0·0	+3·0	6	"

(b) Results of Comparsons of Dip Circle Dover No. 145

Date	I.M.S.–No. 145 Needle		Number of Sets	Place of comparison
	No. 1	No. 2		
	′	′		
1925, June	+0·6	+0·8	6	Agincourt

[1] I.M.S. values were obtained with Dominion Observatory magnetometer Cooke No. 15, using the results determined in May–June, 1925, namely:

(I.M.S.—Cooke No. 15) = +0·00083*H*

(c) Results of Comparisons of Dip Circle Dover No. 212

Date	I.M.S.–No. 212 Needle No. 1	I.M.S.–No. 212 Needle No. 2	Number of Sets	Place of comparison
	′	′		
1925, May	0·0	−0·1	6	Agincourt
1925, November	+0·5	+0·1	6	"
1926, June	+0·2	−0·5	6	"
1926, October	+0·6	+0·1	6	"

(d) Results of Comparisons of Magnetometer–Earth Inductor No. 104

Date	I.M.S.–No. 104	Number of Sets	Place of comparison
	′		
1925, August	−0·6[1]	3	Ottawa
1925, November	−2·2	8	"
1925, November	−2·3	12	Agincourt
1926, June	−1·2	12	"
1926, October	−1·1	14	"

The results of the standardizing comparisons for the period 1924–6 are on the whole not unsatisfactory. Discrepancies exist which appear larger than one might expect. but compare favourably with results obtained prior to 1924 and under similar conditions,

From an examination of the results given in Table 2, *a*, it will be noted that there is a difference of approximately 0′·5 between the corrections obtained in 1925 and 1926 with magnet 20*L* of magnetometer No. 20. This rather large difference indicates that some instrumental change took place, in view of the fairly good agreement among the individual values comprising each of the four series of comparisons. The ranges in the values of [I.M.S.—No. 20*L*] for these are, respectively, −0′·4 to −1′·3, −0′·3 to −1′·5, +0′·4 to −1′·2 and 0′·0 to −1′·1. Comparing the mean values obtained in November 1925, and June and October, 1926, with this magnet, and the corresponding values obtained with magnet 104*L* of magnetometer No. 104, which are given in Table 2, *d*, it will be noted that whereas the change in No. 20 between November, 1925, and June, 1926, was 0′·49, the corresponding change in No. 104 was 0′·42. The change between June and October, 1926, is 0′·07 for each instrument. The close agreement between the results obtained with No. 20 and No. 104 rather indicates the possibility of a change in the standard instrument between 1925 and 1926.

The results obtained with the short magnets, on the other hand, rather tend to discount the evidence pointing to a change in the standard instrument. Both long magnets, as was pointed out, show a change of only 0′·07 between June and October, 1926. The changes for the corresponding dates, with No. 20*S* and No. 104*S* are, respectively,

[1] I.M.S. values were obtained with Dominion Observatory earth inductor Toepfer No. 1911, using the results determined at Washington, D.C., in 1915, namely:

(I.M.S.—Toepfer No. 1911) = −0′·25

0′·51 and 0′·49, but of opposite sign, as will be seen from Table 2, *b* and Table 2, *d*. In explanation of these discrepancies with the short magnets, it may be pointed out that there was quite a large range in the values of [I.M.S.—C.I.W. No. 20] both in June and October; these were, respectively, from +0′·1 to −2′·6 and −0′·1 to −2′·6. The results with P.I.C. No. 104 were, however, in quite as good agreement as with the long magnet. The discrepancies in the mean values might easily be accounted for by a comparatively small error in the setting of the torsion head. For example, with the fibre used in P.I.C. No. 104, for 90° turn of the torsion head the deflection of the short magnet amounted to 17′·5, so that the discrepancy between June and October would be accounted for by an error of approximately 2°·5 in the setting. With the long magnet, 90° turn of the torsion head produced a change of only 2′·8 in the position of the magnet. An error of 2°·5 in the setting of the torsion head would produce an error of less than 0′·1 in the declination when using the long magnet. Attention may be drawn here to the fact that the declination is determined regularly with the long magnets, the short magnets being used for declination only when horizontal intensity is being determined. From the evidence furnished by these comparisons a definite conclusion regarding the discrepancies is impossible.

The results obtained in January and June, 1925, with magnetometer Cooke No. 15, as given in Table 2, *c*, when compared with the results obtained in 1910 and 1915, are interesting. The values are as follows: [I.M.S.—No. 15] = +0′·4, for 1910, and [I.M.S. No. 15] = −0′·3 for 1915, the two values being determined, respectively, at Agincourt and Washington. The value for 1925, which is given in the Table 2, *c*, is −1′·4.

With regard to the horizontal intensity results, which are given in Table 3, there is little that calls for discussion. The mean values with C.I.W. No. 20, which are given in Table 3, *a*, are in good agreement. This was rather unexpected in view of the more or less uniform change in the value of [I.M.S.—C.I.W. No. 20] over the period 1916 to 1923. This change was apparently due to the change in the moment of inertia of the intensity, or long, magnet and suspension system. With regard to the changes between spring and fall of each of the three seasons there is no apparent explanation. The cause is evidently not due solely to accidental errors, as there are no outstanding residuals in any of the series of comparisons The ranges in the values of [I.M.S.—C.I.W. No. 20] for the six series from April, 1924, to October, 1926, are respectively: -14γ to -25γ, -9γ to -20γ, -13γ to -25γ, -7γ to -22γ, -7γ to -19γ, and -12γ to -24γ.

The results obtained with P.I.C. No. 104, which are given in Table 3, *c*, indicate that probably some change was taking place in one or more of the constants of this instrument throughout the period from November, 1925, to November, 1926. Changes are not unexpected, especially as the natural process of ageing of the magnets had been going on for a comparatively short time. Changes quite similar were observed with C.I.W. No. 20, which were due, as has been stated, to changes in the moment of inertia of the magnet and suspension system. In order to determine if the change in the correction was due to this cause, the moment of magnet 104*L* and suspension system was redetermined in November, 1926. The values of log $\pi^2 K$ at 20° *C*. determined in November, 1925, and November, 1926, respectively, are 2·80554 and 2·80543. The change, while in the right direction, accounts for only 2γ, whereas the change observed, from the comparisons at Agincourt, amounts to 11γ. The remaining 9γ may be due to

causes similar to those responsible for the discrepancies in the values obtained with C.I.W. No. 20; these causes are as yet undetermined.

The inclination results are given in Table 4. It will be seen from *a* of this table that the discrepancies among the results obtained with C.I.W. No. 20 are very marked. Each of the four needles shows a large change between spring and fall. There is, moreover, an entire absence of uniformity in the values representing the change. Without attempting to determine the cause of the discordant values, the use of this instrument for determining inclination was discontinued after 1924. The results of the comparisons with Dover No. 212, which was substituted for C.I.W. No. 20 for determining inclination, and Dover dip circle No. 145, are as satisfactory as can be expected with this type of instrument.

The results of the comparisons with the earth inductor P.I.C. No. 104 are given in Table 4, *d*. The range in the values between August and November, 1925, which amounts to 1′·6, as well as that between November, 1925, and June and October, 1926, amounting to 1′·1, was unexpected, especially with this type of instrument. It is suspected that the cause may be attributed, partly at least, to the lack of proper adjustment, especially as regards the taking up of the lost motion between the upper end of the rotation axis of the coil and the bearing. It would be expected, however, if such a condition existed, that the inclination of the axis of the coil might alter during the process of rotation, with a consequent fluctuation of the galvanometer. If, however, the axis took up a definite position with respect to the bearing, say the upper or lower part, there would be no difficulty in obtaining a setting, but in such a case the circle reading would not indicate the correct inclination, or dip. In this way an error might be introduced in the observation.

In offering the suggestion as to a possible cause of the discrepancies, there is implied what appears to be a lack of precaution in making the adjustment of the instrument. In the opinion of the observer, whose previous experience with earth inductors was confined to one, namely, the Dominion Observatory earth inductor Toepfer No. 1911, the usual precaution had been taken in this respect. There was one feature about P.I.C. No. 104, however, which up to the end of 1926 had not been discovered. It had been noticed before this, however, that the axis of the coil, or its bearing, required to be adjusted occasionally. Sometimes there was lost motion between the axis and the bearing, at other times it was difficult, and occasionally impossible, to rotate the coil. It was finally noticed, during the early part of 1927, that the latter condition prevailed at comparatively high temperatures. The cause of the necessity of this re-adjustment then appeared quite evident. It was due to a differential expansion between the hard rubber comprising the disc on which the wire is wound and the metal ring supporting the bearings of the axis of the coil. Later observations showed that if the instrument is adjusted for a temperature of 30° C., at 10° C. the lost motion between the axis and bearing is very perceptible. This range of temperature is sometimes encountered during the course of field observations at a station, though it is doubtful if it ever amounted to that during a series of standardizing observations. It is the intention to give further consideration to this problem and determine, if possible, the extent to which dip observations might be affected owing to changes of temperature. Until this undesirable feature of the instrument is remedied it will be necessary to take extra precautions in making the proper adjustment.

ASTRONOMICAL OBSERVATIONS AND THEIR REDUCTION

The astronomical work consists in making a determination at each place of the latitude, the astronomical meridian and true bearing of some well-defined object, and the chronometer correction on local mean time. Combining with the latter the chronometer correction on standard time, which is obtained by comparing the chronometer with wireless time signals, or the time signals sent over the telegraph wires, the longitude of the place may be determined.

At practically all the stations the method of sun observations was employed for determining the necessary astronomical data. With a view, however, to increasing the accuracy of the meridian determination, observations were taken on Polaris at as many of the stations as possible for azimuth. In a few cases, however, it was necessary to depend on one or other of the two methods as a result of unfavourable conditions.

The methods of observing were quite similar to those adopted during preceding years and outlined in reports[1] published previously. This applies also to the reduction of the observations.

MAGNETIC WORK

The magnetic work consists in making a determination of the three magnetic elements —declination, inclination and horizontal intensity—at each station. In general, the methods adopted are similar to those described in the report[2] covering the work of the period 1921–3.

From 1907 to 1920 declinations were reduced so that the mean value corresponded to the mean of elongations. The method is outlined in the report[3] covering the work of the period 1907–20. In systematic surveys, it is usual, however, to refer the observations to the mean of the day, which corresponds to the mean of twenty-four hourly values. In order to secure the necessary data for this purpose the records of an observatory are practically essential. In Canada there are but two magnetic observatories, one at Agincourt and the other at Meanook (established in 1916). The records from the two, it was considered, would be applicable to a comparatively small portion of the country which it was intended to cover in the course of the survey. For this reason the alternative plan was adopted. There was one unsatisfactory feature about this method, and that was the difficulty of determining when the maximum easterly and westerly pointing of the magnet occurred. The time varied considerably from day to day. In 1921 this method was discontinued, and, after due consideration, it was decided to refer the results of declination to the mean of the twelve hourly values from 7h to 18h L.M.T.

The adoption of this method of reducing the declinations necessitated a slight change in the method of observing. Formerly special attention was given to securing continuous observations from 7h to 8h 30m and from 13h, and if possible earlier, to 14h. Less attention was given to observations between 16h and 18h than was given to those taken earlier in the day. During the period since 1921 the regular routine of work was planned so that the declination observations were spread as uniformly as possible over the entire observing period. It was possible in many cases to secure from these a good representation of the daily change of declination, which was used with the results obtained

[1] Publications of the Dominion Observatory, Vol. V., No. 5, pp. 134–135; also Vol. VIII, p. 157.
[2] Publications of the Dominion Observatory, Vol. VIII, No. 8, pp. 159–183.
[3] Publications of the Dominion Observatory, Vol. V, No. 5, pp. 136–139.

from the declinations observed specifically for that purpose, to determine the corrections to be applied to the observations on account of diurnal variation to reduce them to the mean of the day. The question of diurnal variation corrections will be discussed more fully in a subsequent portion of the report.

With regard to the inclination and horizontal intensity there has been practically no change in the method of observing, or in the reduction of the observations, since the inception of the work in 1907, except in the matter of securing diurnal variation of horizontal intensity simultaneously with the special diurnal variation observations of declination, to which reference will be made later. It was usual to observe inclination at or about 10h 00m and again about 16h 00m, and the horizontal intensity at 11h 15m, approximately, and 14h 20m. A slight variation from the times as given will not be serious, as the normal change in each of these elements over a period of an hour or so is not large. Between forenoon and afternoon, however, if the observations are taken at the times indicated, the change in both inclination and horizontal intensity is quite appreciable and considerably in excess of observational errors. It has been customary to secure, if possible, at least one observation of inclination and one of horizontal intensity both in the forenoon and in the afternoon. In the reduction, the mean value is considered as being that derived from the mean of the forenoon and afternoon observations. If, for example, two inclinations are taken in the forenoon and one in the afternoon, the mean value for the station is derived by giving equal weight to the mean of the two forenoon observations and to the single afternoon observation. The horizontal intensities are reduced in a similar manner. If it is found impossible to secure more than one observation of either of these elements, a correction is applied to reduce it to the adopted mean of the day. This has occurred in a few cases during the three seasons.

As uniformity in the methods of work is desirable, the following program has served as a guide in the taking of observations:

PROGRAM OF OBSERVATIONS AT MAGNETIC STATIONS

Observation	L. M. T.					Remarks
	h	m		h	m	
Declination	7	00	to	8	45	If possible two or three sets, or continuous observations at short intervals.
Azimuth	8	55	"	9	10	
Declination	9	30				
Inclination	10	00				Inclination with two needles, or two sets with earth inductor.
Declination	10	30				
Horizontal intensity	10	40	"	11	50	Two sets. Take reference mark reading for determining declination.
Latitude	12	00				
Declination	13	00	"	13	30	
Horizontal Intensity	13	40	"	14	50	Two sets. Take reference mark reading for determining declination.
Azimuth	14	55	"	15	10	
Declination	15	30				
Inclination	16	00				Inclination with two needles, or two sets with earth inductor.
Declination	16	30				
Declination	17	00				
Declination	18	00				

It was not the intention that this schedule should be carried out, necessarily, in one day. The purpose was rather to indicate, not only the time of observation of a particular element, but the number of observations that were considered desirable for a good determination of the element. At practically all stations occupied during the three years the results are for secular change, and require greater care than if they are for ordinary magnetic distribution. In order to make a preliminary computation of the results it has been found advisable to spend the greater part of two days at each station. On this account the work as indicated by the program is usually distributed over the two days. For example, one set of horizontal intensity might be taken in the morning of one day, one in the afternoon, and two in a like manner on the following day; or, one in the forenoon, two in the afternoon and one the following forenoon, at approximately the times indicated in the program.

The method of observing inclination with the earth inductor is essentially the same as that usually followed. Earth inductor P.I.C. No. 104, which was used in field work, differs in one particular from the Wild pattern, which is the one to which reference is usually made in manuals or publications.[1] In the latter there is a level which is set in the coil approximately at right angles to the rotation axis. This is lacking in the field instrument P.I.C. No. 104. This omission shortens the time necessary to observe an inclination, since no readings are taken with the axis vertical, as is done with instruments provided with a level. The method of making an inclination observation with P.I.C. No. 104, after having placed the instrument in the magnetic meridian with the compass which is provided for that purpose, is as follows:—

(1) With vertical circle east place the axis of the coil as nearly as possible in the line of dip. Rotate the coil and observe the galvanometer. A deflection of the scale in the latter is an indication that the axis of the coil is not at the proper inclination. Alter the setting of the circle and, if the deflection of the galvanometer scale is slight, make the final adjustment by means of the slow-motion screw until there is no deflection when the coil is rotated. Read the vertical circle.

(2) Rotate the coil in the opposite direction and, if necessary, adjust the inclination of the axis until the galvanometer shows no deflection as in (1). Again read vertical circle.

(3) and (4). Repeat (1) and (2).

(5), (6) ,(7) and (8). Proceed as in (1), (2), (3) and (4) with vertical circle west.

With circle east the reading is the co-dip and with circle west it represents the dip, assuming the axis to be vertical when the reading of the circle is 90°. The mean of the eight readings constitutes one determination of inclination.

Inclination with the dip circle was observed according to the method regularly used. An outline of the method will be found in text books and manuals, as well as in a former publication of the Dominion Observatory.[2]

Horizontal intensity was determined at all stations according to the usual method,[3] which involves two operations, oscillations and deflections. As a rule, the deflections were taken at three distances. There were a few stations at which only two distances

[1] Directions for Magnetic Measurements, by Daniel L. Hazard, Washington, Government Printing Office, 1921, p. 67; also, Land Magnetic Observations, 1905–1910, by L. A. Bauer, p. 41.
[2] Publications of the Dominion Observatory, Vol. VIII, No. 8, p. 181.
[3] Publications of the Dominion Observatory, Vol. VIII, No. 8, pp. 182–183.

were used, but at none were there less than two. An exception may be made in the case of the horizontal intensity observed for purposes of diurnal variation. In the summary all results obtained from the diurnal variation observations will be distinguished from the results determined from oscillations and deflections.

DIURNAL VARIATION AND DISTURBANCE CORRECTIONS

In reducing the declination observations of the mean of the day two corrections are usually taken account of, provided the necessary data are available, namely, the diurnal variation and the disturbance. It is assumed that the declination at any time is equivalent to a mean declination, a regular diurnal variation and a disturbance effect. The mean declination is usually referred to the mean of twenty-four hourly values. In observatory practice it is usual to derive the mean from a selected number of quiet days of each month. The diurnal variation is the departure of the mean value at any time from the mean of the twenty-four hourly values. Individual values of declination will differ from the mean values for the same time. The departure of this value from the mean, which differs from the mean monthly value by the amount of the diurnal variation at that time, is assumed to be the disturbance. For the selected quiet days these disturbance factors are likely to be small, and correspond to residuals.

To determine the disturbance corrections for field observations it is necessary to have the records of a magnetic observatory. Through the courtesy of Sir Frederic Stupart the records for determining these data have always been available. In order that the disturbance factor derived from observatory data may be applicable to the field observations it is assumed that the disturbance effects at both places are equal. In general this may be accepted as holding, provided the stations are not too far removed from the base station, or observatory. In connection with the reduction of the observations of 1922 and 1923 it was found that, for distant stations, the agreement among the results was only slightly improved by the application of the so-called disturbance corrections.[1] As many of the stations of 1924 are comparable to those of 1923 as regards the distance from the base station, which in this case was Meanook, it was decided not to go to the trouble of determining these corrections. They were, however, applied to the observations of 1925 and 1926.

The corrections which were applied to the declination observations were determined, for the most part, from special observations taken for that purpose in the field. For stations in the vicinity of the standard observatories, data from the records of these institutions were used.

SPECIAL DECLINATION OBSERVATIONS

Special declination observations were taken as a rule on at least three days every month. In addition to these, results, which were used for the same purpose, were obtained from observations taken at approximately hourly intervals throughout the day, the intervening time being devoted to other work. During 1925 and 1926 an effort was made to take these special observations on the 10th, 20th and 30th of the month. For various reasons this plan was not entirely successful. The unsettled state of the weather some-

[1] Publications of the Dominion Observatory, Vol. VIII, No. 8, pp. 159–160.

times made observing difficult, if not impossible, and occasionally a magnetic storm was encountered which was so pronounced that either observing was discontinued, or the results obtained were later discarded.

During 1926 a slight departure was made in the method of observing where the whole day was devoted to these special observations. Previously all readings were taken with the long magnet suspended in the erect position. The alternative method, used with satisfactory results by the Carnegie Institution, makes it possible to observe not only declination but also horizontal intensity simultaneously. The readings are obtained by observing with the short magnet suspended and the long magnet deflecting at the short distance, as in the deflection observations for horizontal intensity. Using the value of M, the magnetic moment of the long or intensity magnet, which is determined from absolute observations by means of deflections and oscillations, and C, a constant for a particular temperature and fixed deflection distance, and knowing the variation of M and C due to temperature, the value of the horizontal intensity can be readily evaluated. This method was used by one observer only.

With regard to the determination of the diurnal variation, only days comparatively free from disturbance were selected. The results are referred to the mean of the hourly values from 7 to 18, inclusive, in accordance with the method of reducing the observations of 1922–3[1]. The results were plotted and a mean curve drawn. From the curve hourly values of declination were tabulated. The mean of the twelve hourly values was determined, as were also the differences between the mean and the hourly values. The latter correspond to what is commonly known as the diurnal inequality, though this term strictly applies to the twenty-four hourly readings. The stations were then grouped, the manner of grouping being quite arbitrary, and from these mean hourly values were determined. In the case of the stations occupied in 1924 they fall naturally into three divisions, taking into consideration seasonal changes. During May and June stations were occupied in British Columbia south of Prince Rupert. The latter station was occupied in June and again in August. With the exception of Stewart and Prince Rupert all the stations occupied in July and August were in the Yukon Territory. Those occupied in September were in British Columbia. The three groups are as follows: (1) Stations occupied during May–August in British Columbia; (2) Stations in the Yukon Territory; (3) Stations occupied in September and October, all in British Columbia. The stations at which special observations were taken in 1925 and 1926 were likewise grouped, due consideration being given to the time of the observations and the location of the stations. The available diurnal variation data, which were derived in the manner outlined, are given in tables 5 to 7.

[1]Publications of the Dominion Observatory, Vol. VIII, No. 8, pp. 159-160

TABLE 5.—RESULTS OF SPECIAL OBSERVATIONS FOR DIURNAL VARIATION OF DECLINATION AT STATIONS OCCUPIED IN 1924

Date	May 22–26		June 4–5		June 23–24		August 19–21		July 3–5		July 10–11	
Station	Victoria		Clayoquot[1]		Ocean Falls		Prince Rupert		Dawson		Intern'l Boundary	
L.M.T.	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation
h.	East ° ′	′	East ° ′	′	East ° ′	′	East ° ′	′	East ° ′	′	East ° ′	′
7	24 43·2	+ 6·0	25 26·6	+ 5·1	27 03·8	+ 5·1	29 04·7	+ 5·0	35 11·0	+ 6·8	35 35·5	+ 7·8
8	42·8	+ 5·6	27·9	+ 6·4	04·4	+ 5·7	05·7	+ 6·0	11·6	+ 7·4	38·3	+10·6
9	41·0	+·3·8	28·6	+ 7·1	04·3	+ 5·6	05·6	+ 5·9	10·9	+ 6·7	37·3	+ 9·6
10	38·6	+ 1·4	27·0	+ 5·5	02·2	+ 3·5	03·8	+ 4·1	9·4	+ 5·2	34·2	+ 6·5
11	36·1	− 1·1	23·5	+ 2·0	26 58·6	− 0·1	01·2	+ 1·5	7·2	+ 3·0	30·0	+ 2·3
12	34·3	− 2·9	20·0	− 1·5	56·0	− 2·7	28 57·8	− 1·9	4·0	− 0·2	25·7	− 2·0
13	33·5	− 3·7	17·0	− 4·5	54·5	− 4·2	55·0	− 4·7	34 59·0	− 5·2	22·4	− 5·3
14	33·7	− 3·5	15·3	− 6·2	53·6	− 5·1	53·8	− 5·9	57·2	− 7·0	20·7	− 7·0
15	34·7	− 2·5	15·8	− 5·7	54·6	− 4·1	55·3	− 4·4	58·0	− 6·2	20·3	− 7·4
16	35·8	− 1·4	17·5	− 4·0	56·5	− 2·2	57·2	− 2·5	59·3	− 4·9	21·5	− 6·2
17	36·4	− 0·8	19·0	− 2·5	57·6	− 1·1	58·1	− 1·6	35 00·5	− 3·7	22·8	− 4·9
18	36·8	− 0·4	20·1	− 1·4	58·2	− 0·5	58·6	− 1·1	01·8	− 2·4	24·2	− 3·5
Mean 7h to 18h	24 37·2	.....	25 21·5	.....	26 58·7	.....	28 59·7	.....	35 04·2	.....	35·27·7	.....
Max. and min...	24 38·4	.....	25 22·0	.....	26 59·0	.....	28 59·8	.....	35 04·4	.....	35 29·3	.....

Date	July 21–22		Sept. 6–7		Sept. 24–25		Oct. 3–4		Oct. 13–18	
Station	Mayo		Jedway, A		Jedway, C		Alert Bay		Pemberton	
L.M.T.	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation
h.	East ° ′	′	East ° ′	′	East ° ′	′	East ° ′	′	East ° ′	′
7.....	36 12·0	+ 4·0	30 03·0	+ 3·2	29 44·0	+ 3·8	25 54·5	+ 6·8	24 18·7	+ 2·5
8.....	14·8	+ 6·8	03·4	+ 3·6	45·0	+ 4·8	54·3	+ 6·6	19·6	+ 3·4
9.....	16·5	+ 8·5	02·8	+ 3·0	44·2	+ 4·0	53·4	+ 5·7	20·0	+ 3·8
10.....	15·0	+ 7·0	01·6	+ 1·8	41·7	+ 1·5	50·2	+ 2·5	19·3	+ 3·1
11.....	11·8	+ 3·8	00·2	+ 0·4	39·0	− 1·2	46·2	− 1·5	17·0	+ 0·8
12.....	08·0	0·0	29 58·6	− 1·2	37·3	− 2·9	44·6	− 3·1	14·5	− 1·7
13.....	04·7	− 3·3	57·3	− 2·5	37·0	− 3·2	43·8	− 3·9	12·8	− 3·4
14.....	02·0	− 6·0	57·0	− 2·8	37·8	− 2·4	43·6	− 4·1	12·7	− 3·5
15.....	01·5	− 6·5	57·3	− 2·5	38·6	− 1·6	43·7	− 4·0	13·4	− 2·8
16.....	02·2	− 5·8	58·0	− 1·8	39·2	− 1·0	44·7	− 3·0	14·3	− 1·9
17.....	03·0	− 5·0	59·0	− 0·8	39·4	− 0·8	46·3	− 1·4	15·4	− 0·8
18.....	04·0	− 4·0	59·8	0·0	39·6	− 0·6	47·5	− 0·2	16·3	+ 0·1
Mean 7h to 18h.....	36 08·0	.....	29 59·8	.....	29 40·2	.....	25 47·7	.....	24 16·2	.....
Max. and min.....	36 09·0	.....	30 00·2	.....	29 41·0	.....	25 49·1	.....	24 16·4	.....

[1]Clayoquot observations given weight 2 in computation of corrections.

TABLE 6.—RESULTS OF SPECIAL OBSERVATIONS FOR DIURNAL VARIATION OF DECLINATION AT STATIONS OCCUPIED IN 1925

Date	June 19–24		June 29–July 2		July 31–Aug. 3		Aug. 13–15		Aug. 24–27		Aug. 31–Sept. 1	
Station	Pointe aux Basque		Havre St. Pierre		Blanc Sablon		Battle Harbour		Bersimis		Matane	
L.M.T.	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation
h.	West ° ′	′	West ° ′	′	West ° ′	′	West ° ′	′	West ° ′	′	West ° ′	′
7	26 52·4	+ 8·3	34 37·8	+ 4·5	31 57·0	+ 6·2	34 10·0	+ 8·1	21 42·0	+11·1	25 09·1	+ 6·1
8	53·8	+ 6·9	38·2	+ 4·1	57·5	+·5·7	10·0	+ 8·1	44·0	+ 9·1	10·5	+ 4·7
9	56·0	+ 4·7	40·2	+ 2·1	58·8	+ 4·4	13·2	+ 4·9	46·8	+ 6·3	12·0	+ 3·2
10	59·0	+ 1·7	42·8	− 0·5	32 01·5	+ 1·7	16·5	+ 1·6	50·0	+ 3·1	15·5	− 0·3
11	27 04·0	− 3·3	46·0	− 3·7	05·3	− 2·1	20·0	− 1·9	55·6	− 2·5	19·8	− 4·6
12	08·0	− 7·3	48·5	− 6·2	09·5	− 6·3	22·8	− 4·7	22 01·7	− 8·6	22·2	− 7·0
13	08·3	− 7·6	48·0	− 5·7	09·8	− 6·6	25·0	− 6·9	02·8	− 9·7	20·5	− 5·3
14	06·5	− 5·8	45·7	− 3·4	07·4	− 4·2	25·0	− 6·9	01·0	− 7·9	15·8	− 0·6
15	03·5	− 2·8	43·0	− 0·7	05·3	−·2·1	22·7	− 4·6	21 57·8	− 4·7	14·3	+ 0·9
16	00·6	+ 0·1	40·6	+ 1·7	03·2	0·0	19·4	− 1·3	55·5	− 2·4	13·8	+ 1·4
17	26 58·5	+ 2·2	39·0	+ 3·3	02·3	+ 0·9	17·0	+ 1·1	51·0	+ 2·1	14·1	+ 1·1
18	57·3	+ 3·4	38·0	+ 4·3	01·0	+ 2·2	15·3	+ 2·8	49·0	+ 4·1	15·0	+ 0·2
Mean 7h to 18h	27 00·7	.....	34 42·3	.....	32 03·2	.....	34 18·1	.....	21 53·1	.....	25 15·2	.....
Max. and min...	27 00·4	.....	34 42·3	.....	32 03·6	.....	34 17·5	.....	21 52·2	.....	25 15·8	.....

Date	Sept. 5–8		Sept. 9		Sept. 10		Sept. 8–11		Sept. 16–18		Sept. 29–30	
Station	Magdalen River		Magdalen River		Magdalen River		West Turnavik		Matapedia		Grindstone	
L.M.T.	Declination	Variation	Declination	Variation	Delcination	Variation	Declination	Variation	Declination	Variation	Declination	Variation
h.	West ° ′	′	West ° ′	′	West ° ′	′	West ° ′	′	West ° ′	′	West ° ′	′
7	26 57·0	+ 8·4	26 58·0	+ 5·7	26 59·0	+ 7·2	36 34·2	+ 8·2	23 51·2	+ 8·9	26 26·2	+ 7·6
8	27 00·0	+ 5·4	27 00·8	+ 2·9	27 01·0	+·5·2	37·0	+·5·4	53·8	+ 6·3	27·3	+ 6·5
9	04·0	+ 1·4	02·7	+ 1·0	03·6	+ 2·6	41·0	+ 1·4	57·5	+ 2·6	29·8	+ 4·0
10	07·4	− 2·0	05·0	− 1·3	06·6	− 0·4	44·0	− 1·6	24 01·5	− 1·4	33·0	+ 0·8
11	11·0	− 5·6	07·4	− 3·7	09·8	− 6·6	46·8	− 4·4	05·0	− 4·9	36·2	− 2·4
12	12·7	− 7·3	09·0	− 5·3	12·5	− 6·3	47·8	− 5·4	07·2	− 7·1	39·0	− 5·2
13	10·8	− 5·4	07·3	− 3·6	11·7	− 5·5	48·0	− 5·6	06·3	− 6·2	38·5	− 4·7
14	07·6	− 2·2	05·0	− 1·3	09·3	− 3·1	46·8	− 4·4	04·0	− 3·9	37·0	− 3·2
15	04·8	+ 0·6	03·5	+ 0·2	07·0	− 0·8	44·5	− 2·1	01·6	− 1·5	35·7	− 1·9
16	03·4	+ 2·0	02·4	+ 1·3	05·0	+ 1·2	41·3	+ 1·1	23 59·0	+ 1·1	34·7	− 0·9
17	03·0	+ 2·4	01·8	+ 1·9	04·4	+ 1·8	39·0	+ 3·4	57·5	+ 2·6	34·2	− 0·4
18	02·8	+ 2·6	01·6	+ 2·1	04·4	+ 1·8	38·2	+ 4·2	56·7	+ 3·4	33·8	0·0
Mean 7h to 18h	27 05·4	.....	27 03·7	.....	27 06·2	.....	36 42·4	.....	24 00·1	.....	26 33·8	.....
Max. and min...	27 04·4	.....	27 03·5	.....	27 05·7	.....	36 40·6	.....	23 59·0	.....	26 32·6	

TABLE 6.—RESULTS OF SPECIAL OBSERVATIONS FOR DIURNAL VARIATION OF DECLINATION AT STATIONS OCCUPIED IN 1925—(concluded)

Date	Oct. 3–7		Oct. 14–15		Oct. 16–17	
Station	Mulgrave		Halifax		Yarmouth	
L. M. T.	Declination	Variation	Declination	Variation	Declination	Variation
h.	West ° ′	′	West ° ′	′	West ° ′	′
7	24 58·4	+ 2·7	22 24·2	+ 2·4	18 19·7	+ 4·5
8	58·2	+ 2·9	23·5	+ 3·3	19·6	+ 4·6
9	58·7	+ 2·4	23·3	+ 3·5	20·2	+ 4·0
10	25 00·2	+ 0·9	24·2	+ 2·4	22·0	+ 2·2
11	02·5	− 1·4	25·7	+ 1·1	24·5	− 0·3
12	04·2	− 3·1	27·8	− 1·0	27·5	− 3·3
13	04·5	− 3·4	30·7	− 3·9	28·0	− 3·8
14	04·2	− 3·1	31·2	− 4·4	27·4	− 3·2
15	03·0	− 1·9	29·7	− 2·9	26·6	− 2·4
16	01·5	− 0·4	28·0	− 1·2	25·7	− 1·5
17	24 59·8	+ 1·3	26·8	0·0	24·7	− 0·5
18	58·5	+ 2·6	26·0	+ 0·8	24·0	+ 0·2
Mean 7h to 18h	25 01·1	.....	22 26·8	.....	18 24·2	.....
Max. and min	25 01·2	.....	22 27·2	.....	18 23·8	.....

TABLE 7.—RESULTS OF SPECIAL OBSERVATIONS FOR DIURNAL VARIATION OF DECLINATION AT STATIONS OCCUPIED IN 1926

Date	June 19–21		June 25–26		July 1		July 1–2		July 8–10		July 14–16	
Station	Kinmount		Stanstead		Woodstock		Mont Laurier		Rivière du Loup		Quebec	
L.M.T.	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation
h.	West ° ′	′	West ° ′	′	West ° ′	′	West ° ′	′	West ° ′	′	West ° ′	′
7	9 34·2	+ 8·9	16 06·2	+10·1	20 57·0	+ 8·8	10 26·8	+ 9·9	21 41·8	+10·2	19 10·4	+11·0
8	33·7	+ 9·4	06·4	+ 9·9	56·8	+ 9·0	26·8	+ 9·9	43·5	+ 8·5	10·7	+10·7
9	36·3	+·6·8	09·3	+ 7·0	58·6	+ 7·2	28·6	+ 8·1	46·8	+ 5·2	14·7	+ 6·7
10	40·5	+ 2·6	14·6	+ 1·7	21 02·4	+ 3·4	32·8	+ 3·9	50·0	+ 3·0	19·4	+ 2·0
11	46·0	− 2·9	18·6	− 2·3	06·2	− 0·4	38·4	− 1·7	53·8	− 1·8	23·6	− 2·2
12	48·4	− 5·3	22·2	− 5·9	09·8	− 4·0	42·4	− 5·7	57·0	− 5·0	27·1	− 5·7
13	49·3	− 6·2	23·6	− 7·3	13·0	− 7·2	44·3	− 7·6	59·6	− 7·6	29·7	− 8·3
14	49·0	− 5·9	23·0	− 6·7	14·1	− 8·3	44·1	− 7·4	59·5	− 7·5	29·4	− 8·0
15	47·7	− 4·6	20·7	− 4·4	12·5	− 6·7	42·6	− 5·9	56·7	− 4·7	26·5	− 5·1
16	45·6	− 2·5	18·5	− 2·2	09·7	− 3·9	40·3	− 3·6	53·7	− 1·7	23·5	− 2·1
17	43·8	− 0·7	16·8	− 0·5	05·7	+ 0·1	37·8	− 1·1	51·3	+ 0·7	21·3	+ 0·1
18	42·6	+ 0·5	16·0	+ 0·3	04·0	+ 1·8	35·1	+ 1·6	49·7	+ 2·3	20·0	+ 1·4
Mean 7h to 18h	9 43·1	.....	16 16·3	.....	21 05·8	.....	10 36·7	.....	21 52·0	.....	19 21·4	.....
Max.and min....	9 41·5	.....	16 14·8	.....	21 05·5	.....	10 35·6	.....	21 50·8	.....	19 20·0	.....

TABLE 7.—RESULTS OF SPECIAL OBSERVATIONS FOR DIURNAL VARIATION OF DECLINATION AT STATIONS OCCUPIED IN 1926—(continued)

Date	July 20–23		July 24–30		July 27–28		July 29–30		Aug. 4–5		Aug. 12	
Station	Roberval		Ottawa		La Tuque		Hervey Junction		Shawinigan Falls		Doucet	
L.M.T.	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Delcination	Variation
h.	West ° ′	′	West ° ′	′	West ° ′	′	West ° ′	′	West ° ′	′	West ° ′	′
7	18 46·8	+ 9·2	14 01·6	+ 8·6	18 06·0	+ 7·7	19 53·7	+ 9·0	15 55·0	+ 9·6	14 46·5	+ 8·9
8	46·3	+ 9·7	01·7	+ 8·5	05·8	+ 7·9	53·6	+ 9·1	56·1	+ 8·5	47·2	+ 8·2
9	47·4	+ 8·6	03·3	+ 6·9	07·0	+ 6·7	56·0	+ 6·7	16 00·0	+ 4·6	50·7	+ 4·7
10	54·0	+ 2·0	08·0	+ 2·2	12·0	+ 1·7	20 00·0	+ 2·7	04·5	+ 0·1	54·7	+ 0·7
11	19 00·0	− 4·0	11·8	− 1·6	18·0	− 4·3	04·5	− 1·8	09·4	− 4·8	58·7	− 3·3
12	03·1	− 7·1	15·8	− 5·6	21·5	− 7·8	07·6	− 4·9	12·7	− 8·1	15 01·6	− 6·2
13	04·2	− 8·2	17·3	− 7·1	22·5	− 8·8	09·2	− 6·5	13·8	− 9·2	02·7	− 7·3
14	03·3	− 7·3	17·3	− 7·1	20·0	− 6·3	09·4	− 6·7	11·3	− 6·7	01·9	− 6·5
15	01·3	− 5·3	14·9	− 4·7	16·3	− 2·6	08·0	− 5·3	07·0	− 2·4	14 59·5	− 4·1
16	18 57·0	− 1·0	12·3	− 2·1	12·6	+ 1·1	05·7	− 3·0	03·3	+ 1·3	55·8	− 0·4
17	54·3	+ 1·7	09·6	+ 0·6	11·3	+ 2·4	03·3	− 0·6	01·0	+ 3·6	53·5	+ 1·9
18	54·0	+ 2·0	08·2	+ 2·0	11·3	+ 2·4	01·4	+ 1·3	00·5	+ 4·1	52·5	+ 2·9
Mean 7h to 18h	18 56·0	.....	14 10·2	.....	18 13·7	.....	20 02·7	.....	16 04·6	.....	14 55·4	.....
Max. and min...	18 55·2	.....	14 09·5	.....	18 14·2	.....	20 01·5	.....	16 04·4	.....	14 54·6	.....

Date	Aug. 20		Aug. 24–25		Aug. 27		Aug. 30		Aug. 31–Sept. 3		Sept. 10–11	
Station	New Liskeard		Cochrane		Hearst		Port Stanley		Sioux Lookout		Redditt	
L.M.T.	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Vari ation
h.	West ° ′	′	West ° ′	′	West ° ′	′	West ° ′	′	East ° ′	′	East ° ′	′
7	9 54·0	+10·2	10 12·6	+10·8	4 41·3	+12·6	3 36·5	+ 7·3	4 33·9	+ 8·1	8 03·5	+ 6·4
8	54·2	+10·0	11·8	+11·6	42·7	+11·2	35·4	+ 8·4	33·2	+ 7·4	02·7	+ 5·6
9	57·6	+ 6·6	17·8	+ 5·6	47·3	+ 6·6	36·8	+ 7·0	31·0	+ 5·2	00·6	+ 3·5
10	10 03·5	+ 0·7	23·7	− 0·3	52·7	+ 1·2	41·2	+ 2·6	27·7	+ 1·9	7 57·2	+ 0·1
11	10·1	− 5·9	28·7	− 5·3	57·4	− 3·5	46·0	− 2·2	24·0	− 1·8	54·7	− 2·4
12	13·0	− 8·8	31·8	− 8·4	5 00·8	− 6·9	49·7	− 5·9	20·6	− 5·2	53·2	− 3·9
13	13·0	− 8·8	32·7	− 9·3	02·7	− 8·8	51·2	− 7·4	18·6	− 7·2	52·2	− 4·9
14	09·8	− 5·6	30·3	− 6·9	01·3	− 7·4	50·2	− 6·4	20·0	− 5·8	52·0	− 5·1
15	07·0	− 2·8	26·7	− 3·3	4 58·2	− 4·3	48·2	− 4·4	22·8	− 3·6	54·4	− 2·7
16	04·4	− 0·2	23·0	+ 0·4	55·5	− 1·6	45·9	− 2·1	25·0	− 0·8	56·7	− 0·4
17	02·4	+ 1·8	20·7	+ 2·7	53·6	+ 0·3	43·1	+ 0·7	26·3	+ 0·5	58·7	+ 1·6
18	01·2	+ 3·0	20·5	+ 2·9	52·8	+ 1·1	41·6	+ 2·2	26·8	+ 1·0	59·5	+ 2·4
Mean 7h to 18h	10 04·2	.....	10 23·4	.....	4 53·9	.....	3 43·8	.....	4 25·8	.....	7 57·1	.....
Max. and min...	10 03·5	.....	10 22·2	.....	4 52·0	.....	3·43·3	.....	4 26·2	.....	7·57·8	.....

TABLE 7.—RESULTS OF SPECIAL OBSERVATIONS FOR DIURNAL VARIATION OF DECLINATION AT STATIONS OCCUPIED IN 1926 (concluded)

Date	Sept. 23		Sept. 27-29		Oct. 2-3		Oct. 2-4		Oct. 4-6		Oct. 12-14	
Station	Algoma		Twin City Junct'n		Schreiber		Atikokan		White River		Sudbury	
L.M.T.	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation	Declination	Variation
	West		East		West		East		West		West	
h.	° ′	′	° ′	′	° ′	′	° ′	′	° ′	′	° ′	′
7	6 12·2	+ 5·2	1 51·0	+ 5·7	1 53·5	+ 7·6	4 14·5	+·4·8	4 57·5	+ 7·1	8 25·0	+ 5·5
8	12·3	+ 5·1	50·5	+ 5·2	53·2	+ 7·9	15·6	+ 5·9	56·3	+ 8·3	24·3	+ 6·2
9	13·7	+ 3·7	49·2	+ 3·9	54·6	+ 6·5	15·8	+ 6·1	57·2	+ 7·4	24·1	+ 6·4
10	16·7	+ 0·7	46·5	+ 1·2	58·0	+ 3·1	14·2	+ 4·5	5 00·1	+ 4·5	26·6	+ 3·9
11	20·0	− 2·6	42·8	− 2·5	2 01·6	− 0·5	10·6	+ 0·9	06·6	− 2·0	30·0	+ 0·5
12	22·7	− 5·3	39·8	− 5·5	04·7	− 3·6	06·2	− 3·5	11·5	− 6·9	33·6	− 3·1
13	23·0	− 5·6	40·4	− 4·9	06·7	− 5·6	04·8	− 4·9	11·4	− 6·8	36·3	− 5·8
14	21·0	− 3·6	41·6	− 3·7	07·2	− 6·1	05·5	− 4·2	09·2	− 4·6	35·8	− 5·3
15	19·0	− 1·6	43·2	− 2·1	06·0	− 4·9	06·3	− 3·4	07·2	− 2·6	34·5	− 4·0
16	17·2	+ 0·2	44·8	− 0·5	04·4	− 3·3	07·0	− 2·7	06·4	− 1·8	33·2	− 2·7
17	15·7	+ 1·7	46·3	+ 1·0	02·3	− 1·1	07·8	− 1·9	06·0	− 1·4	31·8	− 1·3
18	15·1	+ 2·3	47·0	+ 1·7	01·0	+ 0·1	08·5	− 1·2	05·8	− 1·2	30·8	− 0·3
Mean 7h to 18h	6 17·4	.....	1 45·3	.....	2 01·1	.....	4 09·7	.....	5 04·6	.....	8 30·5	.....
Max. and min...	6 17·6	.....	1 45·4	.....	2 00·2	.....	4 10·5	.....	5 04·2	.....	8 30·2	.....

TABLE 8.—DIURNAL VARIATION CORRECTIONS TO BE APPLIED TO OBSERVATIONS TAKEN DURING 1924

L.M.T.	7h	8h	9h	10h	11h	12h	13h	14h	15h	16h	17h	18h	Remarks
Month	′	′	′	′	′	′	′	′	′	′	′	′	
May-August.....	−5·3	−6·0	−5·9	−4·0	−0·9	+2·1	+4·3	+5·4	+4·9	+2·8	+1·7	+1·0	Stations in British Columbia.
July-August.....	−6·2	−8·3	−8·3	−6·2	−3·0	+0·7	+4·6	+6·7	+6·7	+5·6	+4·5	+3·3	Stations in Yukon Territory.
September-October.	−4·1	−4·6	−4·1	−2·2	+0·4	+2·2	+3·2	+3·2	+2·7	+1·9	+1·0	+0·2	Stations in British Columbia.

TABLE 9.—DIURNAL VARIATION CORRECTIONS TO BE APPLIED TO OBSERVATIONS TAKEN DURING 1925

L.M.T.	7h	8h	9h	10h	11h	12h	13h	14h	15h	16h	17h	18h	Remarks
Month	′	′	′	′	′	′	′	′	′	′	′	′	
June-August.....	−7·4	−6·4	−4·2	−1·2	+3·0	+6·7	+7·0	+4·8	+2·4	+0·1	−1·8	−2·8	
September.....	−7·5	−5·2	−2·4	+0·8	+4·0	+6·2	+5·2	+2·8	−0·7	−0·8	−1·7	−2·1	Stations south of St. Lawrenc river.
September.....	−8·2	−5·4	−1·4	+1·6	+4·4	+5·4	+5·6	+4·4	+2·1	−1·1	−3·4	−4·2	Stations in Labrador and Newfoundland.
October.....	−3·1	−3·4	−3·1	−1·6	+0·5	+2·6	+3·6	+3·4	+2·3	+0·9	−0·5	−1·6	Stations in Nova Scotia and New Brunswick.

TABLE 10.—DIURNAL VARIATION CORRECTIONS TO BE APPLIED TO OBSERVATIONS TAKEN DURING 1926

L.M.T.	7h	8h	9h	10h	11h	12h	13h	14h	15h	16h	17h	18h	Remarks
Month	′	′	′	′	′	′	′	′	′	′	′	′	′
June	−9·5	−9·6	−6·9	−2·2	+2·6	+5·6	+6·8	+6·3	+4·5	+2·4	+0·6	−0·4	
July	−9·3	−9·2	−7·0	−2·5	+2·2	+5·7	+7·7	+7·2	+5·0	+2·0	−0·5	−1·8	
August	−10·0	−9·5	−5·6	−0·7	+4·1	+7·3	+8·4	+6·5	+3·3	+0·2	−1·8	−2·5	Stations in Northern Quebec and Northern Ontario.
August	−9·5	−8·8	−5·7	−0·1	+3·9	+6·4	+7·1	+5·7	+3·2	+0·7	−1·0	−2·0	Derived from Agincourt data: applied to stations in Southern Ontario.
September	−5·8	−5·3	−3·7	−0·7	−2·5	+4·9	+5·1	+4·1	+2·1	+0·2	−1·5	−2·1	Stations in Ontario north of latitude 45°·5.
September	−5·9	−5·8	−3·3	−0·4	+2·5	+4·5	+5·3	+4·0	+1·8	−0·3	−1·3	−1·8	Derived from Agincourt data; applied to stations in Southern Ontario.
October	−6·2	−7·1	−6·8	−4·0	+0·3	+4·3	+5·8	+5·0	+3·7	+2·6	+1·4	+0·6	

MAGNETIC RESULTS, 1924-1926

From the results given in the foregoing tables were determined most of the diurnal variation corrections which were used in the reduction of observations of declination. In cases where the field data were not used for this purpose, the corrections were determined from the records at Agincourt. The corrections are summarized in Tables 8 to 10, which correspond, respectively, to the years 1924 to 1926. As will be seen, the results are grouped according to months, and under the heading of remarks are references which indicate the grouping as to locality. For example, in Table 8 are given the hourly values corresponding to the period, May–August, and a reference to a locality. It is to be understood from this that the results were derived from the special observations of declination at stations in British Columbia during the months May–August, 1924, and further, these results were applied as corrections at all the stations in that particular region and occupied during those months. Where no remarks appear after a series of values, as, for example, those of June–August, 1925, Table 9, the inference is that these values apply to all stations occupied during those months regardless of the locality.

The question may naturally arise as to the reliability of the corrections determined in this manner. The method was used in connection with the reduction of the observations obtained in 1922 and 1923 and found quite satisfactory.[1] From the results given in Table 10 it will be seen that there is fairly good agreement between the results obtained at field stations and those derived from Agincourt for the corresponding months. The results for October, 1926, show a larger range than was expected, even making allowance for difference of magnetic latitude. The results on the whole, however, appear to be quite satisfactory. In view of the policy of securing at all stations declinations spread over the observing period of the day, the error in the mean value at any station due to errors in the adopted correction for diurnal variation will probably be small.

[1] Publications of the Dominion Observatory, Vol. VIII, No. 8, pp. 160–181.

In applying the corrections given in Tables 8–10 it is assumed that west declination is negative and east declination positive. A negative sign in the tables indicates that west declination must be increased and east declination decreased in order to reduce the observation to the mean of the day; in the case of a correction with a plus sign the procedure is, of course, the reverse.

SPECIAL DECLINATION—HORIZONTAL INTENSITY OBSERVATIONS

Reference has been made to the method of determining the diurnal variation of horizontal intensity simultaneously with declinations by observing deflections at one distance. The value of the intensity is computed from the formula

$$H = \frac{M_t \; C_t}{\sin u}$$

where M_t = the value of the magnetic moment at temperature $t°$ centigrade
C_t = a constant at a particular deflection distance and a particular temperature, in this case $t°$
u = observed angle of deflection

To determine H it is necessary to know the value of both M and C at temperature $t°$. These values are determined from values at 20° by applying a correction for change of temperature. The value of log C, which is one of the instrumental constants used in the computation of H from deflections and oscillations, is known. As M, the magnetic moment, is found, usually, to vary during a season it is necessary to compute a value for the time of observation. It has been the custom, as a matter of interest, to compute a value of M from each observation of horizontal force obtained by the method of deflections and oscillations. These were then reduced to 20° centigrade, and the values for the season were adjusted. For convenience in computing the force from the special observations, the values of 1926 were tabulated for intervals of ten, or, in a few cases, eleven days. These, as well as the values of log MC at 20°, are given in Table 11.

The change in the logarithm of the product of the magnetic moment, M, and the constant, C, is given by the following expression:

$$\log (MC)_t = [\log M_{20} \{1-(t-20°)\, q\}] + \log [C_{20} \{1-(t-20°)\, x\}]$$

where q and x are, respectively, the decrease in the magnetic moment, M, and the constant C, for 1° increase in temperature.

For our purpose this becomes

$$\log (MC)t = \log M_{20} + \log C_{20} + \log \{1-(t-20°)\, q\} + (t-20°) \log (1-x)$$

where $q = 0 \cdot 000466$ and $\log (1-x) = -0 \cdot 000025$.

The values of the correction to be applied to $\log (MC)_{20}$ are given in Table 12.

TABLE 11.—VALUES OF MAGNETIC MOMENT OF INTENSITY MAGNET No. 104L FOR USE IN COMPUTING DIURNAL VARIATION OBSERVATIONS OF HORIZONTAL INTENSITY FOR THE SEASON 1926.

Date	M_{20}	log M_{20}	log C_{20}	log $(MC)_{20}$
1926				
June 10	266·82	2·42622	6·40412	8·83034
" 20	·80	619	.....	·83031
" 30	·77	614	.....	·83026
July 10	·75	610	.....	·83022
" 20	·73	607	.....	·83019
" 30	·70	602	.....	·83014
Aug. 10	·68	599	.....	·83011
" 20	·65	594	.....	·83006
" 30	·63	591	.....	·83003
Sept. 10	·60	586	.....	·82998
" 20	·57	581	.....	·82993
" 30	·55	578	.....	·82990
Oct. 10	·52	573	.....	·82985
" 20	·50	570	.....	·82982
" 30	·47	565	.....	·82977

TABLE 12.—VALUES OF log $\{1-(t-20°)\,q\}$ + log $\{1-(t-20°)x\}$ FOR DIFFERENT TEMPERATURES

$(t-20°)$ Cent.	log $\{1-(t-20°)\,q\}$		$(t-20°)$. log $(1-x)$	log $\{1-(t-20°)\,q\}$+log $\{1-(t-20°)x\}$	
	$(t-20°)$ − ve	$(t-20°)$ + ve		$(t-20°)$ − ve	$(t-20°)$ + ve
1	+0·00020	−0·00020	±0·000025	+0·00022	−0·00022
2	040	040	050	045	045
3	061	061	075	068	068
4	081	081	100	091	091
5	101	101	125	114	114
6	+0·00121	−0·00122	±0·000150	+0·00136	−0·00137
7	141	142	175	158	159
8	162	162	200	182	182
9	182	182	225	205	205
10	202	202	250	227	227
11	+0·00222	−0·00223	±0·000275	+0·00250	−0·00250
12	242	244	300	272	274
13	262	264	325	295	296
14	282	284	350	317	319
15	303	305	375	340	342
16	+0·00323	−0·00325	±0·000400	+0·00363	−0·00365
17	343	345	425	386	388
18	363	366	450	408	411
19	383	386	475	430	434
20	403	407	500	453	457

TABLE 13.—RESULTS OF SPECIAL DECLINATION-HORIZONTAL INTENSITY OBSERVATIONS, 1926

Ottawa			Port Stanley			Algoma		
Date	July 30		Date	August 30		Date	September 23	
L.M.T.	D	H	L.M.T.	D	H	L.M.T.	D	H
h m	West ° ′	γ	h m	West ° ′	γ	h m	West ° ′	γ
7 00	14 01·9	14749	7 00	3 34·0	16108	6 59	6 14·3	14117
20	01·2	757	20	34·4	102	7 19	11·6	115
40	01·7	754	40	.....	.....	39	10·7	118
8 00	02·2	751	8 00	33·4	087	59	12·0	107
20	03·2	739	20	34·2	079	8 19	11·7	109
40	03·7	744	40	34·5	076	39	12·8	099
9 00	05·2	737	9 00	34·7	068	59	12·4	092
20	07·3	740	20	36·8	068	9 19	13·5	102
40	06·7	738	40	38·7	066	39	15·8	093
10 00	09·9	738	10 00	39·2	059	59	17·6	094
20	11·8	741	20	40·8	063	10 19	18·2	090
40	11·4	737	40	42·5	065	39	19·3	084
11 00	12·0	724	11 00	43·3	073	59	21·0	089
20	13·3	747	20	44·0	075	11 19	21·7	093
40	15·0	745	40	.....	.....	39	.....	.....
12 00	13·9	748	12 00	.....	.....	59	.....	.....
20	.....	.....	20	48·8	088	12 19	26·1	111
40	.....	.....	40	48·8	093	39	26·2	141
13 00	12·4	768	13 00	48·2	110	59	26·7	145
20	13·0	768	20	48·5	095	13 19	24·2	135
40	13·6	779	40	48·3	097	39	23·1	156
14 00	14·2	781	14 00	48·7	112	59	22·0	161
20	13·9	776	20	48·6	113	14 19	21·7	155
40	14·0	785	40	47·6	110	39	21·1	163
15 00	13·4	788	15 00	46·7	119	59	19·4	171
20	11·9	782	20	46·4	116	15 19	15·6	152
40	11·1	779	40	45·8	132	39	14·0	159
16 00	10·3	780	16 00	44·6	137	59	16·0	167
20	09·4	789	20	42·7	129	16 19	16·1	173
40	09·8	781	40	42·3	121	39	17·7	148
17 00	08·6	781	17 00	42·2	116	59	18·8	140
20	08·7	779	20	.....	.....	17 19	.....	.....
40	08·1	788	40	.....	.....	39	17·1	154
18 00	08·5	773	18 00	43·0	126	59	.....	.....

TABLE 13.—RESULTS OF SPECIAL DECLINATION-HORIZONTAL INTENSITY OBSERVATIONS, 1926 (concluded)

White River					Sudbury				
Date	October 5		October 6		Date	October 13		October 14[1]	
L.M.T.	D	H	D	H	L.M.T.	D	H	D	H
h m	West ° ′	γ	West ° ′	γ	h m	West ° ′	γ	West ° ′	γ
6 58	.....	.....	.....	.....	7 09	.....	.....	8 17·3	14176
7 18	.....	.....	4 54·7	12613	29	.....	.....	18·5	187
38	.....	.....	52·9	608	49	.....	.....	16·5	193
58	.....	.....	51·6	588	8 09	.....	.....	19·4	193
8 18	.....	.....	54·3	596	29	.....	.....	19·7	179
38	.....	.....	53·9	582	49	.....	.....	18·7	182
58	.....	.....	57·4	578	9 09	.....	.....	17·7	162
9 18	.....	.....	55·8	571	29	.....	.....	17·6	162
38	.....	.....	58·3	571	49	.....	.....	17·1	156
58	.....	.....	59·9	566	10 09	.....	.....	18·6	162
10 18	.....	.....	5 01·9	557	29	.....	.....	21·0	166
38	.....	.....	05·5	547	49	.....	.....	23·6	161
58	.....	.....	08·1	557	11 09	.....	.....	22·4	168
11 18	.....	.....	11·0	561	29	.....	.....	25·6	171
38	.....	.....	14·7	571	49	.....	.....	29·9	163
58	.....	.....	15·1	568	12 09	.....	.....	32·0	156
12 18	.....	.....	13·2	573	29	.....	.....	43·2	172
38	.....	.....	13·4	578	49	.....	.....	43·8	190
58	.....	.....	12·5	583	13 09	8 38·2	14174	39·2	212
13 18	.....	.....	.....	.....	29	39·3	180	31·5	225
38	.....	.....	11·4	596	49	39·1	185	32·1	225
58	.....	.....	10·8	595	14 09	39·3	218	35·0	233
14 18	.....	.....	10·4	597	29	38·8	215	37·6	252
38	.....	.....	08·2	602	49	37·3	221	.....	.....
58	.....	.....	07·2	614	15 09	.....	.....	.....	.....
15 18	.....	.....	08·6	622	29	37·2	236	.....	.....
38	.....	.....	07·5	616	49	38·4	233	.....	.....
58	5 02·7	12610	06·4	606	16 09	38·1	247	.....	.....
16 18	03·0	608	04·9	597	29	37·1	203	.....	.....
38	02·6	614	05·1	604	49	36·3	228	.....	.....
58	02·3	615	04·4	606	17 09	33·5	238	.....	.....
17 18	.....	.....	03·7	612	29	.....	.....	.....	.....
38	.....	.....	.....	.....	49	.....	.....	.....	.....

[1] Disturbance developed on October 14.

SUMMARY OF MAGNETIC RESULTS

The results of the observations for the three years 1924–6 are given in accordance with the plan adopted for summarizing the results of the two years, 1922 and 1923, which, with slight modification, is similar to the scheme used by the Carnegie Institution for recording similar data.

In the summary the observations are grouped according to years and the results of each year are arranged in order of increasing west longitude. For each station there are given the values of the latitude, longitude, date, local mean times corresponding to the values of the three magnetic elements, declination, inclination and horizontal intensity, which are also given, as well as the instrument number and observer's initial. The letters *F* and *M* refer, respectively, to C. A. French and R. G. Madill.

The method of arriving at the mean value of each of the elements may be briefly explained. In three columns are entered values of local mean time, which is given to the nearest $0 \cdot 1^h$, followed by a value or values of the magnetic element. Where, for example, four values of time precede a value of declination the inference is that the value given is the mean of four observations taken at the times indicated. In some cases there is given the time of beginning and time of ending of what may be either a continuous series of readings at uniform intervals, or a number of sets taken in the ordinary way and distributed fairly uniformly over the interval, followed by a bracketed number. The number indicates either the actual number of sets taken, or the weight to be assigned to the result in deriving a mean value for the station. Where no such number is given, the weight is determined by the number of values of the time preceding the value of the magnetic element.

Inclination values are, at most stations, grouped, but the method of grouping differs slightly from that adopted for the declinations. Corresponding to each value of time there is given one value of inclination. Two numbers in the column headed "needle" indicate that the inclination was determined from the mean of results using two needles. These numbers, furthermore, designate the needles used in the observations. When two dip needles were used, the observations were carried out in such a way that the mean time was the same for each needle. When the earth inductor was used the corresponding spaces in the column for the number of needle remain blank, except in a few cases, where the bracketed number, (2), occurs. This number indicates that the value of inclination is the mean of two observations. The time given for this value of inclination is the mean for the two observations, which are separated at most by $0 \cdot 2^h$.

As in the declination results, the number of values of time preceding a horizontal intensity result indicates the number of sets of observations entering into the result.

In the summary there is given for each station a mean value for each of the three magnetic elements. It has already been pointed out that each observation of declination has been corrected for diurnal variation, so that the mean value is simply the weighted mean. Corresponding values of inclination and horizontal intensity, however, have not been similarly corrected, that is for diurnal variation, but represent observed values. In certain cases the mean value for the station has been derived by assigning weights to the individual values in accordance with the method outlined on pages 347–8. For example, observations were taken at Alert Bay, $\lambda = 126° \, 55' \cdot 8$, on Oct. 3 and 4, 1924. The mean value of the inclination for this station is $71° \, 22' \cdot 7$ and the horizontal intensity

18318γ. The mean value of the inclination is obtained by taking the mean of the values at $14 \cdot 4^h$ on Oct. 3 and $14 \cdot 4^h$ on Oct. 4, which is 71° 23′·6, giving it weight unity and combining it with the morning observation on Oct. 4 to obtain the mean value 71° 22′·7. In the case of the horizontal intensity, the mean of the morning values is 18314γ and the afternoon 18323γ, giving for the station the mean value 18318γ. At a few stations observations were obtained only in the morning, or the afternoon. As a rule a correction was applied to these observations to reduce them to the mean of the day, though a few exceptions to this will be noted. For example, on June 9, 1924, at Nanaimo, λ = 123° 56′·2, observations of horizontal intensity were taken at $15 \cdot 8^h$, $16 \cdot 4^h$ and $20 \cdot 2^h$. As there were no observations during the season at the time of the last, namely, $20 \cdot 2^h$, from which a correction could be determined, the mean of the three observations was adopted as the mean value for the station.

In the summary of the horizontal intensity results are the means of the hourly values from 7^h to 18^h at five stations at which special declination-horizontal intensity observations were taken in 1926. These values are obtained from Table 13 and in order that they may be distinguished from the other values they are given in italics. As they differ fairly consistently, though by a small amount, from the values determined according to the regular program, they were not included when deriving the general mean.

SELECTION AND DESCRIPTION OF STATIONS

The usual consideration was given to the selection and description of stations. In the selection it is important that the point chosen appears likely to be available for future observations. The site must also be free from artificial disturbance. Having made the selection the description should be sufficiently complete that its recovery at a future date may be readily made. When possible the point is connected by linear measurements to some well-defined and permanent marks, and bearings, referred to the meridian, of some prominent objects are determined. As an additional aid in relocating the station a mark of some kind is left in the ground to indicate the precise point of observation. For this purpose a wooden peg is sometimes used. It is customary, however, to use material of a more permanent nature, such as a brick, a stone or concrete block.

The general form adopted for the description is: name of station, province in which it is located, year occupied and the general description, including details of linear and angular measurements and marking of the station.

The stations are arranged alphabetically.

MAGNETIC OBSERVATIONS, 1924

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	West ° ′	h.	° ′		h. h.	γ			
Ottawa	45 23·6	75 43·0	April 17	7·6 8·0 12·2 12·6	14 01·9	.....	.....	.....	10·7 11·1	14771	20	....	M
			" 17	.....	.....	.....	.....	.....	13·4 14·2	14793	20	....	M
			" 23	7·9 8·3 12·5 12·9	00·7	10·8	75 38·4	1, 2	11·6	14769	20	20	M
			" 23	.....	.....	16·2	36·4	5, 6	13·7	14769	20	20	M
			" 24	7·6 8·2 13·1 13·4	02·2	10·2	37·6	1, 5	11·4	14765	20	20	M
			" 24	.....	.....	15·1	35·8	6, 2	13·9	14786	20	20	M
				Mean	14 01·6	.....	75 37·0	.....	.....	14780			
Ottawa	45 23·6	75 43·0	Nov. 11	7·5 to 17·0 (10)	14 05·5	9·7	75 36·6	1, 2	10·6 11·6	14755	20	20	M
			" 11	.....	.....	15·6	35·2	5, 6	13·4 14·7	14784	20	20	M
			" 12	7·5 to 17·0 (10)	05·0	9·6	37·4	5	10·3 11·5	14757	20	20	M
			" 12	.....	.....	15·5	37·8	6	13·4 14·5	14776	20	20	M
			" 13	8·0 to 16·0 (7)	03·8	9·6	39·4	1, 2	10·5 11·5	14753	20	20	M
			" 13	.....	.....	15·6	37·0	5, 6	13·5 14·5	14775	20	20	M
				Mean	14 04·9	.....	75 37·2	.....	.....	14767			
Pemberton	50 19·6	122 48·2	Oct. 13	10·4 10·6 13·4 13·8	East 24 17·2	11·3	73 00·3	1, 5	.....	.....	20	20	M
			" 13	14·1 15·2 15·7	15·9	14·6	72 56·2	2, 6	15·5 16·2	17027	20	20	M
			" 14	8·9 9·3 9·7 10·0	15·4	.....	.....	.....	10·7 11·4	17003	20	..	M
			" 15	11·8 13·5 14·9 16·2	14·6	.....	.....	.....	15·0 15·8	17039	20	..	M
			" 18	15·0	14·9	14·1	58·0	5, 6	.....	.....	20	20	M
				Mean	24·15 7	.....	72 58·7	.....	.....	17018			
Vancouver	49 17·8	123 07·1	June 19	16·4 16·6	25 19·2	.....	.....	.....	16·0 17·2	18631	20	..	M
			" 20	8·0 8·4 11·4 13·7	24·5	9·6	71 31·0	1, 5	10·4 11·0	18636	20	20	M
			" 20	14·0 14·4 16·4 16·6	24·0	17·3	29·7	6, 2	15·5 16·2	18625	20	20	M
			" 21	9·0 9·3	25·3	8·5	29·8	2, 1	.....	.....	20	20	M
				Mean	25 23·6	.....	71 30·0	.....	.....	18632			

Squamish	49 42·6	123 08·6	Oct.	9	10·6 10·8 13·8 14·1	25 28·4	15·4	71 41·4	1, 2	11·0 11·5	18167	20	20	M
			"	9	14·4 15·9 17·1	27·5	.....	.....	.....	16·2 16·8	18185	20	..	M
			"	10	8·4 8·8	24·9	9·7	44·2	5, 6	.....	.....	20	20	M
					Mean.....	25 27·3	.....	71 42·8	.....	.....	18176	....		
Victoria (Mount Douglas)	48 29·1	123 19·9	May	27	9·4 12·8 13·0 13·5	24 33·7	10·2	70 55·2	1, 5	11·0	18850	20	20	M
			"	27	15·2 16·8 17·0	34·2	14·2	51·7	2, 6	11·5	18884	20	20	M
			"	28	8·0 to 16·2 (12)	32·0	10·5	57·7	1	.....	.....	20	20	M
			"	28	.....	.....	15·5	58·4	6	.....	.....	..	20	M
					Mean.....	24 32·7	.....	70 54·8	.....	.....	[1]18874			
Victoria	48 24·5	123 22·2	May	22	16·4 16·8	24 37·7	.....	.....	.....	.....	.....	20	..	M
			"	23	7·8 8·2 8·6	36·6	9·6	71 10·8	1, 2	10·8 11·7	18533	20	20	M
			"	23	10·2 10·3	36·6	.....	.....	.....	14·2 14·9	18583	20	..	M
			"	23	13.0 13·4 13·8 15·4	38·7	.....	.....	.....	.....	.....	20	..	M
			"	26	10·0 10·3	33·2	9·4	11·0	5, 6	10·8	18585	20	20	M
					Mean.....	24 36·9	.....	71 10·0[1]	.....	.....	18567			
Nanaimo	49 12·8	123 56·2	June	9	11·5 12·4 12·8 13·3	25 16·8	14·1	71 11·2	1, 6	15·8	18647	20	20	M
			"	9	13·6 14·6 15·4 16·8	16·2	.....	.....	.....	16·4	18659	20	..	M
			"	9	17·4 18·0 18·5	17·1	.....	.....	.....	20·2	18655	20	..	M
					Mean.....	25 16·7	.....	71 12·1[1]	.....	.....	18654			
Courtenay	49 42·0	124 59·2	June	12	11·5 to 16·7 (6)	26 23·6	14·4	71·08·1	1, 2	15·8 16·4	18701	20	20	M
			"	13	6·9 7·3 7·7	22·1	10·0	09·3	5, 6	11·0 11·6	18693	20	20	M
			"	13	14·5 16·6 16·8	23·3	14 0	08·1	5, 1	15·4 16·0	18690	20	20	M
					Mean.....	26 23·1	.....	71 08·7	.....	.....	18694			
Clayoquot	49 09·5	125 56·5	June	4	9·6 to 13·8 (6)	25 23·1	14 9	70 36·8	5, 6	10·3 11·5	19028	20	20	M
			"	4	14·1 " 19·6 (5)	21·3	.....	.....	.....	15·8 16·4	19026	20	20	M
			"	5	6·4 " 12·6 (8)	22·2	10·2	36·0	1, 2	.....	.....	20	20	M
			"	5	13·0 " 16·9 (8)	20·2	16·3	36·8	5, 2	.....	.....	20	20	M
					Mean.....	25 21·6	.....	70 36·4	.....	.....	19027			

[1] Corrections applied to observations for diurnal change.

MAGNETIC OBSERVATIONS, 1924 (continued)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	East ° ′	h.	° ′		h. h.	γ			
Alert Bay	50 35·6	126·55·8	Oct. 3	9·3 9·5 11·2 13·6	25 47·4	14·4	71 23·0	1, 6	10·1 10·9	18313	20	20	M
			" 3	15·1 16·6	45·0	.....	.....	.....	15·4 16·2	18323	20	..	M
			" 4	8·4 8·8 11·5 13·5	45·0	9·6	21·8	2, 5	10·4 11·1	18315	20	20	M
			" 4	15·4 15·8 16·5 17·2	44·1	14·4	24·2	1, 2	.....	.....	20	20	M
				Mean	25 45·4	.....	71 22·7	.....	.....	18318			
Ocean Falls B	52 21·3	127 42·1	June 23	14·0 14·2 16·5 20·0	26 58·2	19·4	73 04·4	5, 6	15·6 16·1	16821	20	20	M
			" 24	7·6 8·0 9·7	58·9	8·6	05·8	1, 2	10·1 10·8	16813	20	20	M
			" 24	11·1 14·0 14·3	59·2	.....	.....	.....	.....	.....	20	..	M
				Mean	26 58·7	.....	73 05·1	.....	.....	16817			
Stewart	55 56·3	129 59·2	Aug. 24	14·9 15·1 17·0	30 06·7	.....	.....	.....	15·8 16·6	15238	20	..	M
			" 25	10·0 11·9 15·8 16·1	01·8	15·5	74 53·6	1, 6	10·4 11·4	15208	20	20	M
			" 28	7·3 to 13·4 (6)	03·9	10·9	53·0	5, 2	.....	.....	20	20	M
			" 28	13·8 to 19·2 (6)	04·3	.....	.....	.....	.....	.....	20	..	M
				Mean	30 04·0	.....	74 53·3	.....	.....	15223			
Prince Rupert	54 18·2	130 20·0	June 26	10·9 11·2 12·6 13·0	28 57·7	.....	.....	.....	14·6 15·4	16380	20	..	M
			" 26	13·5 13·9 15·8	29 00·5	.....	.....	.....	.....	.....	20	..	M
			" 26	16·2 18·9 19·3	28 59·1	.....	.....	.....	.....	.....	20	..	M
				Mean	28 59·0	.....	.....	.....	.....	[1]16370			
Prince Rupert	54 18·2	130 20·0	Aug. 18	19·2	28 57·8	.....	.....	.....	.....	.....	20	..	M
			" 19	10·6 12·6 12·9	58·8	14·4	73 33·6	1, 2	11·2 12·3	16355	20	20	M
			" 19	13·2 13·4 15·0	58·8	.....	.....	.....	15·5 16·0	16380	20	..	M
			" 20	9·9 15·4	59·8	11·6	37·2	5, 6	.....	.....	20	20	M
			" 20	.....	.....	14·9	33·6	1, 5	.....	.....	20	20	M

[1] Corrections applied to observations for diurnal change.

			" 21	8·0 to 9·6 (5)	59 0	.....	.....	.....	.....	.....	20	..	M
			" 21	12·6 to 16·7 (7)	58·6	.....	.....	.....	.....	.....	20	..	M
				Mean.....	28 58·8	.....	73 35·4	.....	.....	16358			
Jedway A.....	52 18·2	131 13·0	Sept. 6	13·9 14·1	29 59·8	.....	.....	.....	.....	.....	20	..	M
			" 8	12·7 13·4 15·8 16·5	59·4	.....	.....	.....	14·5 15·4	18261	20	..	M
			" 9	9·8 11·1 15·5 16·5	59·1	14·6	71 35·8	5, 6	10·2 10·9	18245	20	20	M
			" 9	....	.....	.....	.....	.....	15·9 16·2	18278	20	..	M
			" 11	7·9 8·2	58·5	16·4	34·3	2, 1	.....	.....	20	20	M
				Mean.....	29 59·2	.....	71 35·8[1]	.....	.....	18257			
Jedway B.....	52 18·2	131 13·0	Sept. 15	11·2 to 15·4 (9)	27 04·6	.....	.....	.....	.....	.....	20	..	M
			" 21	15·5	06·0	.....	.....	.....	.....	.....	20	..	M
			" 22	9·1 9·2 12·6 15·4	03·4	11·5	71 19·7	1 ,2	10·0 10·8	18732	20	20	M
			" 22	.....	.....	14·8	20·1	5, 6	13·0 13·7	18718	20	20	M
				Mean.....	27 04·4	.....	71 19·9	.....	.....	18725			
Jedway C.....	52 17·8	131 13·0	Sept. 24	13·1 to 17·8 (9)	29 39·8	.....	.....	.....	15·3 16·1	17851	20	..	M
			" 25	7·6 " 9·7 (5)	39·5	11·4	71 45·9	1, 5	9·9 10·5	17837	20	20	M
			" 25	10·8 " 14·1 (5)	39·2	13·5	44·2	2, 6	.....	.....	20	..	M
				Mean.....	29 39·6	.....	71 45·0	.....	.....	17844			
Whitehorse.....	60 43·5	135 02·5	Aug. 12	10·0 10·2 14·1 15·8	32 15·1	15.0	77 20·5	1, 2	.....	.....	20	20	M
			" 13	8·1 8·5 9·1 10·0	15·8	10·7	25·8	5, 6	8·6 9·5	12781	20	20	M
			" 13	11·1 11·8 13·7 14·6	14·0	.....	.....	.....	11·5 14·2	12757	20	..	M
				Mean.....	32 15·0	.....	77 23·2	.....	.....	12769			
Keno City.....	63 55·0	135 17·8	July 24	15·2 15·3 17·2 20·8	36 54·6	17·9	78 53·2	1, 2	15·9 16·8	11321	20	20	M
			" 25	10·0 11·9 15·0 16·6	53·8	16·1	54·8	5, 6	10·7 11·4	11277	20	20	M
				Mean.....	36 54·0	.....	78 54·0	.....	.....	11299			
Mayo.....	63 36·0	135 53·5	July 21	14·7 14·9 17·2	36 06·9	.....	.....	.....	.....	.....	20	..	M
			" 21	17·4 20·0 20·2	05·8	.....	.....	.....	16·0 16·8	11648	20	..	M
			" 22	7·2 7·8 9·4 10·7	08·2	10·1	78 25·0	1, 2	10·5 11·4	11625	20	20	M
			" 22	11·8 14·0 15·2 16·4	08·1	14·7	33·8	5, 6	15·6 16·1	11635	20	20	M
			" 22	.....	.....	16·8	34·7	1, 5	.....	.....	20	20	M
				Mean.....	36 07·4	.....	78 29·6	.....	.....	11633			

[1] Corrections applied to observations for diurnal change.

MAGNETIC OBSERVATIONS, 1924 (concluded)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	East ° ′	h.	° ′		h. h.	γ			
Tantalus	62 05·5	136 15·8	Aug. 5	15·5 16·0 16·2 17·7	34 31·0	17·0	77 36·6	1, 2	.....	.....	20	20	M
			" 6	10·0 14·8 16·3 17·8	33·0	17·3	41·0	1, 5	15·2 15·9	12443	20	20	M
			" 7	9·9 11·8 14·3	30·0	15·0	37·6	2, 6	10·4 11·3	12457	20	20	M
			" 7	15·5 16·7	31·2	.....	.....	.....	15·8 16·4	12450	20	..	M
				Mean.....	34 31·4	.....	77 38·4	.....	.....	12452			
Selkirk	62 46·3	137 22·2	Aug. 2	12·6 14·2 16·5	33 59·8	.....	.....	.....	.....	.....	20	..	M
			" 2	17·8 18·2 18·9	54·6	17·3	78 25·0	5, 1	14·6 16·0	11765	20	20	M
			" 3	9·8 11·3 13·4 14·4	59·8	10·4	22·4	2, 6	11·7 14·0	11747	20	20	M
				Mean.....	33 58·2	.....	78 23·7	.....	.....	11756			
Stewart	63 19·2	139 24·2	July 29	15·3 16·9 18·1	34 03·5	17·5	77 41·8	1, 5	15·9 16·6	12309	20	20	M
			" 30	7·5 7·8 9·8 10·2	02·7	11·8	41·6	6, 2	15·6 16·3	12305	20	20	M
			" 30	12·4 15·2 16·7 17·0	02·0	.....	.....	.....	.....	.....	20	..	M
				Mean.....	34 02·7	.....	77 41·7	.....	.....	[1]12302			
Dawson	64 03·4	139 26·0	July 3	11·3 to 20·8 (12)	35 03·8	.....	.....	.....	15·8 19·3	12571	20	..	M
			" 4	8·3 9·4 13·7	03·4	11·5	77 41·4	5, 6	10·0 10·7	12554	20	20	M
			" 4	.....	.....	14·6	37·4	1, 2	.....	.....	..	20	M
			" 5	11·2 to 16·3 (7)	02·4	14·0	42·1	1, 5	15·4 16·0	12553	20	20	M
				Mean.....	35 03·3	.....	77 40·6	.....	.....	12558			
International Boundary	64 40·9	141 00·0	July 10	10·3 to 19·1 (10)	35 29·1	.....	.....	.....	14·8 16·0	12178	20	..	M
			" 11	6·4 " 9·2 (7)	27·4	10·0	77 58·2	1, 6	11·0 11·7	12147	20	20	M
			" 11	10·6 " 14·9 (6)	26·5	16·3	56·8	2, 5	13·8 14·4	12154	20	20	M
			" 11	15·6 " 19·6 (6)	26·9	19·2	54·7	1, 2	.....	.....	20	20	M
				Mean.....	35 27·7	.....	77 56·6	.....	.....	12157			

[1] Corrections applied to observations for diurnal change.

MAGNETIC OBSERVATIONS, 1925

Station	Lat.	Long.	Date.	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	West ° ′	h.	° ′		h. h.	γ			
St. Anthony, Newfoundland	51 22·1	55 33·5	Sept. 29	10·2 11·8	34 09·8	15·4	75 34·8	1, 2	10·6 11·4	13878	20	212	M
			" 29	13·0 14·4	11·8	.....	.....	.....	13·4 14·1	13901	20	....	M
			" 30	9·0 10·0	12·2	9·5	38·0	1, 2	10·5	13858	20	212	M
			" 30	11·0 11·5 12·0	12·6	.....	.....	.....	.....	.....	20	....	M
				Mean.....	34 11·7	.....	75 36·4	.....	.....	13886			
Battle Harbour, Labrador..	52 16·4	55 35·4	Aug. 13	13·8 16·1	34 17·3	.....	.....	.....	14·4 15·6	13643	20	....	M
			" 15	8·0 9·2 10·7	17·4	8·6	75 47·7	1, 2	9·6 10·2	13596	20	212	M
			" 15	11·8 13·6 15·4	16·7	16·0	44·2	1, 2	14·1 15·0	13662	20	212	M
			" 16	7·0 to 12·0 (7)	16·8	8·5	47·2	1, 2	9·7 10·4	13595	20	212	M
			" 16	13·0 " 17·0 (6)	19·1	16·5	43·9	1, 2	.....	.....	20	212	M
				Mean.....	34 17·6	.....	75 45·8	.....	.....	13624			
Point Amour, Labrador.....	51 27·9	56 51·5	Aug. 6	9·5 to 16·7 (5)	32 10·0	16·8	75 50·2	1, 2	10·1 10·9	13730	20	212	M
			" 6	.....	.....	.....	.....	.....	14·4 15·2	13762	20	....	M
			" 7	8·5 to 14·8 (5)	12·7	9·8	51·6	1, 2	.....	.....	20	212	M
				Mean.....	32 11·4	.....	75 50·9	.....	.....	13746			
Blanc Sablon.....	51 25·8	57 08·6	July 31	11·9 15·1 16·9	32 04·7	.....	.....	.....	15·8 16·5	13679	20	212	M
			Aug. 1	10·0 11·7	02·6	.....	.....	.....	10·4 11·2	13673	20	....	M
			" 3	7·0 to 12·0 (6)	03·5	7·5	75 53·5	1, 2	10·4 11·6	13654	20	212	M
			" 3	13·0 " 17·0 (6)	01·8	12·5	51·8	1, 2	15·0 16·0	13714	20	212	M
			" 4	.....	.....	10·2	54·5	1, 2	.....	.....	....	212	M
			" 4	.....	.....	14·7	50·1	1, 2	.....	.....	....	212	M
				Mean.....	32 03·0	.....	75 52·5	.....	.....	13680			

MAGNETIC OBSERVATIONS, 1925 (continued)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	West ° ′	h.	° ′		h. h.	γ			
West Turnavik, Labrador...	55·15·8	59 19·9	Sept. 8	16·4	36 42·7	.....	.....	.....	.....	.....	20	....	M
			" 9	16·2	29·3	16·9	78 33·4	1, 2	.....	.....	20	212	M
			" 10	7·0 8·0 9·0	42·9	.....	.....	.....	.....	.....	20	....	M
			" 10	11·0 13·0 15·5 16·0	42·8	.....	.....	.....	.....	.....	20	....	M
			" 11	8·8 11·2	42·3	9·4	41·2	1, 2	10·1 10·8	11215	20	212	M
			" 11	12·7 14·6 15·9	41·9	15·4	39·6	1, 2	13·4 14·2	11247	20	212	M
			" 12	9·3	43·2	8·7	41·6	1, 2	9·8 10·5	11225	20	212	M
				Mean.....	36 41·7	.....	78 39·0	.....	.....	11234			
Salmon Bay.....	51 25·3	57 37·3	July 21	15·8 17·4	30 11·8	.....	.....	.....	16·3 16·9	13573	20	....	M
			" 22	8·6 9·8 11·5	11·7	9·2	76 01·7	1, 2	10·3 11·1	13515	20	212	M
			" 22	13·5 15·0 16·4	08·6	15·9	75 56·0	1, 2	13·9 14·6	13557	20	212	M
			" 23	9·8 11·4 14·2 15·7	11·0	9·3	76 00·7	1, 2	10·3 11·1	13511	20	212	M
			" 23	.....	.....	15·0	75 58·8	1, 2	.....	.....	....	212	M
				Mean.....	30 10·7	.....	75 59·3	.....	.....	13539			
Harrington Harbour.....	50 30·1	59 28·1	July 14	10·1 11·7 14·1	31 05·5	16·4	75 55·4	1, 2	10·6 11·3	13706	20	212	M
			" 14	15·8 17·0	05·4	.....	.....	.....	14·4 15·3	13764	20	....	M
			" 15	9·7 10·7 11·9	04·1	10·3	56·2	1, 2	11·0 11·6	13724	20	212	M
			" 15	14·4 16·4 17·4	07·7	17·0	55·3	1, 2	15·6 16·1	13748	20	212	M
				Mean.....	31 05·7	.....	75 55·8	.....	.....	13736			
Sydney B.....	46 08·8	60 12·0	Oct. 8	15·2 15·5 16·4 17·0	26 07·4	15·9	73 51·6	.....	.....	.....	104	104	F
			" 8	.....	.....	16·1	51·5	.....	.....	.....	....	104	F
			" 9	7·8 8·2 9·2 10·0	07·4	9·6	53·0	.....	10·4 11·2	15551	104	104	F
			" 9	11·2 to 16·0 (6)	10·0	9·7	53·1	.....	14·7 15·1	15591	104	104	F
				Mean.....	26 08·5	.....	73 52·3	.....	.....	15571			

Mulgrave A.....	45 36·3	61 23·3	Oct.	3	17·5 17·7	24 59·4	.....	.....	.....	.....	.....	104	....	F
			"	5	7·2 to 11·0 (6)	25 02·2	9·6	73 32·3	(2)	10·6 11·4	15959	104	104	F
			"	5	12·0 " 17·0 (6)	00·9	15·6	29·6	(2)	13·6 14·4	16069	104	104	F
			"	6	7·5 " 16·5 (17)	01·9	.....	.....	.....	.....	.....	104	....	F
			"	7	7·0 " 12·2 (6)	00·3	.....	.....	.....	.....	.....	104	....	F
					Mean.....	25 01·4	.....	73 31·0	.....	.....	15984			
Nain, Labrador.....	56 32·2	61 41·8	Sept.	1	9·8 11·5 14·2	42 25·8	.....	.....	.....	10·3 11·1	11299	20	....	M
			"	2	14·0 16·6	27·3	17·1	78 42·5	1, 2	14·4 16·2	11325	20	212	M
			"	3	6·5 to 16·0 (9)	26·4	9·5	45·3	1, 2	.....	.....	20	212	M
					Mean.....	42 26·4	.....	78 43·9	.....	.....	11312			
Natashkwan.....	50 11·3	61 51·4	July	8	9·4 11·0 13·6 15·8	29 42·6	11·6	76 23·9	1, 2	9·8 10·6	13503	20	212	M
			"	8	.....	.....	.....	.....	.....	14·0 14·6	13539	20	....	M
			"	9	8·2 9·4 1·08 11·6	40·6	8·8	23·3	1, 2	9·8 10·4	13516	20	212	M
			"	9	13·4 14·4 15·7 16·3	45·0	15·2	20·6	1, 2	.....	.....	20	212	M
					Mean.....	29 42·7	.....	76 22·6	.....	.....	13524			
Grindstone.....	47 22·6	61 51·4	Sept.	29	9·8 10·8 11·9 13·5	26 31·6	10·4	74 58·7	(2)	11·1 11·6	14738	104	104	F
			"	29	15·0 16·3 17·0 17·5	35·8	15·9	56·7	(2)	13·8 14·6	14778	104	104	F
			"	30	7·6 to 11·0 (8)	32·8	.....	.....	.....	.....	.....	104	....	F
			"	30	11·5 " 16·0 (8)	33·8	.....	.....	.....	.....	.....	104	....	F
					Mean.....	26 33·4	.....	74 57·7	.....	.....	14758			
Etang du Nord.....	47 22·8	61 57·2	Oct.	1	9·6 10·5 11·5 12·7	26 39·2	10·2	75 05·3	.....	10·9	14590	104	104	F
			"	1	13·1 14·1 15·3 15·8	36·3	14·4	04·5	.....	13·6	14635	104	104	F
					Mean.....	26 37·8	.....	75 04·9	.....	.....	14612			
Charlottetown.....	46 14·0	63 07·4	Sept.	24	15·1 16·0 16·9 17·4	24 38·8	16·4	74 34·8	.....	.....	.....	104	104	F
			"	24	.....	.....	16·6	34·6	.....	15·5	15217	104	104	F
			"	25	8·4 8·9 9·9 11·2	36·2	9·4	38·6	.....	10·2	15146	104	104	F
			"	25	13·0 13·9 14·9	39·9	9·6	38·0	.....	10·9	15152	104	104	F
			"	25	15·9 16·9	39·9	.....	.....	.....	14·3	15199	104	....	F
			"	26	7·0 to 12·0 (8)	36·9	.....	.....	.....	.....	.....	104	....	F
					Mean.....	24 37·8	.....	74 36·5	.....	.....	15178			

MAGNETIC OBSERVATIONS, 1925 (continued)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	West ° ′	h.	° ′		h. h.	γ			
Truro	45 21·3	63 16·6	Oct. 12	9·0 10·0 11·4 11·8	23 13·8	9·6	73 38·1	(2)	10·4 11·1	16039	104	104	F
			" 12	13·0 14·5 15·5 16·2	12·1	15·2	38·9	(2)	13·4 14·2	16051	104	104	F
			" 13	7·5 to 13·0 (7)	11·8	.....	.....	.....	.....	.....	104	....	F
				Mean	23 12·4	.....	73 38·5	.....	.....	16045			
Halifax	44 37·6	63 34·5	Oct. 14	9·6 10·7 11·7 12·0	22 25·8	10·2	73 41·7	.....	11·1	15887	104	104	F
			" 14	12·7 14·2 14·9 ...	27·4	15·4	41·2	.....	13·1	15898	104	104	F
			" 14	15·9 16·6 16·9	27·1	15·5	41·0	.....	13·8	15918	104	104	F
			" 15	7·4 7·9 8·3 8·9	26·8	.....	.....	.....	.....	.....	104	....	F
				Mean	22 26·7	.....	73 41·4	.....	.....	15898			
Havre St. Pierre	50 14·6	63 36·0	June 29	9·8 11·3 13·4	34 37·7	15·7	76 08·6	1, 2	10·2 10·9	13851	20	212	M
			" 29	15·0 16·5	44·6	.....	.....	.....	13·8 14·4	13894	20	....	M
			" 30	6·5 to 17·5 (21)	42·6	.....	.....	.....	.....	.....	20	....	M
			July 1	.....	.....	11·1	09·9	1, 2	.....	.....	....	212	M
			" 1	.....	.....	16·0	08·8	1, 2	.....	.....	....	212	M
			" 2	9·1 11·6 13·9 15·3	40·4	8·5	11·4	1, 2	9·6 10·2	13843	20	212	M
			" 2	.....	.....	13·4	09·9	1, 2	14·2 14·9	13900	20	212	M
				Mean	34 41·9	.....	76 09·8	.....	.....	13872			
Tignish	46 56·4	64 02·0	Sept. 22	16·7 17·0	24 50·0	.....	.....	.....	.....	.....	104	....	F
			" 23	7·0 to 10·1 (5)	50·7	9·7	75 26·1	.....	10·5 11·1	14437	104	104	F
			" 23	11·4 " 16·3 (5)	51·9	14·9	23·7	.....	13·4 14·1	14465	104	104	F
				Mean	24 51·1	.....	75 24·9	.....	.....	14451			
Gaspe Basin	48 49·9	64 29·5	Sept. 12	15·8 17·8 18·1	26 07·7	17·4	76 01·7	.....	16·6	13956	104	104	F
			" 13	7·2 9·8 10·8 11·8	08·06	10·5	03·0	.....	11·2	13915	104	104	F
			" 13	14·0 15·0 16·0 17·0	05·6	16·4	75 58·0	.....	14·4	13950	104	104	F

			"	14	8·5 to 12·5 (6)	06·8	10·2	76 03·1	.....	10·7	.....	13922	104	104	F
					Mean.....	26 07·1	.....	76 01·5	.....	.....		13936			
Moncton A.....	46 05·0	64 47·2	Oct.	21	14·0 15·7 16·4	23 24·2	.....	.....	.....	14·4	15·3	15108	104	....	F
			"	22	8·3 8·8 9·4 10·7	22·4	10·3	74 51·0	.....	11·0	11·7	15014	104	104	F
			"	22	12·1 13·8 15·3 16·4	25·2	15·9	47·7	.....	14·1	14·9	15064	104	104	F
			"	23	8·1 to 15·9 (8)	21·8	.....	.....	.....	.....		.....	104	....	F
			"	24	8·2 " 15·2 (8)	24·3	.....	.....	.....	.....		.....	104	....	F
					Mean.....	23 23·4	.....	74 49·4	.....	.....		15050			
Magdalen River.....	49 15·1	65 19·4	Sept.	5	8·9 to 12·9 (5)	27 07·8	10·3	76 28·7	.....	11·1	.....	13641	104	104	F
			"	5	13·7 " 17·6 (5)	04·7	15·3	22·7	.....	14·2	.....	13715	104	104	F
			"	7	7·0 8·0 9·0 10·0	05·4	9·6	28·2	.....	10·4	.....	13645	104	104	F
			"	7	11·0 12·4 13·0 14·0	03·8	15·4	24·6	.....	13·9	.....	13718	104	104	F
			"	8	13·0 to 18·2 (6)	04·2	15·8	25·0	.....	.....		.....	104	104	F
			"	9	6·8 " 18·1 (23)	04·1	.....	.....	.....	.....		.....	104	....	F
			"	10	6·8 " 18·0 (23)	06·2	.....	.....	.....	.....		.....	104	....	F
					Mean.....	27 05·2	.....	76 26·2	.....	.....		13680			
Annapolis.....	44 45·0	65 31·2	Oct.	19	10·1 to 16·9 (10)	21 40·0	15·8	73 53·0	.....	13·0	13·7	15855	104	104	F
			"	20	7·6 " 10·6 (5)	39·5	9·3	55·0	.....	10·1	.....	15829	104	104	F
					Mean.....	21 39·8	.....	73 54·0	.....	.....		15842			
Yarmouth.....	43 49·8	66 06·4	Oct.	16	9·9 11·0 11·9 13·2	18 23·4	10·1	74 09·0	.....	11·4	.....	15514	104	104	F
			"	16	15·4 16·4 17·1 17·3	25·0	16·2	08·1	.....	14·9	.....	15551	104	104	F
			"	17	7·1 to 9·7 (5)	23·7	9·3	08·8	.....	10·1	.....	15507	104	104	F
			"	17	10·7 " 14·8 (5)	24·6	14·3	08·1	.....	13·3	.....	15525	104	104	F
					Mean.....	18 24·2	.....	74 08·5	.....	.....		15524			
Seven Islands (Pointe aux Basques).	50 11·2	66 22·0	June	19	9·6 11·2 13·4 15·5	27 00·2	16·2	77 27·0	1, 2	10·0	10·8	12768	20	212	M
			"	19	.....	.....	.....	.....	.....	13·6	14·4	12799	20	....	M
			"	20	7·0 to 17·0 (20)	00·8	10·6	28·6	1, 2	.....		.....	20	212	M
			"	22	14·2 16·0	01·9	.....	.....	.....	14·6	15·4	12815	20	....	M
			"	23	15·0 16·2	00·4	15·6	27·0	1, 2	.....		.....	20	212	M
			"	24	9·6	26 58·7	8·5	30·0	1, 2	10·0	.....	12770			
					Mean.....	27 00·7	.....	77 28·2	.....	.....		12788			

MAGNETIC OBSERVATIONS, 1925 (concluded)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	West ° ′	h.	° ′		h. h.	γ			
Ste. Anne des Monts.....	49 08·3	66 29·6	Sept. 3	6·9 to 10·5 (6)	25 24·6	9·2	76 40·3	.....	11·0	13449	104	104	F
			" 3	11·6 " 17·7 (6)	20·9	16·1	33·7	.....	14·4	13518	104	104	F
				Mean.....	25 22·8	.....	76 37·0	.....	.....	13484			
Matapedia.....	47 58·5	66 57·8	Sept. 16	9·4 to 12·6 (6)	24 00·1	10·4	76 10·8	.....	11·3	13834	104	104	F
			" 16	13·6 " 17·8 (6)	01·0	10·6	10·5	.....	12·1	13848	104	104	F
			" 16	.....	.....	16·6	9·3	.....	14·6	13862	104	104	F
			" 16	.....	.....	16·8	9·7	.....	15·4	13859	104	104	F
			" 17	7·9 to 18·0 (12)	00·6	.....	.....	.....	.....	.....	104	....	F
			" 18	7·0 " 16·0 (12)	00·1	.....	.....	.....	.....	.....	104	....	F
				Mean.....	24 00·4	.....	76 10·1	.....	.....	13851			
Matane.....	48 51·7	67 32·1	Aug. 31	11·2 12·3 13·7	25 15·3	.....	.....	.....	11·7	13558	104	....	F
			" 31	15·6 17·1 18·0	14·6	16·7	76 39·0	.....	14·2 15·1	13598	104	104	F
			Sept. 1	7·0 9·1 9·6	15·1	10·1	39·2	.....	11·0	13550	104	104	F
			" 1	10·5 11·5 12·6	15·4	.....	.....	.....	.....	.....	104	....	F
				Mean.....	25 15·1	.....	76 39·1	.....	.....	13576			
Godbout A.....	49 19·0	67 36·1	June 15	9·4 11·1 12·9	25 06·1	15·7	77 11·0	1, 2	9·9 10·7	12955	20	212	M
			" 15	14·4 16·6	08·6	.....	.....	.....	13·3 14·0	12976	20	....	M
			" 16	8·1 9·5 11·3	06·9	8·8	14·4	1, 2	10·3 11·0	12935	20	212	M
			" 16	12·9 15·6	06·2	15·0	10·0	1, 2	13·3 14·0	13001	20	212	M
				Mean.....	25 06·9	.....	77 12·4	.....	.....	12967			
Godbout B.....	49 19·0	67 36·1	June 11	14·3 16·3 17·1	25 04·6	.....	.....	.....	14·9 15·8	12987	20	....	M
			" 12	7·6 9·1 11·0 12·8	04·3	8·3	77 14·9	1, 2	9·7 10·5	12929	20	212	M
			" 12	14·5 17·1	04·6	15·8	12·4	1, 2	13·2 14·0	12985	20	212	M

			"	13	9·2 13·6 15·0	03·9	10·0	17·0	1, 2	10·7 11·2	12911	20	212	M
			"	13	.....	.....	14·2	12·1	1, 2	.....	.....	20	212	M
					Mean.....	25 04·3	.....	77 15·5	.....	.....	12953			
Bersimis.....	48 56·1	68 39·2	Aug.	24	17·8	21 53·4	.....	.....	.....	.....	.....	104	....	F
			"	25	7·7 9·6 10·1 11·6	51·6	11·2	77 33·3	.....	12·2	12758	104	104	F
			"	25	14·0 15·0 16·0 17·0	54·0	16·5	31·0	.....	14·4	12796	104	104	F
			"	25	18·0	49·7	.....	.....	.....	15·6	12760	104	....	F
			"	26	10·0 11·0 12·1 13·0	54·2	10·4	33·3	.....	11·4	12755	104	104	F
			"	26	.....	.....	16·3	31·4	.....	.....	.....	....	104	F
			"	27	7·0 8·0	50·7	.....	.....	.....	.....	.....	104	....	F
					Mean.....	21 52·7	.....	77 32·3	.....	.....	12767			
Ottawa.....	45 23·6	75 43·0	July	7	13·0 to 18·0 (6)	14 05·4	15·6	75 35·0	1, 2	14·5	14782	15	145	F
			"	8	7·0 " 14·0 (8)	06·5	9·6	37·0	1, 2	10·4	14753	15	145	F
			"	9	.....	.....	9·7	35·6	1, 2	10·5	14745	15	145	F
			"	9	.....	.....	15·0	33·3	1, 2	13·4 14·3	14787	15	145	F
			"	10	7·0 to 17·0 (11)	04·2	9·5	35·1	1, 2	10·5	14746	15	145	F
			"	11	7·0 " 10·0 (4)	06·4	.....	.....	.....	.....	.....	15	....	F
			"	13	11·0 " 14·0 (4)	07·8	.....	.....	.....	.....	.....	15	....	F
			"	14	15·0 " 18·0 (4)	05·6	.....	.....	.....	.....	.....	15	....	F
					Mean.....	14 05·7		75 35·0	.....	.....	14767			

MAGNETIC OBSERVATIONS, 1926

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	West ° ′	h.	° ′		h. h.	γ			
Moncton B.	46 05·9	64 49·4	July 6	10·4 11·4 13·4 14·3	23 16·7	15·6	74 45·1	.....	11·0	15031	104	104	F
			" 6	15·1 16·1 17·0 18·0	17·5	.....	.....	.....	14·0 14·7	15095	104	....	F
			" 7	7·0 to 14·3 (9)	16·5	10·0	48·9	.....	10·8	15036	104	104	F
				Mean	23 16·8	.....	74 47·0	.....	.....	15064			
St. John	45 16·8	66 03·2	July 3	15·9 16·8 17·7 18·2	21 35·6	16·5	74 07·0	.....	.....	.....	104	104	F
			" 4	7·0 to 10·0 (5)	33·8	9·9	10·0	(2)	10·9 11·5	15700	104	104	F
			" 4	11·3 " 16·0 (5)	35·4	15·4	07·1	.....	14·0 14·7	15734	104	104	F
			" 5	9·2 10·0	36·4	.....	.....	.....	.....	.....	104	....	F
				Mean	21 35·1	.....	74 08·5	.....	.....	15717			
Woodstock A.	46 09·6	67 34·6	July 2	7·0 7·5 8·0 8·5	21 03·1	9·9	75 14·9	.....	10·8	14711	104	104	F
			" 2	9·0 9·5 10·5 11·6	01·4	10·0	14·5	.....	11·2	14704	104	104	F
			" 2	13·0 13·5 15·0 15·5	03·1	15·9	12·6	.....	13·9	14754	104	104	F
			" 2	16·5 17·0 17·5 18·0	03·2	16·1	12·7	.....	14·5	14754	104	104	F
				Mean	21 02·7	.....	75 13·7	.....	.....	14731			
Woodstock B.	46 09·6	67 34·6	July 1	7·4 8·0 8·5 9·5	21 05·4	9·9	75 15·5	.....	10·8	14708	104	104	F
			" 1	10·5 11·4 12·0	04·6	10·1	15·3	.....	11·5	14720	104	104	F
			" 1	13·5 14·0 14·7	06·1	16·1	11·9	.....	14·3	14749	104	104	F
			" 1	15·3 16·5 17·0 18·0	06·4	16·2	12·3	.....	15·0	14755	104	104	F
				Mean	21 05·7	.....	75 13·8	.....	.....	14733			
Rivière du Loup	47 51·6	69 34·1	July 8	13·5 to 18·0 (5)	21 52·7	15·8	76 14·6	.....	14·6	13956	104	104	F
			" 9	7·0 " 12·0 (6)	52·0	10·0	18·0	.....	10·8	13920	104	104	F
			" 9	12·5 " 18·0 (6)	52·8	10·2	18·3	.....	11·5	13920	104	104	F

			"	9	.....	.....	15·3	15·9	.....	14·5	.....	13948	104	104	F
			"	10	6·5 to 11·3 (6)	52·9	.....	.....	.....	.....	.....	.....	104	....	F
			"	10	12·5 " 18·0 (6)	50·3	.....	.....	.....	.....	.....	.....	104	....	F
					Mean.....	21 52·1	.....	76 16·7	.....	.....	.....	13936			
Tadoussac.....	48 08·5	69 43·7	July	12	7·2 to 11·9 (6)	21 16·7	10·4	77 00·2	(2)	11·1	11·6	13291	104	104	F
			"	12	12·8 " 18·0 (8)	13·8	15·4	76 55·2	(2)	14·0	14·5	13360	104	104	F
			"	13	7·0 " 10·0 (4)	13·9	.....	.....	.....	.....	.....	.....	104	....	F
					Mean.....	21 14·8	.....	76 57·7	.....	.....	.....	13326			
Quebec.....	46 48·0	71 15·0	July	14	17·9	19 21·9	.....	.....	.....	.....	.....	.....	20	....	M
			"	15	6·5 to 12·0 (6)	20·9	9·6	75 46·0	1, 2	10·5	11·2	14493	20	212	M
			"	15	12·6 " 18·0 (6)	21·7	15·4	44·2	1, 2	13·7	14·5	14523	20	212	M
			"	16	9·0 " 11·0 (3)	21·5	.....	.....	.....	.....	.....	.....	20	....	M
					Mean.....	19 21·4	.....	75 45·1	.....	.....	.....	14508			
Stanstead.....	45 00·6	72 05·0	June	25	16·4 18·1	16 16·6	.....	.....	.....	.....	.....	.....	104	....	F
			"	26	7·3 to 11·8 (6)	16·0	10·0	74 55·2	(2)	10·7	11·4	15217	104	104	F
			"	26	14·0 " 16·6 (4)	15·6	15·5	51·4	(2)	13·8	14·5	15257	104	104	F
					Mean.....	16 16·0	.....	74 53·3	.....	.....	.....	15237			
Roberval.....	48 32·1	72 13·4	July	20	16·8 17·2 17·7 18·0	19 55·4	.....	.....	.....	.....	.....	.....	20	....	M
			"	21	9·9 15·4 16·5 17·0	55·0	10·4	77 08·2	1, 2	.....	.....	.....	20	212	M
			"	21	.....	.....	16·0	05·1	1, 2	.....	.....	.....	....	212	M
			"	22	10·5 11·4 12·5 13·0	57·6	.....	.....	.....	11·0	11·8	13304	20	....	M
			"	22	13·5 14·4 15·1 16·0	56·6	.....	.....	.....	14·0	14·7	13340	20	....	M
			"	23	8·5 9·0 9·8	54·8	.....	.....	.....	.....	.....	.....	20	....	M
					Mean.....	19 55·9	.....	77 06·6	.....	.....	.....	13322			
Hervey Junction.....	46 51·4	72 28·4	July	29	15·7 16·6 17·5	20 03·4	16·2	76 27·0	1, 2	.....	.....	.....	20	212	M
			"	30	6·8 to 11·5 (8)	02·7	10·0	27·8	1, 2	11·2	11·8	14012	20	212	M
			"	30	13·1 " 18·0 (10)	02·7	.....	.....	.....	13·9	14·6	14056	20	....	M
					Mean.....	20 02·8	.....	76 27·4	.....	.....	.....	14034			

MAGNETIC OBSERVATIONS, 1926 (continued)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int.[1] L.M.T.	Hor. Int.[1] Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	West ° ′	h.	° ′		h. h.	γ			
Shawinigan Falls	46 33·9	72 47·6	Aug. 4	8·9 to 13·4 (6)	16 05·5	10·0	76 03·1	1, 2	10·9 11·6	14401	20	212	M
			" 4	14·1 " 18·0 (6)	03·4	16·0	00·3	1, 2	13·7 14·5	14419	20	212	M
			" 5	7·2 " 9·8 (8)	05·4	.....	.....	.....	.....	.....	20	....	M
				Mean	16 04·8	.....	76 01·7	.....	.....	14410			
La Tuque C.	47 27·4	72 49·0	July 27	9·9 10·4 15·6 16·6	18 13·7	.....	.....	.....	10·3 11·1	13657	20	....	M
			" 27	17·0 17·5 18·0	13·2	16·2	76 39·8	1, 2	14·3 14·9	13723	20	212	M
			" 28	8·2 8·6 9·0 9·4	14·2	10·0	43·2	1, 2	.....	.....	20	212	M
			" 28	10·5 11·5 13·7 14·0	13·1	.....	.....	.....	.....	.....	20	....	M
				Mean	18 13·6	.....	76 41·5	.....	.....	13690			
Huntingdon	45 05·6	74 10·1	July 20	7·5 to 12·0 (6)	13 59·1	10·0	75 50·7	(2)	10·7 11·3	14620	104	104	F
			" 20	13·2 " 18·0 (6)	58·5	16·0	48·5	(2)	13·9 14·5	14648	104	104	F
			" 21	8·5 " 12·5 (6)	58.5	.....	.....	.....	.....	.....	104	....	F
				Mean	13 58·7	.....	75 49·6	.....	.....	14634			
Mont Laurier	46 33·5	75 31·1	July 1	14·1 to 18·0 (5)	10 37·8	16·0	76 26·3	1, 2	14·5	14241	20	212	M
			" 2	8·0 8·5 9·5 10·5	35·5	10·0	27·9	1, 2	10·4 11·6	14216	20	212	M
			" 2	11·2 13·5 14·5	38·3	.....	.....	.....	14·0	14254	20	....	M
				Mean	10 37·2	.....	76 27·1	.....	.....	14232			
Ottawa	45 23·6	75 43·0	July 24	10·0 to 18·0 (9)	14 09·7	.....	.....	.....	10·6	14737	104	....	F
			" 24	.....	.....	.....	.....	.....	13·6 14·3	14770	104	....	F
			" 26	7·0 to 12·0 (6)	10·5	15·6	75 34·0	.....	10·5	14742	104	104	F
			" 26	13·0 " 18·0 (6)	10·5	15·8	34·3	.....	13·6 14·5	14785	104	104	F
			" 27	7·0 " 15·0 (9)	10·5	9·5	34·7	.....	10·6	14724	104	104	F
			" 27	.....	.....	9·8	35·3	.....	11·3	14738	104	104	F

[1]Values of horizontal intensity given in italics, which were derived from special diurnal variation observations, were not used in deriving a mean value.

			"	28	7·0 to 12·0 (6)	11·1	15·4	35·4	.....	10·6	11·4	14736	104	104	F
			"	28	13·0 " 18·0 (6)	10·6	16·6	36·0	.....	13·0	14·5	14752	104	104	F
			"	29	7·0 8·0 9·0	09·1	9·4	38·1	.....	.....	.....	.....	104	104	F
			"	29	16·0 17·0 18·0	10·3	9·6	38·1	.....	.....	.....	.....	104	104	F
			"	30	.....	.....	.....	.....	.....	11·0	14·0	14752	104	....	F
			"	30	7·0 to 18·0 (12)	09·8	.....	.....	.....	7·0—18·0		*14760*	104	....	F
					Mean.....	14 10·2	.....	75 35·7	.....	.....		14749			
Doucet B.....	48 13·6	76 35·2	Aug.	12	7·7 to 11·4 (5)	14 56·3	10·1	77 31·4	1, 2	10·9	11·6	13006	20	212	M
			"	12	13·5 " 18·0 (5)	56·1	15·9	28·0	1, 2	13·8	14·6	13054	20	212	M
					Mean.....	14 56·2	.....	77 29·7	.....	.....		13030			
Belleville B.....	44 07·1	77 22·6	Aug.	20	10·2 to 13·5 (4)	10 13·3	9·3	74 57·7	(2)	10·6	11·2	15230	104	104	F
			"	20	13·7 " 17·9 (5)	12·0	16·5	53·3	(2)	13·5	14·2	15292	104	104	F
			"	21	7·5 " 11·4 (8)	13·4	.....	.....	.....	.....		.....	104	....	F
					Mean.....	10 13·0	.....	74 55·5	.....	.....		15261			
Chalk River A.....	46 00·8	77 28·0	Oct.	13	17·0 17·5 18·0	12 02·2	.....	.....	.....	.....		.....	20	....	M
			"	14	8·0 to 10·5 (6)	03·4	10·0	76 21·1	1, 2	11·0	11·6	14131	20	212	M
			"	14	11·4 " 14·4 (5)	03·9	.....	.....	.....	13·9	14·5	14208	20	....	M
			"	15	7·0 7·5 8·0	04·9	.....	.....	.....	.....		.....	20	....	M
			"	17	15·6 16·6	02·6	16·2	20·3	1, 2	.....		.....	20	212	M
					Mean.....	12 03·3	.....	76 20·7	.....	.....		14170			
Bancroft.....	45 03·1	77 52·0	June	24	13·9 15·3 16·7	10 09·2	15·9	76 13·2	1, 2	14·4	....	14295	20	212	M
			"	25	7·8 9·1 11·5	09·2	9·7	51·1	1, 2	10·4	11·0	14240	20	212	M
			"	25	13·5 14·5	09·5	.....	.....	.....	13·9	.....	14294	20	....	M
					Mean.....	10 09·5	.....	76 14·2	.....	.....		14267			
Kinmount A.....	44 47·0	78 39·3	June	19	13·1 13·6 16·1 17·0	9 42·7	15·6	75 20·8	1, 2	14·1	....	15052	20	212	M
			"	20	7·0 to 12·0 (7)	43·1	.....	.....	.....	11·4	....	14992	20	....	M
			"	20	13·5 " 18·0 (7)	43·2	.....	.....	.....	14·0	....	15031	20	....	M
			"	21	8·6 10·9	44·0	9·2	20·8	1, 2	10·4	....	14998	20	212	M
					Mean.....	9 43·1	.....	75 20·8	.....	.....		15019			

MAGNETIC OBSERVATIONS, 1926 (continued)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	West ° ′	h.	° ′		h. h.	γ			
Kinmount B.....	44 47·0	78 39·3	June 22	15·0 16·6 17·7	6 29·3	17·2	74 36·9	1, 2	15·5 16·3	15623	20	212	M
			" 23	7·6 8·7 10·0	30·1	8·1	36·9	1, 2	9·0 9·7	15578	20	212	M
				Mean.....	6 29·7	.....	74 36·9	.....	.....	15600			
Port Colborne B.....	42 52·6	79 17·6	Aug. 25	12·9 to 17·8 (7)	7 12·7	16·2	74 03·2	(2)	13·6 14·3	16249	104	104	F
			" 26	7·5 " 12·9 (9)	12·1	9·8	06·4	(2)	10·5 11·1	16199	104	104	F
				Mean.....	7 12·4	.....	74 04·8	.....	.....	16224			
New Liskeard[1]	47 30·6	79 40·4	Aug. 20	7·0 to 12·0 (8)	10 04·6	10·0	77 28·2	1, 2	10·9 11·5	13078	20	212	M
			" 20	13·0 " 18·0 (9)	04·2	16·0	25·8	1, 2	13·8 14·5	13124	20	212	M
				Mean.....	10 04·4	.....	77 27·0	.....	.....	13101			
Parry Sound.....	45 21·6	80 02·6	Sept. 16	11·5 to 17·1 (7)	8 36·1	15·9	75 39·1	(2)	14·3 15·0	14839	104	104	F
			" 17	8·2 " 17·0 (11)	36·8	9·8	42·4	(2)	10·6 11·5	14797	104	104	F
			" 18	7·8 " 17·2 (15)	36·8	.....	.....	.....	.....	.....	104	....	F
				Mean.....	8 36·7	.....	75 40·8	.....	.....	14818			
Owen Sound.....	44 33·8	80 53·8	Sept. 7	15·6 to 17·9 (6)	7 06·3	16·1	75 15·3	(2)	.....	.....	104	104	F
			" 8	7·5 " 12·0 (9)	09·0	10·4	16·7	(2)	10·4 11·1	15159	104	104	F
			" 8	13·3 " 15·4 (6)	05·6	.....	.....	.....	13·8 14·5	15217	104	....	F
				Mean.....	7 07·3	.....	75 16·0	.....	.....	15188			
Cochrane.....	49 04·0	81 01·3	Aug. 24	10·3 to 18·0 (10)	10 23·4	16·1	78 14·9	1, 2	13·9 14·7	12379	20	212	M
			" 25	7·0 " 12·0 (10)	23·4	9·9	17·7	1, 2	10·5 11·5	12347	20	212	M
				Mean.....	10 23·4	.....	78 16·3	.....	.....	12313			

[1]For reference to the designation of this station, see footnote on page 394 of this report.

Sudbury C.	46 30·9	80 59·6	Oct.	12	12·3 to 17·3 (9)	8 30·0	15·1	76 25·8	(2)	13·2	14·1	14186	104	104	F
			"	13	8·0 " 13·0 (7)	31·0	9·7	29·0	(2)	10·4	11·2	14162	104	104	F
			"	13	.....	.....	.....	.....	.....	14·0	....	14225	104	....	F
			"	13	13·2 to 17·2 (5)	30·5	.....	.....	.....	13·2	—17·2	*14221*	104	....	F
			"	14	.....	.....	.....	.....	.....	11·0	....	14167	104	....	F
			"	14	7·2 to 12·2 (6)	30·0	.....	.....	.....	7·2	—12·2	*14170*	104	....	F
					Mean.....	8 30·4	.....	76 27·4	.....	.....		14182			
Port Stanley A.	42 39·9	81 13·5	Aug.	28	10·3 to 13·5 (6)	3 44·4	15·9	74 14·7	.....	10·7	11·2	16068	104	104	F
			"	28	14·0 " 17·6 (7)	45·4	16·2	14·7	.....	13·8	14·3	16108	104	104	F
			"	30	.....	.....	.....	.....	.....	11·0	14·0	16092	104	....	F
			"	30	7·0 to 18·0 (12)	43·9	.....	.....	.....	7·0	—18·0	*16100*	104	....	F
					Mean.....	3 44·4	....	74 15·7[1]	.....	.....		16089			
Port Stanley B.	42 40·4	81 14·5	Aug.	29	6·8 to 11·6 (8)	3 53·5	9·8	74 18·5	(2)	10·5	11·2	16060	104	104	F
			"	29	13·4 " 17·8 (7)	54·4	15·3	16·3	(2)	13·7	14·2	16075	104	104	F
					Mean.....	3 53·9	.....	74 17·4	.....	.....		16068			
Goderich B.	43 44·9	81 42·9	Aug.	4	15·6 16·6 17·0	5 40·7	16·2	74 36·7	.....	.....		.....	104	104	F
			"	5	9·7 10·6 11·8 13·2	44·2	10·2	38·2	.....	11·0	....	15858	104	104	F
			"	5	14·7 15·5 16·3 17·2	41·0	16·0	35·0	.....	13·6	14·4	15900	104	104	F
			"	6	7·2 to 11·6 (7)	43·5	9·8	37·6	.....	10·9	....	15868	104	104	F
					Mean.....	5 42·6	.....	74 36·9	.....	.....		15882			
Kingsville	42 02·2	82 44·5	Sept.	1	11·0 12·0 13·0 13·7	2 29·2	.....	.....	.....	11·4	....	16982	104	....	F
			"	1	14·5 15·0 16·7 17·2	25·6	16·3	73 21·3	.....	13·3	14·1	17005	104	104	F
			"	2	7·5 to 9·5 (5)	28·2	10·1	21·0	.....	10·8	....	16994	104	104	F
			"	2	10·5 " 14·0 (5)	28·1	.....	.....	.....	.....		.....	104	....	F
					Mean.....	2 27·8	.....	73 21·2	.....	.....		16996			
Algoma	46 11·4	82 48·8	Sept.	22	7·2 to 12·1 (6)	6 15·2	9·4	76 30·2	(2)	10·2	10·9	14071	104	104	F
			"	22	12·8 " 17·9 (6)	15·4	15·3	25·7	(2)	13·5	14·2	14135	104	104	F
			"	23	.....	.....	.....	.....	.....	11·2	14·0	14118	104	....	F
			"	23	7·0 to 18·0 (12)	17·6	.....	.....	.....	7·0	—17·6	*14129*	104	....	
					Mean.....	6 16·4	.....	76 28·0	.....	.....		14108			

[1]Corrcetions applied to observations for diurnal change.

MAGNETIC OBSERVATIONS, 1926 (concluded)

Station	Lat.	Long.	Date	Declination L.M.T.	Declination Value	Inclination L.M.T.	Inclination Value	Inclination Needle	Hor. Int. L.M.T.	Hor. Int. Value	Mag'r.	D.C.	Obs'r.
	° ′	° ′		h. h. h. h.	West ° ′	h.	° ′		h. h.	γ			
Essex	42 10·4	82 49·4	Sept. 3	8·6 to 12·5 (6)	2 56·2	10·2	73 26·7	.....	10·8 11·4	16945	104	104	F
			" 3	13·0 " 17·0 (7)	53 0	15·4	26·2	.....	13·9 14·5	16964	104	104	F
				Mean	2 54·5	.....	73 26·4	.....	.....	16954			
Chapleau	47 50·3	83 24·4	Oct. 8	15·1 16·2 16·8 17·2	5 35·5	15·8	77 44·0	(2)	.....	.....	104	104	F
			" 9	7·2 to 12·1 (8)	34·7	10·0	46·2	(2)	10·8 11·7	12916	104	104	F
			" 9	13·2 " 16·2 (5)	34·1	.....	.....	.....	13·6 14·3	12942	104	....	F
			" 10	8·1 9·0 9·9 10·5	35·1	.....	.....	.....	.....	.....	104	....	F
				Mean	5 34·8	.....	77 45·1	.....	.....	12929			
Hearst	49 40·9	83 39·7	Aug. 27	6·8 to 12·0 (9)	5 53·3	9·9	78 55·3	1, 2	10·8 11·6	11800	20	212	M
			" 27	13·0 " 18·0 (8)	54·5	16·0	53·3	1, 2	13·9 14·5	11830	20	212	M
				Mean	5 53·9	.....	78 54·3	.....	.....	11815			
Sault Ste. Marie	46 30·9	84 17·8	Sept. 24	14·6 to 17·6 (5)	4 22·7	16·3	76 55·6	(2)	15·0	13808	104	104	F
			" 25	7·2 " 10·9 (6)	21·4	9·8	59·2	(2)	10·6 11·4	13732	104	104	F
			" 25	11·8 " 15·0 (5)	21·1	.....	.....	.....	13·9	13769	104	....	F
				Mean	4 21·7	.....	76 57·4	.....	.....	13760			
White River, B.	48 35·5	85 16·5	Oct. 4	15·6 16·0 17·1	5 02·8	.....	.....	.....	.....	.....	104	....	F
			" 5	7·3 to 12·0 (6)	03·0	9·8	78 13·0	(2)	10·7 11·5	12553	104	104	F
			" 5	13·5 " 17·0 (5)	02·8	15·6	11·0	(2)	14·0 14·8	12591	104	104	F
			" 6	.....	.....	.....	.....	.....	11·1 14·2	12573	104	104	F
			" 6	7·3 to 17·3 (11)	04·3	.....	.....	.....	7·3—17·3	*12592*	104	....	F
				Mean	5 03·5	.....	78 12·0	.....	.....	12572			

Schreiber	48 48·5	87 15·5	Oct.	2	7·9 to 12·6 (5)	2 01·0	9·0	78 23·1	(2)	10·1	11·1	12370	104	104	F
			"	2	13·2 " 17·5 (5)	01·4	16·1	20·9	(2)	13·6	14·3	12389	104	104	F
			"	3	7·5 " 15·0 (8)	01·3	.....	.....	.....	.....		.....	104	....	F
					Mean	2 01·2	.....	78 22·0	.....	.....		12380			
						East									
Twin City Junction	48 22·3	89 25·0	Sept.	27	16·1 16·6 17·5	1 44·9	.....	.....	.....	.....		.....	104	....	F
			"	28	7·6 to 11·2 (5)	45·6	10·0	77 49·9	.....	10·8	11·8	12980	104	104	F
			"	28	11·9 " 16·6 (5)	45·0	15·6	49·0	.....	14·1	14·8	12994	104	104	F
			"	29	7·5 8·0 8·5 8·9	45·4	10·0	50·4	.....	10·7	....	12996	104	104	F
			"	29	9·6 10·3 11·8 12·8	44·1	15·2	48·9	.....	14·0	....	13011	104	104	F
			"	29	13·4 14·3 15·6 16·2	45·2	.....	.....	.....	.....		.....	104	....	F
			"	30	7·2 to 11·0 (7)	45·7	.....	.....	.....	.....		.....	104	....	F
					Mean	1 45·3	.....	77 49·5	.....	.....		12992			
Atikokan	48 45·3	91 37·1	Oct.	2	15·5 16·5 17·0 18·0	4 09·2	16·0	77 34·0	1, 2	.....		.....	20	212	M
			"	3	11·4 12·5 13·0	11·2	.....	.....	.....	11·0	11·7	13240	20	....	M
			"	3	13·5 14·2	11·0	.....	.....	.....	13·9	14·6	13278	20	....	M
			"	4	7·0 to 10·5 (6)	9·2	9·8	36·4	1, 2	.....		.....	20	212	M
					Mean	4 09·8	.....	77 35·2	.....	.....		13259			
Sioux Lookout B	50 05·5	91 55·5	Aug.	31	15·5 16·5 17·3 18·0	4 24·6	16·0	78 45·0	1, 2	.....		.....	20	212	M
			Sept.	3	7·0 to 10·5 (6)	24·8	10·0	47·2	1, 2	10·9	11·7	12072	20	212	M
			"	3	11·2 " 15·0 (4)	26·4	.....	.....	.....	13·9	14·6	12101	20	....	M
					Mean	4 25·2	.....	78 46·1	.....	.....		12086			
Redditt	49 59·2	94 23·6	Sept.	10	6·8 to 18·0 (12)	7 56·8	16·0	78 35·9	1, 2	14·0	15·0	12366	20	212	M
			"	11	9·5	56·6	10·0	39·1	1, 2	11·0	11·6	12321	20	212	M
					Mean	7 56·8	.....	78 37·5	.....	.....		12344			
Dauphin	51 09·0	100 02·6	Sept.	14	15·5 to 18·0 (5)	13 53·8	16·0	78 15·6	1, 2	.....		.....	20	212	M
			"	16	7·5 " 9·5 (5)	14 01·5	10·0	24·0	1, 2	.....		.....	20	212	M
			"	17	10·5 " 15·5 (6)	13 57·8	.....	.....	.....	11·1	11·7	12640	20	....	M
			"	17	.....	.....	.....	.....	.....	14·0	14·6	12650	20	....	M
					Mean	13 57·7	.....	78 19·8	.....	.....		12645			

MAGNETIC STATIONS AND DESCRIPTIONS

Alert Bay, B.C., 1924.—The station is on the cannery property southeast of the cannery. It is on the hill near the fence between the cannery property and the Naval Reserve, and near the tram line to the wireless station. The point is 95·5 feet northerly from the fence on the north side of the tram line, this distance being measured along the north–south fence, and 17 feet westerly from the fence at this point. Observations were taken over a brass screw in a circular stake projecting 3 inches above the ground. The west side of the west dormer window on the mission bears 314° 44′·4.

Algoma, Ont., 1926.—The station is, approximately, a relocation of the C.I. station of 1906 and the D.O. station of 1916. It is 144·5 feet south of the south side of the main part of the Grand Central hotel, 11 feet east of the west end of the main part of the hotel produced, and 215 feet from the southeast corner of the Catholic church. Observations were taken over a drill-hole in a stone, the upper part of which is curved, projecting about 2 inches above the ground. The following true bearings were determined: southeast corner of Catholic church, 221° 06′·3; northwest corner of Catholic church, 228° 37′·2.

Annapolis, N.S., 1925.—The station is a relocation of the station of 1912 and 1918. It is near the south side of the grounds around the old fort, now designated Anne park. It is southwesterly from the cemetery and westerly from the vacant lot at the rear of the court-house. The point is 38·4 feet southwest of the post at the northwest corner of the lot, 35·5 feet west of a line determined by the west limit of the row of posts along the west side of the lot, and 34·9 feet east of a lamp post on the drive. Observations were taken over a drill-hole in the top of a stone set flush with the ground. The following true bearings were determined: spire of English church, 1° 50′·0; tip of tower of Methodist church, 56° 01′·0; chimney on middle of small house across flat, 179° 43′·5.

Atikokan, Ont., 1926.—The station is an approximate relocation of the D.O. station of 1918. It is on townsite property, enclosed by a wire fence, to the north of the school. It is 24 feet north from the edge of a prominent rock exposure, 41 feet east from the middle of the trail, and 105·5 feet east from the fence on the west side of the property. Observations were taken over a drill hole in a granite boulder 1 by 1·5 feet projecting 4 inches above the ground. The pole on the centre of the top of the C.N.R. water-tank bears 158° 30′·8.

Bancroft, Ont., 1926.—The D.O. station of 1921 was reoccupied. It is in the exhibition grounds about one-half mile westerly from the C.N.R depot. The station is in the clear space inside the race track, to the west of a grove of trees and to the south of the exhibition buildings, 129·5 feet southerly from the southwest corner of the main exhibit building and in line with its westerly side, 43·4 feet southerly and 43·8 feet westerly from the southwest corner of a small building, 61·7 feet southwesterly from the southwesterly corner of the same building, and 41·5 feet northeasterly from a telephone pole at a large boulder. Observations were taken over a drill-hole in a stone 3·5 by 4·5 inches set flush with the ground. The following true bearings were determined: east edge of chimney on house at entrance to grounds, 132° 38′·6; northwest edge of chimney on white house, 162° 19′·9; northeast edge of chimney on grey house, 208° 27′·0; southeast edge of chimney on house, 215° 21′·0.

Battle Harbour, Labrador, 1925.—The station is near the centre of Battle island and is close in proximity to the C.I. station C of 1905. It is about 500 feet east of the English church, about the same distance north of the wireless station, and lies in a small hollow extending northwest and southeast. The point is 24 feet easterly from a low step in the rock, 10 feet westerly from the edge of the rock at a natural ditch, 43 feet southeasterly from the perpendicular face of the large rock and 9 feet easterly from the C.I. station C of 1914. Observations were taken over a drill hole, filled with lead, in the rock. The following true bearings were determined: lighthouse on Double island, 138° 39′·4; north gable of wireless house, 157° 43′·5; west side at base of wireless mast, 163° 52′·4; west edge at base of flagstaff on hill, 182° 18′·4.

Belleville B, Ont., 1926.—The station is approximately a relocation of the station occupied first in 1920. It is situated in Prince Edward county, about three miles from Rossmore, on a farm owned by Mr. E. Salisbury, the northerly part of the farm being adjacent to the east side of the Picton–Rossmore road. The station is in the second field south from the road passing in front of Mr. Salisbury's house. It is 94·2 feet south of the north boundary fence, and 48·2 feet west of the fence along the east side of the field. Observations were taken over a drill-hole, filled with lead, in a stone set flush with the ground. The following true bearings were determined: south gable of factory, 4° 33′·5; ornament on ventilator of barn, 282° 35′·3; pole on tower of city hall, 343° 48′·3; spire of United church, 345° 51′·9; spire of church, 346° 16′·0.

Bersimis, Que., 1925.—The D.O. station of 1909 and 1920 was reoccupied. It is near the southerly edge of an irregular depression in the point of land south of the village and west of the wharf, about 125 feet east, 175 feet west, and 450 feet north of high-water mark on the west, east, and south respectively. The point is marked by a brass screw in the top of a stake 4 inches in diameter set flush with the ground. The following true bearings were determined: top of post at west end of range, 29° 37′·3; spire of Catholic church, 34° 00′·8; top of post at east end of range, 54° 05′·6.

Blanc Sablon, Quebec, 1925.—The D.O. station of 1920 was reoccupied. It is about 700 feet northwesterly from a small saw-mill, which is one of a group of buildings belonging to Job Bros. & Co.; about 80 feet east of high-water mark of the stream, and about 130 feet from high-water mark on the south; the stream changes from a southerly to an easterly course just before the outlet is reached. The lighthouse on Greenly island and the east extremity of a low rocky point (Point au Pot) are seen in line from the station. Observations were taken over the intersection of two grooves in the top of a stone about 12 inches by 14 inches set flush with the ground. The following true bearings were determined: tip of bell-tower on building of Job Bros. & Co., 134° 02′·5; east side of flagstaff in front of Job Bros. & Co's office, 139° 05′·9; base of flagstaff on Isle au Bois, 193° 38′·5; weather vane on lighthouse on Greenly island, 210° 18′·6; smoke-pipe on house on Point au Pot, 211° 37′·4.

Chalk River A, Ont., 1926.—The D.O. station of 1913 was reoccupied. It is near the south side of a large field, covered with trees and shrubs, which is owned by Mr. James Hawley. It is about 91 feet northwesterly from the C.I. station of 1906, 68·8 feet east of the east side of Elizabeth street, 15·7 feet north of the south fence, and 14·2 feet southwest of a pine tree. Observations were taken over a drill-hole in a stone 4·5 by

4·5 inches set flush with the ground. The following true bearings were determined: spire of Lutheran church, 90° 06′·2; top of pole on C.P.R. water-tank, 145° 25′·0; cross on tower of Presbyterian church, 208° 36′·8; cross on English church, 212° 50′·4.

Chapleau, Ont., 1926.—The station of 1910 was reoccupied. It is near the river bank on the east side of the town, just at the end of the street lying between the Protestant and the Catholic cemeteries. It is 60 feet southeast of the southeast corner of the Protestant cemetery and 59 feet northeast of the northeast corner of the Catholic cemetery. Observations were taken over a drill-hole in a stone set flush with the ground. The exposed portion of the stone is approximately 6 by 8 inches. The pole on the town water-tank bears 253° 21′·7.

Charlottetown, P.E.I., 1925.—The C.I. station of 1908 and D.O. station of subsequent years was reoccupied. The observations were made over the middle one of three stones marking the true meridian line established by the British Admiralty in Victoria park. The stone is 13 by 14 inches and projects 18 inches above the surface. West of and in line with the stone marking the south end of the meridian are two additional stones. The point of observation was over the east end of a groove about 2 inches long in the southwest quarter of the stone. The following true bearings were determined: spire of church seen between two chimneys, 49° 56′·4; cross on dome of building near hospital, 68° 47′·7.

Clayoquot, B.C., 1924.—The station is in the pasture field along the beach northwesterly from and directly behind Mr. Dawley's store and about 200 yards distant. It is northerly from the base of the bluff, is southerly from the beach, is close to and northerly from a large fir stump, and is southerly from another large stump. The point is 8·5 feet from the stump to the south, 25·5 feet from the stump to the north, 91 feet from the edge of the grass at the beach, measured to the west of the north stump, 52 feet east from a large boulder, and 40 feet from the base of the bluff. Observations were taken over a drill-hole in the end of a brick embedded just below the surface of the ground. The following true bearings were determined: front gable on brown house with white trim across sound, 39° 59′·5; gable of red roofed building across sound, 44° 46′·3; north edge of top of front of red and green building, 94° 10′·9; south edge of top of front of store, 109° 34′·2.

Cochrane, Ont., 1926.—The station is an approximate relocation of the D.O. station of 1913. It is on the north shore of Commando lake about one-fourth mile north of the C.N.R. tracks. The lake is almost bisected by two strips of land extending from north to south and connected by a foot bridge. The station is slightly to the east of the centre of the northerly strip of land, is east of the path and north of the band-stand. It is 16 feet north and 4 feet west of the northeast corner of the band-stand, and 10·8 feet from an elm tree. Observations were taken over a drill-hole, filled with lead, in the end of a brick set flush with the ground. The following true bearings were determined: tip of transmission tower, 55° 21′·0; pole on centre of top of C.N.R. water-tank, 146° 43′·6; pole of anemometer, 232° 08′·4; east gable of white church, 281° 40′·0; tip of transmission tower, 355° 34′·7.

Courtenay, B.C., 1924.—The station is on the east bank of Courtenay river in a pasture field owned by Mr. Duncan. It is at the bend in the river about 200 yards northerly from the bridge and is west of the ball grounds. It is in line with a snubbing

post and the first telephone pole to the northeast of the bridge, and is also in line with the northeast corner of a green house and a pole on the street. The point is 30 feet east from the bank of the river, and 72 feet northwest from the snubbing post. Observations were taken over a drill-hole on the end of a brick buried just below the surface of the ground. The following true bearings were determined: southwest gable of white building, 73° 34′·2; west edge of cap on concrete pier at east end of bridge over Courtenay river, 151° 25′·3; east edge of Vancouver Milling Company's sign on roof, 155° 26′·5 ; west edge at base of low red brick chimney on rear of roof, 184° 10′·0.

Dauphin, Man., 1926.—The station of 1911 was reoccupied. It is southwest of the town near the southeast corner of the exhibition grounds. It is in line with the south side of the horticultural hall and 191·6 feet west of the southwest corner, and 114 feet north of the south fence of the grounds. Observations were taken over a copper nail in the top of a stake about 3 by 3 inches set flush with the ground. The following true bearings were determined: gable of roof, 5° 44′·9; smoke-stack, 31° 19′·0; westerly gable of coal chute, 34° 20′·2; base of pole on school, 42′ 09′·4.

Dawson, Yukon, 1924.—The C.I. station of 1907 was reoccupied. It is on a tract of government land in the rear of the administration building, approximately one-half mile north of Klondike river, about 300 feet southeast of the administration building, about 200 feet nearly due south of the D.O. astronomical pier of 1907, 88 feet south of a roadway, little used, running from Sixth avenue towards Fifth avenue, and 62 feet west of the board-walk on Sixth avenue. Observations were taken over a brass screw in the top of a fir post 6 by 8 inches set flush with the ground. The following true bearings were determined: west edge of telephone pole on street to north of park, 22° 02′·0; west edge at base of iron smoke-stack on pumping station, 227° 49′·1; north edge at base of flagstaff on R.C.M.P. barracks, 272° 59′·3.

Doucet B., Que., 1926.—The station is about one mile west of the C.N.R. depot, on the location of an abandoned wye on the north side of the track. It is 132 feet north from the fence along the north side of the right-of-way, and 80·5 feet east from the base of a jackpine tree on the east edge of the west embankment of the wye. Observations were taken over a copper nail in a lead plug in the top of a grey granite boulder 1 by 1·5 feet. and projecting above the ground. The following true bearings were determined: north gable of depot, 105° 19′·5; west gable of depot, 105° 37′·3; west gable of coal chute, 110° 02′·2; ball on top of water-tank, 113° 59′·9.

Essex, Ont., 1926.—The station is on the agricultural grounds and near the south end. It is in line with the south end of the second barn from the south end of the grounds, and 236 feet west from the southwest corner, 268 feet east from the west fence, and 252 feet north from the fence along the south side of the grounds. Observations were taken over a drill-hole in a concrete block 8 by 8 inches set flush with the ground. The following true bearings were determined: ornament, near top, on house on south side of Talbot street, 26° 13′·4; base of flagstaff on centre of grandstand, 64° 00′·2; lightning rod on centre of red house, 235° 05′·4; tip of tower of United church, 347° 23′·8.

Etang du Nord, Magdalen Islands, Que., 1925.—The station is in a small open field which is the second north of the main road leading from Grindstone to Etang du Nord and adjacent to the east side of the road along the beach. It is near the southwest corner of the field, being 48·5 feet north of the south side of the field, 82·5 feet east of the fence

along the west side of the field, and near the edge of a small creek. It is almost directly across the road from a blacksmith shop. Observations were taken over a small hole in the end of a brick set flush with the ground. The following true bearings were determined: chimney on house, 43° 13′·2; Geodetic Survey triangulation station, 66° 21′·2.

Gaspe Basin, Que., 1925.—The D.O. station of 1921 was reoccupied. It is in an open field belonging to Mr. B. F. Patterson, on the hillside northeast of Mr. Patterson's house and northwest of the United church. It is about 575 feet north of the main road along the shore, 140 feet west of the fence along the east side of the property, and 78 feet west of the fence along the west side of a small cultivated field. From the station the road running over the hill south of the pulp mill across the harbour may be seen between two smokestacks on the mill. Observations were taken over a small hole in the top of a concrete block 5 by 5 inches set flush with the ground. The following true bearings were determined: base of flagstaff in front of house across harbour, 97° 19′·4; north smokestack on mill, 101° 16′·0.

Godbout A, Que., 1925.—The D.O. station of 1909 was reoccupied. It is near the northwest corner of the grounds around Mr. Eugene Comeau's house, being 141·5 feet from the northwest corner of the house, 53 feet northeast from the west post of a range, 59 feet south and 48·5 feet east from the fence on the north and west sides, respectively, of the grounds. Observations were taken over a brass screw in the top of a stake 4 inches in diameter set flush with the ground. The following true bearings were determined : north edge of middle support of east range post, 103° 02′·1; southwest corner of gate-post at entrance to Mr. Comeau's yard, 145° 16′·2; south edge of glass in window near southwest corner of house to south station, 170° 06′·6; east side at base of chimney seen over shed, 200° 37′·1.

Godbout B, Que., 1925.—The D.O. station of 1920 was reoccupied. It is 20 feet east from Station A, 139 feet from the northwest corner of Mr. Comeau's house, 70·3 feet northeast from the post at the west end of the range, 59·5 feet south and 68·5 feet east from the fence along the north and west sides, respectively, of the grounds. Observations were taken over a drill-hole in the top of a concrete block 4 by 4 inches set flush with the ground. The following true bearings were determined: east side at base of cross on mountain, 55° 21′·1; north edge at base of middle support of east range post, 102° 17′·4; west edge at base of chimney on house to south, 171° 32′·7.

Goderich B, Ont., 1926.—The station is about one mile south of the station occupied in 1910. It is on the agricultural grounds near the south end, and inside the race-track, being 124·8 feet north of the fence along the south side of the grounds, and 262 feet east of the fence along the west side. Observations were taken over a drill-hole in a stone set flush with the ground. The following true bearings were determined: spire of church 15° 26′·1; pole on centre of octagonal building in grounds, 26° 53′·6; south gable of white brick house, 358° 38′·6.

Grindstone, Magdalen Islands, Que., 1925.—The station is near the edge of the bank along the shore, in an open field belonging to Mr. McLean, the field being the third west of the one in which are located the buildings of the Eastern Canada Fisheries, Limited. The point is 365 feet west of the east side of the field, and slightly south of a line joining the inner extremities of two inlets; it is 25 feet west of the edge of the easterly one, 46 feet east of the edge of the westerly one, and 19 feet northerly from the edge of a third.

Observations were taken over a drill-hole in the top of a stone, the diagonals of which are 2 and 3 inches, set flush with the ground. The following true bearings were determined: spire of Catholic church in House Harbour, 51° 03′·3; southerly extremity of Alright island, 73° 53′·3; northerly extremity of Entry island, 124° 21′·3; Geodetic Survey of Canada triangulation station, on hill, 290° 45′·4; spire of English church, 303° 11′·2.

Halifax, N.S., 1925.—The station is approximately a relocation of the C.I. station of 1905 and an exact relocation of the D.O. station of 1918. It is in Point Pleasant park, about 2·5 miles south of the city, and is west of the old fort (Point Pleasant battery) in a small open space between the road and the beach, 65 feet from the edge of the roadway and 119·7 feet from a flagpole socket in line with the tower of the lighthouse to the southeast. It is easterly and on the continuation of a line joining two small drill-holes, 5·5 inches apart, in the top of a flat rock, the exposed portion of which is scarcely flush with the ground, and is 3 feet 3·6 inches from the easterly one of the two holes. Observations were taken over a copper nail in the top of a stake 1 by 1 inch set flush with the ground. The following true bearing was determined: top of tower of lighthouse, 126° 29′·0.

Harrington Harbour, Que., 1925.—The D.O. station of 1909 was reoccupied. It is 554 feet northwesterly and 51 feet northeasterly from the northerly corner of the English church, and 81 feet westerly from the government telegraph line, on a low piece of land, the property of the Grenfell Mission, lying to the north of the hospital and the doctor's house. Observations were taken over the centre of the top of a stone about 3 by 4 inches set flush with the ground. The following true bearings were determined: south gable of brown house, 18° 46′·2; west side of chimney on greenhouse, 138° 02′·5; cross on tower of English church, 144° 05′·8; north gable of doctor's house, 155° 18′·5; north corner at base of hospital, 180° 34′·2.

Havre St. Pierre B (Eskimo Point, B), Que., 1925.—The D.O. station of 1920 was reoccupied. It is on a sandy ridge 60·5 feet north and 106·5 feet west of the northwest corner of the cemetery, and 257 feet from the centre of the main gate on the west side of the cemetery. From the station the lighthouse and another building on a point of land on an island may be seen through an iron arch over the main gate on the west side of the cemetery. Observations were taken over the centre of the top of a stake 5 inches in diameter set flush with the ground. The following true bearings were determined : tip of bell-tower on school near east end of village, 79° 33′·3; top of large cross in cemetery, 126° 59·3; top of lighthouse, 141° 32′·3; spire of Catholic church, 197° 23′·3.

Hearst, Ont., 1926.—The D.O. station of 1914 was reoccupied. It is about one-fourth mile southeast from the C.N.R. depot, 91 feet south from the south side of Prince street, and 42 feet east from the east side of Seventh street. Observations were taken over a copper nail in the top of a stake 2 by 4 inches projecting 7 inches above the ground. The following true bearings were determined: west gable of barn, 101° 11′·3; cross on church, 239° 05′·1; west edge of store front, 295° 59′·2; south gable of coal-chute, 314° 36′·1: top of ball on C.N.R. water-tank, 336° 24′·2.

Hervey Junction, Que., 1926.—The station is on Mr. Ed. Lecuy's property, near the west bank of Tawachiche river, and on the rock opposite the head of the falls. It is about 130 feet south from the D.O. station of 1914, 63·6 feet west from the highest point

of rock at the head of the falls on the west bank, 63·2 feet south from a small spruce tree in the lane, and 35·5 feet southeast from a birch tree. Observations were taken over a drill hole, filled with lead, in the rock. The following true bearings were determined: junction of cross-arm braces on telegraph pole on railway right-of-way, 1° 38′·8; southeast corner of Mr. Lecuy's barn, 287° 15′·4; southwest edge of small building, 334° 48′·1.

Huntingdon, Que., 1926.—The D.O. station of 1921 was reoccupied. It is in the exhibition grounds southeast of and on the opposite side of Chateauguay river from the town. It is near the southwesterly corner of the grounds, in line with the westerly side of a judge's stand and also in line with the southerly side of the most northerly of two cattle sheds, 94·5 feet south of the southwest corner of the judge's stand, 188 feet west of the southwest corner of the catt'e-shed, 149 feet north of the south side of the grounds and 173·2 feet east of the sheds along the west side of the grounds. Observations were taken over a drill hole in a stone, the exposed part being 2 by 3 inches, set flush with the ground. The following true bearings were determined: tip of ornament on red brick house, 35° 14′·5; ornament on west ventilator of barn, 215° 54′·7; spire of St. Andrew's church, 273° 50′·3; spire of Catholic church, 331° 07′·5.

International Boundary, Yukon, 1924.—The C.I. station of 1907 was reoccupied. It is on the boundary line between Yukon and Alaska, and near the south bank of Yukon river. It is in line with the two boundary monuments, one on the north bank and one on the south bank of the river. The station is at a point 61 feet south of the monument on the south bank, and is marked by a brass rifle shell lettered on the end "W.R.A. Co. 32–40", and driven in the top of a wooden post 2 by 4 inches projecting about 2 inches above the ground. The apex of the monument on the north bank was used as a mark and assumed to stand due north.

Jedway A, Queen Charlotte Islands, B.C., 1924.—The station is on Pig island at the entrance to Harriet harbour, around which Jedway is built. The station is on the south end of the island and northwesterly from the long point at the southeast end of the island. It is south of a clump of trees on the gravel bank, and is on the rock above high-tide mark above the shell beach. The point is on the summit of a slight rise in the rock, 7 feet from the edge of the rock, 4 feet south from the bushes, and 14 feet west from the edge of the grass. Observations were taken over a drill hole in the rock. The west edge of the base of the west chimney on the government office bears 131° 39′·7.

Jedway B, B.C., 1924.—The station is on the point on the east side of the entrance to the harbour and across the channel and east of the south end of Pig island. It is on the rocks at the point above high-tide mark, 15 feet west of the east side of the outcrop, 5·3 feet east of a large rock, 0·8 feet south of the north end of the northwesterly rock of the outcrop, and 11 feet south of the edge of the bush. Observations were taken over the intersection of two grooves cut in the rock. The west edge of the gable on the high part of Mr. McMillan's house bears 195° 25′·9.

Jedway C, B.C., 1924.—The station is on Mr. McMillan's property and near the warehouse at the old wharf. It is on a small level spot at the base of the knoll on which the house is built, and on the summit of the grade from the board-walk along the beach. It is 45 feet southerly and 10 feet westerly from the southwesterly corner of the warehouse, 22·3 feet westerly from the intersection of the two walks from the warehouse to the house, 5 feet from the edge of the bush, and 20·3 feet west and 90 feet north from the

northeast corner of the house, the 90 feet being measured in line with the east side of the post office, which is in the east wing of the house. A temporary reference mark was used.

Keno City, Yukon, 1924.—The station is on the north side of the large rock outcrop to the northeast of the government assay office. The point is 93 feet west from the tip of the point of the outcrop, measured along the north side. Observations were taken over a drill-hole in the rock, the mark being covered by a mound of stones. The following true bearings were determined: northeast edge of front on dance hall, 187° 00′·2; north gable of Hotel Galena, 191° 20′·2; west gable of Lanning's store, 201° 47′·5.

Kingsville, Ont., 1926.—The D.O. station of 1910 was reoccupied. It is about one mile west of the town on property belonging to Mrs. Colin MacDonald, on the west side of a private lane, and about 1,275 feet north of the road (Main street produced). The station is 648 feet south of the north boundary of the field, and 149 feet east of the west fence. As the field was under cultivation, the point was not marked. The following true bearings were determined: spire of school, 96° 50′·9; spire of English church, 108° 48′·9; lightning rod on north end of barn, 156° 23′·5; lightning rod on east end of barn, 171° 16′·7.

Kinmount A., Ont., 1926.—The station of 1910 was reoccupied. It is southeast of the town on property belonging to the Dettman estate, and on the south side of a rocky hill on the northern slope of which is an abandoned iron mine. The point is 213 feet from the east side of the large gate on the north side of the road, and 214·5 feet from the intersection of the road fences at the fork of the roads. Observations were taken over a drill-hole in a triangular-shaped stone about 3 by 4 inches set flush with the ground. The following true bearings were determined: south edge of chimney on house at foot of road, 71° 56′·6; west edge of cross on Catholic church spire, 198° 03′·7; spire on Presbyterian church, 219° 53′·9; west edge at base of pole on public school, 236° 13′·5.

Kinmount B, Ont., 1926.—The D.O. station of 1920 was reoccupied. It is 53·5 feet north from station A, 266·8 feet from the east side of the large gate on the north side of the road, and 225·9 feet from the intersection of the road fences at the fork of the roads. Observations were taken over a drill-hole in a stone 2·5 by 3 inches set flush with the ground. The following true bearings were determined: south edge of chimney on house at foot of road, 80° 19′·3; west edge of cross on Catholic church spire, 197°39′·9; spire on Presbyterian church, 218° 02′·6; west edge at base of pole on public school, 232° 50′·5.

La Tuque C., Que., 1926.—The station is northeast of the town and west of the Anglican cemetery, in rear of the vault which is on the east side of the road from the town, and south of the road branching off to the cemetery. The point is in line with the north side of the vault and 80·5 feet from its northeast corner, 95 feet from a wire fence to the south, and 125·5 feet from the road fence. Observations were taken over a drill-hole in the end of a brick set flush with the ground. The following true bearings were determined: west gable of barn, 170° 58′·7; east gable of house, 197° 14′·5; west gable of house 219° 20′·8; cross on Catholic church, 222° 15′·8; east gable of house, 228° 47′·8.

Magdalen River, Que., 1925.—The D.O. station of 1921 was reoccupied. It is northwesterly from the group of houses comprising the village on a ridge lying between Magdalen river and St. Lawrence gulf. It is about 1,190 feet westerly from the westerly

fence around a field in which is located an old saw-mill, 180 feet easterly from the grassy extremity of the ridge, and near the westerly side of the roadway leading to Magdalen river. Observations were taken over a drill-hole in a concrete block 7 inches by 7 inches and projecting 3 inches above ground. The top of the block is marked "D.O. 1921". The following true bearings were determined: vertical edge of rock near village, 90° 30′·6; weather vane on lighthouse, 336° 03′·6; top of cross on point near lighthouse, 341° 53′·1.

Matane, Que., 1925.—The D.O. station of 1921 was reoccupied. It is about 350 feet north and 450 feet west of the railway depot, in an open field, which is reached by a private road passing along the north side of the Imperial Oil Company's property. It is near the upper edge of a steep incline just west of a clump of spruce trees, and 17·5 feet south of the north boundary fence. It is 5 feet east of a wire fence, which has recently been put across the field. As this was found to be magnetic, about 45 feet of the same was removed to what was considered a safe distance during the observing period. Observations were taken over a concrete block 4 by 4 inches set flush with the ground. The following true bearings were determined: spire of Catholic church, 60° 20′·8; tip of post office tower, 87° 29′·1; cross on top of dome of brick building, 90° 56′·6.

Matapedia, Que., 1925.—The station of 1907 and of subsequent years was reoccupied. It is on the north bank of Restigouche river on property belonging to the Fishing club, 497 feet south and 9 feet east of the southeast corner of the Restigouche hotel, and 39·5 feet easterly from the base of a large elm tree. A line joining the station and the cross on the tower of the Catholic church passes about 1·5 feet south of this tree. The point is marked by a concrete block 5 by 5 inches set flush with the ground. The following true bearings were determined: north gable of house on west bank of Restigouche river, 195° 41′·3; tip of cross on tower of Catholic church, 281° 16′·3; southwest corner of Restigouche hotel, 343° 49′·1; northeast corner of Restigouche hotel, 353° 13′·1.

Mayo, Yukon, 1924.—The station is just outside the northwest corner of the townsite on the police reserve. It is 7 inches south and 1 foot 1 inch west of the southwest corner of the survey stake at the northeast corner of the police reserve. It is 21 feet north and 30·9 feet west from the northwest corner of the fence around the log cabin to the east of the road, and is just to the east of the road to the hospital. Observations were taken over a brass screw in the top of a stake 6·5 inches in diameter projecting one inch above ground. The following true bearings were determined: north edge of chimney on house to east of station, 90° 10′·8; west edge of ventilator on cabin to south of station, 174° 34′·0.

Moncton A, N.B., 1925.—The station of 1907 was reoccupied. It is in an open field on the east side of Westmorland street and adjacent to the north side of Petitcodiac river, 74 feet east of the east side of Westmorland street, and 155 feet from a point determined by the intersection of the east line of the street produced and the middle of the footpath along the top of the dyke. The station is marked by a concrete block set flush with the ground. The following true bearings were determined: spire of tower on post office, 17° 00′·1; tip of lighthouse across river, 93° 17′·2; spire of church seen over Lockhart's mill (formerly Paul Lea's mill), 303° 26′·4, spire of English church, 330° 14′·7.

Moncton B, N.B., 1926.—Station B is about two miles west of station A, or original station occupied in 1907, and about one mile west of the city in the natural park. It is near the west side of the level strip of land opposite the west end of George street, being 35·5 feet north of the centre line of George street produced, and 274 feet west of the iron tile at the intersection of George street and the east side of the road along the east side of the park. Observations were taken over a drill hole in a stone which projects about 3 inches above ground. The following true bearings were determined: north mast of wireless station in Moncton, 86° 45′·4; pipe on small building near south entrance to park, 165° 19′·6; north gable of farm house, 177° 35′·3.

Mont Laurier, Que., 1926.—The D.O. station of 1921 was reoccupied. It is about one mile from the C.P.R. depot on the opposite side of the river and north from the Catholic church. It is on property owned by the Seminary, and on the summit of a hill on which is located a bandstand and a large wooden cross, these being visible from the whole town. The point is 43·8 feet westerly from the westerly side of the bandstand and 1·4 feet southerly from the northerly side produced, 39 feet easterly and 15 feet northerly from the most northerly point of the base of the cross, and 14·5 feet northerly from the base of two birch trees growing together. Observations were taken over a drill hole in a stone set flush with the ground. The following true bearings were determined: north edge of tank at railway, 75° 02′·7; east edge at base of cross on school, 141° 03′·1; west edge at base of cross on Catholic church spire, 159° 48′·3; southeast edge at top of Seminary, 168° 23′·4; east gable of red brick house, 202° 40′·9.

Mulgrave A, N.S., 1925.—The station is approximately a relocation of the station of 1907. It is approximately on the centre line of the street, extended, which passes the south side of the Seaside hotel and is 850 feet west of the front of same. The station is about 180 feet north of station C, which was occupied first in 1912 and estimated at that time to be the approximate location of station A. Observations were taken over a drill hole in the top of a stone 3 by 4 inches and projecting 2 inches above ground. The following true bearings were determined: tip of cross on Catholic church, 6° 46′·0; spire of church in Hawkesbury, 62° 30′·0; spire of United church, 71° 41′·8; spire of Presbyterian church, 83° 37′·6.

Nain, Labrador, 1925.—The station is on the summit of the rocky hill directly south and across the river from the village. It is 25 feet south from a large boulder, 23 feet north from a step in the rock, and 34 feet west from another boulder. Observations were taken over a drill hole in the rock. The following true bearings were determined: south gable of house in southwest corner of village, 347° 46′·9; east gable of store on west end of wharf, 355° 41′·2; cross on church, 357° 34′·2; east gable of mission residence, 359° 04′·5.

Nanaimo, B.C., 1924.—The D.O. station of 1919 was reoccupied. It is on the southwesterly side of Jesse island, about 480 feet southeasterly from a cliff which is east of the fish sheds at the northwesterly corner of the island, about 135 feet from the edge of the bank on the south, 67 feet south and 202 feet east of the southeast corner of a cottage. Observations were taken over a drill-hole in a sandstone block. The following true bearings were determined: west gable of west herring shed across narrows, 184° 04′·6; west gable of metal-sided building to west, 211° 33′·6.

Natashkwan, Que., 1925.—The D.O. station of 1909 was reoccupied. It is about 100 feet from the high-water mark near the northwestern extremity of Wood island, being opposite a small peninsula on the west side of which is the western harbour. It is about 1,150 feet northeast of the lighthouse, which is also on Wood island and 125 feet north of east from a granite monument lettered "C.R.C. 1886". This monument is not visible from the station owing to the presence of a rocky ridge. Observations were taken over the west angle of a triangle cut in the rock. The following true bearings were determined: south gable of shed seen over middle of shed at east end of wharf, 0° 00′·0; spire of Catholic church, 81° 39′·9; tip of lighthouse on Wood island, 220° 30′·9; base of cross on beacon islet, 299° 14′·9; east gable of shed at west end of wharf, 349° 16′·0.

New Liskeard[1] *A, Ont., 1926.*—The D.O. station of 1913 was reoccupied. It is in the grounds around the public school, 166·3 feet east of the northeast corner and in line with the north end of the building, and 15 feet west of the fence along the east side of the grounds. Observations were taken over a drill-hole in the end of a concrete block 2 by 3 inches set flush with the ground. The following true bearings were determined: tip of ornament on Mr. Hartman's summer house, 100° 39′·1; spire of Presbyterian church, 139° 22′·2; chimney on east side of hospital, 245° 44′·5; east gable of barn, 309° 46′·5; south gable of barn, 357° 47′·3.

Ocean Falls, B.C., 1924.—The station is east of the town, east of the dam, and on the lake shore opposite the dam. It is south of the plank drive from the boat houses to the second part of the lake and is opposite the walk to the trap grounds. The station is on the southwesterly rock of the grey granite outcrop at this point. It is about 200 yards from the lake shore, 77·5 feet southerly from the southerly side of the plank drive opposite the walk to the trap grounds, and 9 feet south from a small clump of elms. A water tower can be seen midway between a cedar stump to the right and a cedar tree at the shore to the left. Observations were taken over a drill-hole in the rock. The south corner of the erection on top of the water tower bears 297° 40′·1.

Ottawa, Ont., 1924–1926.—Observations were taken in the magnetic hut which is in the Observatory grounds.

Owen Sound, Ont., 1926.—The station is approximately a relocation of the station of 1910. It is on the agricultural grounds, being 158·8 feet from the northeast corner of the new cement-block building, 164·5 feet from the southeast corner, and 104·6 feet from the southwest corner of the grandstand. Observations were taken over a drill-hole in a concrete block set flush with the ground. The following true bearings were determined: left ornament on tower of Catholic church, 12° 04′·3; spire of Catholic church, 12° 24′·0; tip of ventilator on Catholic church, 13° 44′·7; north gable of red brick house, 99° 17′·2.

Parry Sound, Ont., 1926.—The station is approximately a relocation of the station of 1916. It is on the north side of the town near the northwest corner of the agricultural and athletic grounds, 77 feet east of the fence along the west side of the grounds, and 83 feet south of the fence along the north side. Observations were taken over a drill-hole in a stone set flush with the ground. The following true bearings were determined:

[1] This station was designated "Liskeard" in Publications of the Dominion Observatory, Vol. V, No. 5, pp. 155, 165 and 213. This was in accordance with the decision of the Geographic Board of Canada, see Fifteenth Report, 1917, p. 148. Locally the original designation, New Liskeard, has been retained; furthermore, in the Eighteenth Report of the Geographic Board, 1924, the decision with respect to this station is not included.

northeast corner of exhibit building, 87° 43′·6; bottom of pole on centre of exhibit building 91° 41′·5; bottom of pole on tower on southwest corner of exhibit building, 95° 22′·8; chimney on house near C.P.R. water tank, 172° 58′·4; pole on C.P.R. water tank, 173° 14′·8.

Pemberton, B.C., 1924.—The station is near the east edge of the clearing east of the P.G.E. depot and east of the tracks. It is in line with the north side of the freight shed and 200·8 feet from the northeast corner of the platform of the freight shed. Observations were taken over the centre of the top of a fir stake set flush with the ground. The north edge of the white part of the sign on the Pemberton hotel bears 282° 19′·7.

Point Amour, Labrador, 1925.—The station is on the plateau to the north of the lighthouse and is 171 feet from the edge of the bluff, measured in line with the lighthouse which can be seen from the station to the left of the centre of the roof of the keeper's house. The point is on a red granite boulder 4·5 by 4·5 feet projecting one foot above ground. Observations were taken over a drill hole filled with lead. The following true bearings were determined: spire on lighthouse, 161° 47′·3; west edge of signal flagstaff at splice, 165° 13′·3; west edge at base of wireless mast, 141° 54′·9.

Port Colborne B, Ont., 1926.—As the station of 1910 was not available a new station was selected about two miles southwest of the town on the top of Sugar Loaf hill. It is approximately on the centre line, produced, of that part of the "cement" road lying between the east edge of the paved strip and the east limit of the road. Observations were taken over a drill-hole in a stone about 6 by 6 inches set flush with the ground. The following true bearings were determined: spire of church in Port Colborne, 39° 06′·9; tip of water tank in Port Colborne, 53° 42′·9; spire of church in Port Colborne, 56° 45′·2; pole on water-tank, seen over elevator, 90° 22′·6; tip of lighthouse on break-water, 105° 38′·7.

Port Stanley A, Ont., 1926.—The station of 1910 was reoccupied. It is on the road leading west from the town in a field belonging to Mr. Snowdon and just west of the lot on which his dwelling house stands. The field is the second west of the second road leading up to Fraser Heights and about one-half mile west of the town. The point is 116·5 feet east of the fence along the west side of the field and 109·5 feet south of the north side of the field. Observations were taken over a brick set flush with the ground. The following true bearings were determined: spire of Anglican church, 55° 51′·9; pipe on roof of cottage on Fraser Heights, 162° 54′·7; gable of red brick house, 354° 38′·1.

Port Stanley B, Ont., 1926.—Station B is about one-quarter of a mile northwest of station A, on property leased by Mr. Gilliard. It is near the northwest corner of a pasture field, at the top of a steep incline and on the most northerly ridge in the field. It is about 155 feet south of the north boundary fence, 200 feet east of the west boundary of the field, and 25 feet distant in an easterly direction from a beech tree. Observations were taken over a hole in a concrete block 7 by 9 inches set flush with the ground. The following true bearings were determined: spire of Anglican church, 76° 08′·7; top of water tank on Fraser Heights, 149° 28′·9; ornament on tower of cottage on Fraser Heights, 178° 44′·6.

Prince Rupert, B.C., 1924.—The D.O. station of 1915 was reoccupied. It is about one-half mile south of the wharf near the agricultural hall and the athletic field. It is 120 feet southerly from the southeasterly corner of the reservoir, 77 feet southerly and

350 feet westerly from the southwesterly corner of the agricultural hall, and 50·8 feet northerly and 138 feet westerly from the northeasterly corner of the grandstand. Observations were taken over a drill-hole in a concrete block set flush with the ground. The following true bearings were determined: centre of base of north pole on agricultural hall, 25° 25′·0; centre of base of south pole on agricultural hall, 30° 24′·4; east corner at base of agricultural hall, 34° 03′·1; north edge at base of chimney at dry dock, 36° 59′.0; front west gable on new school, 42° 35′·6; west gable of white church in distance, 43° 30′·1; tip of ornament on centre of building, 47° 50′·2.

Quebec, Que., 1926.—The D.O. station of 1918, which was first occupied in 1906 by the Carnegie Institution, was reoccupied. It is on the Plains of Abraham, west of the jail and in line with the rear wall, inside the main drive and also the cinder course. It is 163 feet northwesterly from the top of a stone which was formerly at the intersection of two fences and 89 feet from the third lamp post from Wolfe's monument on the westerly side of the drive. A line joining the station with the southwesterly corner of the jail passes 12 feet south of the base of the second lamp post from Wolfe's monument on the east side of the drive. Observations were taken over a copper nail in a lead-filled drill hole in a stone about 4 by 4 inches set flush with the ground. The following true bearings were determined: tip of steel tank near Ross Rifle factory, 59° 01′·4; spire of church south of river, 141° 27′·9; spire of church south of river, 190° 56′·0; spire of church north of river, 207° 52·6; spire on tower, 218° 03′·0.

Redditt, Ont., 1926.—The D.O. station of 1914 was reoccupied. It is about 1,600 feet north of the C.N.R depot on townsite property, on a street allowance, being 85·5 feet west from the southeast corner post of the cemetery, the measurement being made along the fence, and 18·5 feet south from the fence. The southeast corner post of the cemetery is on the northwest corner of the intersection of the first street north and the first street west of the school. Observations were taken over a drill-hole in a rock 4 by 6 inches set flush with the ground. A temporary reference mark was used.

Rivière du Loup B, Que., 1926.—Station B, which was selected for the eclipse observations in June, 1918, was reoccupied. It is 429 feet from station A on a line bearing N. 33° 23′·0 E. It is near the northerly side of a clearing lying between the main road leading to the wharf and the road along the westerly side of the point. It is almost in line with the southerly end of the garage which is south of the cottage "Villa de Sillery"; is 126 feet easterly from the iron fence in front of the cottage and 148 feet from the board fence along the southerly side of the lot in which the station is located. Observations were taken over a drill-hole in a stone 4 by 4 inches set flush with the ground. The following true bearings were determined: pole on easterly end of building on easterly side of road leading to wharf, 195° 29′·5; pole on westerly end of building, 198° 47′·8; north gable of small building in northeast corner of government grounds, 200° 45′·0; top of lighthouse on wharf, 238° 14′·9; extreme right edge of northerly chimney on shed at wharf, 239° 26′·0.

Roberval B, Que., 1926.—The station is to the north of the town, in the exhibition grounds, between the main exhibition building and the main entrance to the grounds. It is in line with the east side of the main building and 169·2 feet south of its southeast corner, 91·6 feet from the northeasterly corner and in line with the easterly side of a building in the southwest corner of the enclosure, and 39·2 feet westerly from the base of the fourth spruce tree from the south fence. Observations were taken over a shallow drill-

hole in a rock 2 by 3·5 inches set flush with the ground. The following true bearings were determined: southeast corner of barn, 26° 08′·3; southwest gable on house, 36° 54′·9; pole on northeast cupola on factory, 43° 57′·0; southeast edge of smokestack on mill, 47° 46′·4; westerly edge of smokestack on mill, 180° 20′·4.

St. Anthony, Newfoundland, 1925.—The station is on Moore's point and is almost in line with the front, or easterly side of the signal hut. It is 185 feet southerly from the southerly corner of the hut and 113·5 feet easterly from the edge of the rock forming the top of the cliff. Observations were taken over a drill-hole in the rock. The following true bearings were determined: weather vane on lighthouse, 143° 39′·9; west edge of Mr. Budge's house, 250° 03′·5; south gable of Orange Hall, 265° 31′·3; spire of church, 276° 28′·1; north corner of orphanage, 287° 00′·4.

St. John, N.B., 1926.—The station of 1918, which is an approximate relocation of the station of 1908 and 1912, was reoccupied. It is on Gilbert's property facing Gilbert's lane, about one mile northeast of the railway depot and about 750 feet northerly from the railway tracks. It is 68·5 feet south of the fence on the north side of the field, 223 feet easterly from the northerly side of the gateway, which is at the southeast corner of the horticultural section of Rockwood park, 181 feet from the fence along the westerly side of the field, and 38 feet north of the northerly side of Seely street or the south limit of the park produced. From the station the cathedral spire may been seen over the east chimney of the house farthest east on the north side of Pine street, and the tall brick chimney at Peter's tannery and the one at the cotton mill are seen in line. The point is marked by a drill-hole in a stone 5 by 3·5 inches projecting slightly above the ground. The following true bearings were determined: pole on centre of railway water-tank, 62° 36′·0; pole on water-tank at Peter's tannery, 150° 18′·8; pole on Leinster Baptist church, 179° 11′·2; spire on centre dome of hospital, 181° 59′·7.

Ste. Anne des Monts, Que., 1925.—The station is in an open field to the south of the Grand Union hotel, both field and hotel being the property of Mr. A. Pelletier. It is near the southeast corner of the field on an uncultivated ridge composed mainly of shale, being about 1,000 feet south of the hotel, 60 feet west of the fence on the east, and 65 feet north of the fence on the south side of the field. Observations were taken over the intersection of two grooves in a stone set flush with the ground. The following true bearings were determined: cross on west tower of Catholic church, 33° 48′·9; cross on east tower of Catholic church, 35° 02′·3; ornament on centre of church, 36° 51′·8; spire of church in Anse a Jean, 56° 58′·8; smokestack on saw-mill, 265° 21′·9.

Salmon Bay, Que., 1925.—The D.O. station of 1909 was reoccupied. It is near the west side of a depression in an irregular terrace on the east slope of a hill which is opposite Caribou island and south of Salmon bay, about 200 feet west of and in line with the south end of Mr. Jeremiah Dunn's house and about 300 feet north of Mr. Edward Dunn's house. The point is marked by a stake 3 inches in diameter set flush with the ground. The following true bearings were determned: cairn on hill to east, 40° 42′·2; south gable of Mr. McAllister's house, 78° 45′·7; east gable of Catholic church, 159° 17′·4; cairn on point of land seen to left of pipe on church, 160° 09′·2; cross on tower of church 161° 53′·0.

Sault Ste. Marie, Ont., 1926.—The station, which is a relocation of the station of 1916, is about one-half mile northeasterly from the C.P.R. depot on the east side of Great Northern road, which is a continuation of Pym street, and south of McDonald street, which runs east from Great Northern road to the wireless station. It is 125 feet west of the wire fence along the east side of the second street east of Great Northern road and 97 feet south of the row of telephone poles along the south side of MacDonald street. Observations were taken over a drill-hole in a stone set flush with the ground. The following true bearings were determined: flagstaff, 134° 23′·0; pipe on white house, 178° 14′·6; flagstaff on high school, 268° 51′·7; tip of tower of public school, 312° 42′·7.

Schreiber, Ont., 1926.—The D.O. station of 1910, which is the C.I. station of 1906, was reoccupied. It is 99·5 feet from the southwest corner of the cemetery and in line with the picket fence on the south side. Observations were taken over a drill-hole in a stone set flush with the ground. The upper face of the stone is about 3 by 4 inches. The following true bearings were determined: tip of ventilator on C.P.R. car shops, 192° 33′·4; pole on C.P.R. water-tank, 211° 03′·0; spire of United church, 256° 49′·9; spire of English church, 261° 55′·3.

Selkirk, Yukon, 1924.—The C.I. station of 1907 was reoccupied. It is on the low ridge south of the old government telegraph station and about 300 feet south 21° west (true) from the astronomical pier erected in 1907. The old stake was replaced by one 4 inches in diameter projecting 2 inches above the ground. Observations were taken over a brass screw in the top of this stake. The following true bearings were determined: west edge at base of flagstaff on old telegraph office, 13° 46′·3; southeast edge of astronomical pier, 20° 49′·1; northwest edge of old barracks, 74° 25′·7; cross on Catholic church, 301° 44′·1.

Seven Islands (Pointe aux Basques), Que., 1925.—The station of 1920 was reoccupied. It is located on Pointe aux Basques and about 2 miles south of the village of Seven Islands. It is in line with the western extremities of Basque island and Manowin island and a line joining the station and a prominence on the peninsula across the harbour passes over a low rock, which is at a short distance from Basque island. It is about 275 feet southeast from a house with shingled sides and 116 northerly from a fence (partially removed), measured in the direction of the westerly extremity of Basque island. Observations were taken over a cartridge shell in the top of a stake 5·5 inches in diameter set flush with the ground. The following true bearings were determined: cairn on highest point of Boule island, 114° 44′·0; gable over window of log house, 335° 19′·6; east gable of house with shingled sides, 357° 33′·9.

Shawinigan Falls, Que., 1926.—The station is in the northeast part of the town on land owned by the Shawinigan Water and Power Company and used as an athletic field. It is on the rough ground inside the race track and to the east of the ball field, in line with the southerly goal post at the west side of the field and the northerly post at the east side of the field, and 170·5 feet northeasterly from the latter post Observations were taken over a lead-filled drill hole in the top of a sandstone post set flush with the ground. The following true bearings were determined: southwest corner of red brick house, 15° 44′·9; centre of top of transmission tower seen over chimney, 76° 13′·8; base of pole on fire station, 143° 03′·5; base of pole on school, 164° 09′·7; easterly gable of white house, 291° 23′·2.

Sioux Lookout B, Ont., 1926.—The D.O. station of 1918 was reoccupied. It is slightly west of the summit of a rocky hill which is the first one southerly from that on which the C.N.R. water tower stands. The point is 26 feet north and 237 feet east of the northeast corner of the second from the south end of a row of five houses owned by the railway. Observations were taken over a drill-hole in a stone set flush with the ground. The following true bearings were determined: east gable of coal chute, 10° 57′·7; observing tower on hill across lake, 259° 43′·3; east end of railway bridge across narrows, 281° 27′·7; cross on tower of Catholic church, 329° 22′·7; tip of pole on water-tower, 348° 15′·8.

Squamish, B.C., 1924.—The station is near the road to the power house and across the bridge from the town. It is southwesterly from the southerly end of the bridge and is on the summit of the rock outcrop at this point. The point is 5·5 feet from the edge of the bluff at the water's edge, 45·5 feet southwest from the edge of the plank at the bridge, and 18 feet northwesterly from the edge of the outcrop. Observations were taken over a drill-hole in the rock. A temporary reference mark was used.

Stanstead, Que., 1926.—The D.O. station of 1921 was reoccupied. It is on the exhibition grounds and inside the race course. It is 80 feet southerly from the inner edge of the race course and 254 feet easterly from the judge's stand, which is opposite the site where once was located a grandstand. Observations were taken over a drill-hole in a boulder, triangular in shape, projecting 6 inches above the ground. The following true bearings were determined: pole on Stanstead College, 249° 19′·0; tip of spire of United church, 267° 07′·0; cross on Catholic school, 276° 02′·2; cross on Catholic church, 314° 20′·2.

Stewart, B.C., 1924.—The station is about one-half mile northeast of the centre of the town and is about one-quarter mile north from the railway crossing along the road leading to the bridge. It is in a partially clear space to the east of the waggon road and is screened from the road by a fringe of bushes. It is 82 feet east of the east edge of the waggon road, 66 feet east of the east side of the path which is on the east side of the road, and 322 feet north of the junction of the waggon road to the bridge and the road running northwesterly to the old depot, this distance being measured along the waggon road to a point opposite the station. Observations were taken over the centre of the top of a grey granite rock 4 by 4 inches projecting 3 inches above the ground. This is the only grey granite rock in this neighbourhood. A temporary reference mark was used.

Stewart, Yukon, 1924.—The station is in the vicinity of the C.I. station of 1907. It is northeast of the Stewart hotel and behind the hotel garden. It is 26·2 feet northerly from the garden fence, 62·8 feet easterly from the northwest corner of the fence, and in a clearing between the fence and the bush. Observations were taken over the centre of a stake 3 inches in diameter projecting 4 inches above the ground. The following true bearings were determined; west edge at the base of chimney on shack to south, 225° 22′·4; st edge at base of chimney on Stewart hotel, 268° 12′·5.

Sudbury C, Ont., 1926.—The station is approximately a relocation of station C, which was occupied first in 1916. It is in the first large field north of St. Joseph's hospital and east of the Catholic school grounds. It is 292 feet east and 38 feet north of the northeast corner of the school built in 1914, 104 feet east and 79·5 feet north of the

northeast corner of the school built at a later date, and 69·5 feet east and 62·5 feet north of the southwest corner of the field. Observations were taken over a drill-hole in a stone set flush with the ground. The following true bearings were determined: cross on tower of Catholic church, 158° 56′·9; tip of cross on hospital in line with flagstaff on front of hospital, 181° 14′·5; top of flagstaff on tower of town hall, 183° 25′·8; cross on separate school, 252° 58′·3.

Sydney B, N.S., 1925.—Station B, which was first occupied in 1918 and again in 1921, was reoccupied. It is northwest of the town in Victoria park, near the foot of the slope on the northwestern side of the highest point of ground in the western portion of the park. It is near the inner edge of the race course, 220 feet easterly from an electric light post on which is a reflector, 278 feet southerly from the iron house near the signal mast, and 131 feet southeasterly from a row of willow trees along the northerly edge of the race-track. Observations were taken over a drill-hole in the top of a granite post 4 by 4 inches set flush with the ground. The following true bearings were determined: tip of pole near iron works, 69° 36′·3; spire of Catholic church, 126° 33′·7; spire of old stone church on esplanade, 147° 26′·4.

Tadoussac, Que., 1926.—The station is approximately a relocation of the station of 1909. It is near the summit of a rocky slope on the westerly side of the road leading from the wharf to the village, about 390 feet northerly from the freight shed at the wharf, 48·2 feet southerly from a wire fence, 146 feet westerly from a house, and 31·8 feet easterly from the instersection of two grooves chiselled in the rock near the base of the cliff. Observations were taken over a drill-hole in a rock set flush with the ground. The following true bearings were determined: pole on house, 40° 50′·7; tip of outer lighthouse across Saguenay river, 159° 26°·1; tip of inner lighthouse across Saguenay river, 171° 45′·1; bottom of pole on freight shed at wharf, 178° 29′·2.

Tantalus, Yukon, 1924.—The C.I. station of 1907 was reoccupied. It is in a clearing in front of the old R.N.W.M.P. barracks, about one-half mile below the Tantalus coal mine and one-quarter mile above Taylor and Drury's store at Carmacks. It is 48 feet south of the bank of Lewes river, 60 feet east of the old flagstaff, and 128 feet south 78° east (true) from the astronomical pier of 1907. Observations were taken over a brass screw in the top of a fir stake 4 by 4 inches projecting 2 inches above the ground. The following true bearings were determined: northwest gable of highest shed at old coal mine, 65° 09′·4; northeast edge at centre of astronomical pier, 282° 16′·0; northeast gable of Taylor and Drury's warehouse, 294° 29′·0.

Terrebonne, Que., 1926.—The D.O. station of 1918 was reoccupied. It is opposite the Happy Home hotel on an island belonging to the Masson estate. It is about 630 feet northwesterly from a saw-mill, 269·5 feet northwesterly from the northwesterly corner of a stone building, and 69·8 feet southwesterly from the D.O. station of 1912. Observations were taken over a copper nail in a stake set flush with the ground. The following true bearings were determined: northwest corner of Happy Home hotel, 111° 00′·5; base of spire on Catholic seminary, 119° 44′·2; north corner at top of mill, 131° 51′·8; south edge of ventilator on stone building, 141° 12′·0.

Tignish, P.E.I., 1925.—The station of 1921 was reoccupied. It is in a small opening in the grove of trees along the north side of the grounds around the Presbyterian church about a quarter of a mile south of the railway tracks. It is 124 feet east and 26 feet

north of the northeast corner of the church, 69·5 feet north of the fence along the south side of the grounds, and 47·5 feet west of the fence along the east side. Observations were taken over a drill-hole in the top of a brick set flush with the ground. The following true bearings were determined: right edge of chimney on north end of house, 232° 51′·8; southeast corner of church, 233° 28′·0; northwest corner of church, 251° 01′·6; chimney on main part of house, 150° 00′·0.

Truro, N.S., 1925.—The station of 1912 was reoccupied. It is near the entrance to Victoria park and is about 200 feet east and 615 feet south of the southeast corner of the intersection of Brunswick street and Outram street and is 128 feet east of the retaining wall along the front of the property facing the park, and 217 feet southwest of the southwest corner of a bridge over a creek. Observations were taken over a hole in a stone, the diagonals of which are 4 inches and 6 inches, set flush with the ground. The following true bearings were determined: chimney on house on hill, 194° 55′·0; tip of church spire seen over house at southwest corner of intersection of Brunswick street and Outram street, 319° 44′·1; pole on C.N.R. depot, 325° 13′·2; tip of tower of Learmont hotel, 336° 19′·2.

Twin City Junction, Ont., 1926.—The D.O. station of 1916 was reoccupied. It is in the City of Fort William park, the west limit of which is about 1,600 feet east of the C.N.R. depot and the south limit is adjacent to the north side of the government road allowance which is along the north side of the C.N.R. right-of-way. It is 408 feet north of the fence along the south side of the enclosure and 235 feet east of the fence along the west side. Observations were taken over a drill-hole in a triangular-shaped stone 3·5 by 4 by 4·5 inches, set flush with the ground. The first white post east of the depot on the south side of the railway tracks bears 245° 17′·9.

Vancouver, B.C., 1924.—The D.O. station of 1908 was reoccupied. It is on the government lighthouse reserve, on which is also the Dominion Observatory astronomic station, which is used as a reference station for longitudes in British Columbia. It is 43 feet southerly from the southwest corner of the observatory building (office part) and 8 feet due west from the produced line of the west side of the building. Observations were taken over a brass screw in a fir log set flush with the ground. The following true bearings were determined: north spire of church across harbour, 50° 18′·2; south spire of church across harbour, 50° 26′·4; base of flagstaff across harbour, 51° 00′·2; spire across harbour, 104° 32′·8.

Victoria, B.C., 1924.—The D.O. station of 1919, which is an approximate relocation of the C.I. station of 1907, was reoccupied. It is on an open strip of land between Dallas road and the seashore, and between Dallas avenue and Government street extended, 3·5 feet from the edge of the bluff and 42 feet east of the line produced of a row of poles which are on the east side of Government street and seen over the shrubbery on the south side of Dallas road. The point is marked by a copper nail in the top of a stake 4 by 4 inches set flush with the ground. The following true bearings were determined: flagstaff in Dr. Milne's yard, 64° 50′·5; Race Rocks lighthouse, 223° 14′·6; top of buoy on Brotchy ledge, 252° 19′·2; top of lighthouse on outer wharf, 288° 12′·9.

Victoria (Mount Douglas), B.C., 1924.—The station is in Mount Douglas park, about five miles from the centre of the city, in an open space at the base of the mountain on the northwesterly side of a motor road, and about a quarter of a mile southwesterly

from the intersection of this road with Shelburne street. The station is in line with and 54 feet from the nearer of two fir trees, the farther of which is near the speed limit sign at the side of the motor road. It is 91 feet from the northwesterly side of the motor road, 58 feet from a road through the park in line with a small oak tree to the southwest of the station, 102 feet from the sign on the south side of another road, or trail, and 69 feet from a fir tree to the northwest of the station. Observations were taken over a drill-hole in the end of a brick set flush with the ground. The following true bearings were determined: southerly gable of house with red roof on horizon, 78° 21′·0; northerly edge at base of red brick chimney on red-roofed house, 100° 12′·8; west gable of small white house at north end of greenhouse, 115° 23′·9; west gable of yellow house in valley, 136° 59′·8; west gable of iron-roofed barn, 157° 13′·6.

West Turnavik, Labrador, 1925.—The U.S. Coast and Geodetic Survey station of 1881 and 1896, which is also the C.I. station of 1905 and 1908, was reoccupied. It is a little east from the centre of the smallest of the islands called Offer Turnavik, on the summit of a low rock approximately half way between Mr. Bartlett's house and the bunk house. It is 50·9 feet from the northwesterly corner and 45·5 feet from the southwesterly corner and almost in line with the southerly side of Mr. Bartlett's house, and is 55 feet from the easterly corner and 51·9 feet from the southerly corner of the bunk house. Observations were taken over a deep drill-hole 1·75 inches in diameter in the rock. A temporary reference mark was used.

Whitehorse, Yukon, 1924.—The station is in close proximity to the C.I. station of 1907. It is in the R.C.M.P. grounds in the cultivated field in the enclosure formed by the barracks, is southwesterly from the flagstaff and near the northwest roadway. The point is 110 feet southeasterly from the southerly corner of the verandah of the third house from the entrance to the grounds at the northerly corner, this measurement being in line with the southwest side of the house, and 4·5 feet northeasterly from this line. It is 156·3 feet easterly from the southeasterly corner of the verandah on the men's barracks and 89 feet southeast from the southeast edge of the road to the northwest. The station is in line with the southerly corner of the verandah of the third house from the northerly entrance and the west door in the building to the west of the old barracks. Observations were taken over a brass screw in the top of a stake 4·5 inches in diameter projecting 2 inches above the ground. The following true bearings were determined: spire on Catholic church, 1° 32′·6; base of flagstaff on post office, 69° 57′·6; base of police flagstaff, north edge, 79° 39′·2; north corner of old barracks, 119° 27′·9; east corner of Sergt. Head's house, 187° 51′·0.

White River B, Ont., 1926.—The D.O. station of 1918 was reoccupied. It is about a quarter of a mile north of the original station, station A, and a short distance southeast of the Catholic church. It is 60·5 feet southerly and 151 feet easterly from the southeast corner of the church. Observations were taken over a copper nail in the top of a stake 3 inches in diameter set flush with the ground. The following true bearings were determined: tip of spire on tower of United church, 170° 04′·3; tip of pole on ventilator of car shops, 203° 35′·4; pole on C.P.R. water tank, 209° 14′·0; cross on English church, 209° 35′·6; southwest corner of Catholic church, 264° 14′·0.

Woodstock A, N.B., 1926.—The D.O. station of 1912 was reoccupied. It is near the southeast angle formed by the instersection of Orange street and St. John street,

being 73 feet south of the north side of St. John street, 88 feet east of the west side of Orange street, and 144 feet north of the north end of the lot at the northeast corner of the intersection of Orange street and Elm street. Observations were taken over a copper nail in the top of a stake 3 by 3 inches set flush with the ground. The following true bearings were determined: spire of Presbyterian church, 141° 17′·0; south gable of club house, 334° 37′·6; south gable of dwelling house (formerly club house), 347° 02′·6.

Woodstock B, N.B., 1926.—Station B is about 302 feet northwest of station A, in an open pasture field belonging to the Fisher estate. It is opposite the club house in the golf grounds and is 131 feet north and 133 feet west of the northwest angle formed by the intersection of Orange street and St. John street. Observations were taken over a drill-hole near the south end of a flat boulder, triangular in shape, the distance from the south angle to the opposite base being about 3 feet. The following true bearings were determined: east gable of club house, 0° 38′·4; spire of Reformed Baptist church, 127° 40′·0; spire of United Baptist church, 133° 43′·8; spire of Presbyterian church, 136° 43′·6.

Yarmouth, N.S., 1925.—The station is approximately a relocation of the station of 1912. It is in the athletic field, being 51·6 feet south of the fence along the north side of the grounds and 133·2 feet west of the fence along the east side. Observations were taken over a stone, the diagonals of which are 4 inches and 8 inches, set flush with the ground. The spire of Temple Baptist church bears 199° 46′·8.

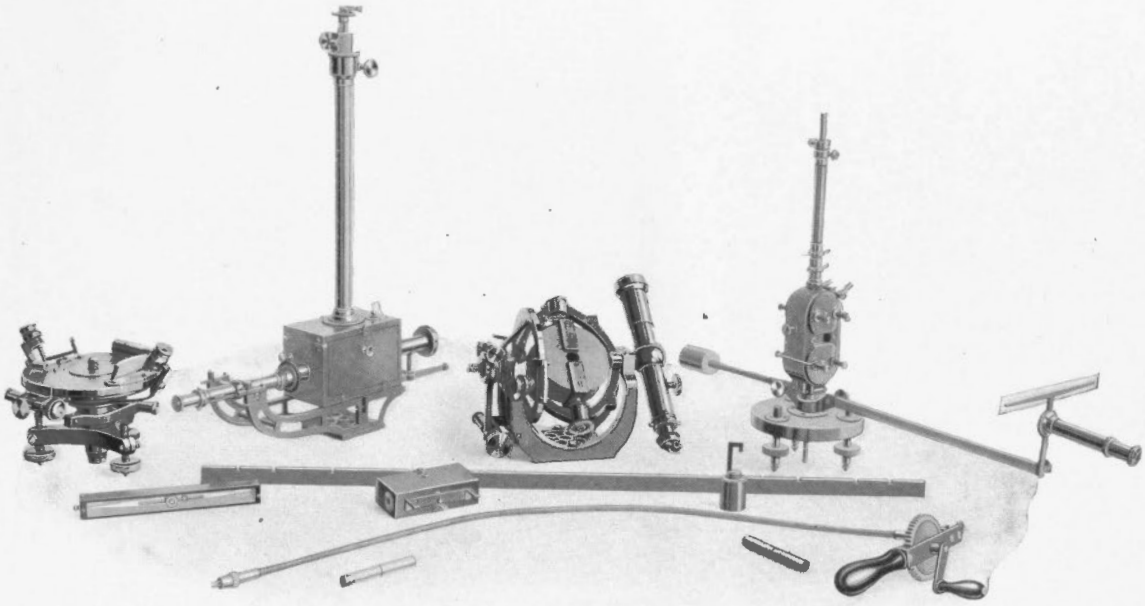

FIG. 1. COMBINED MAGNETOMETER EARTH INDUCTOR NO. 104
A type of magnetic instrument designed by the Carnegie Institution, Washington, D.C. The view shows the base of the instrument, magnetometer attachment, theodolite-earth inductor attachment and galvanometer, as well as various accessories.

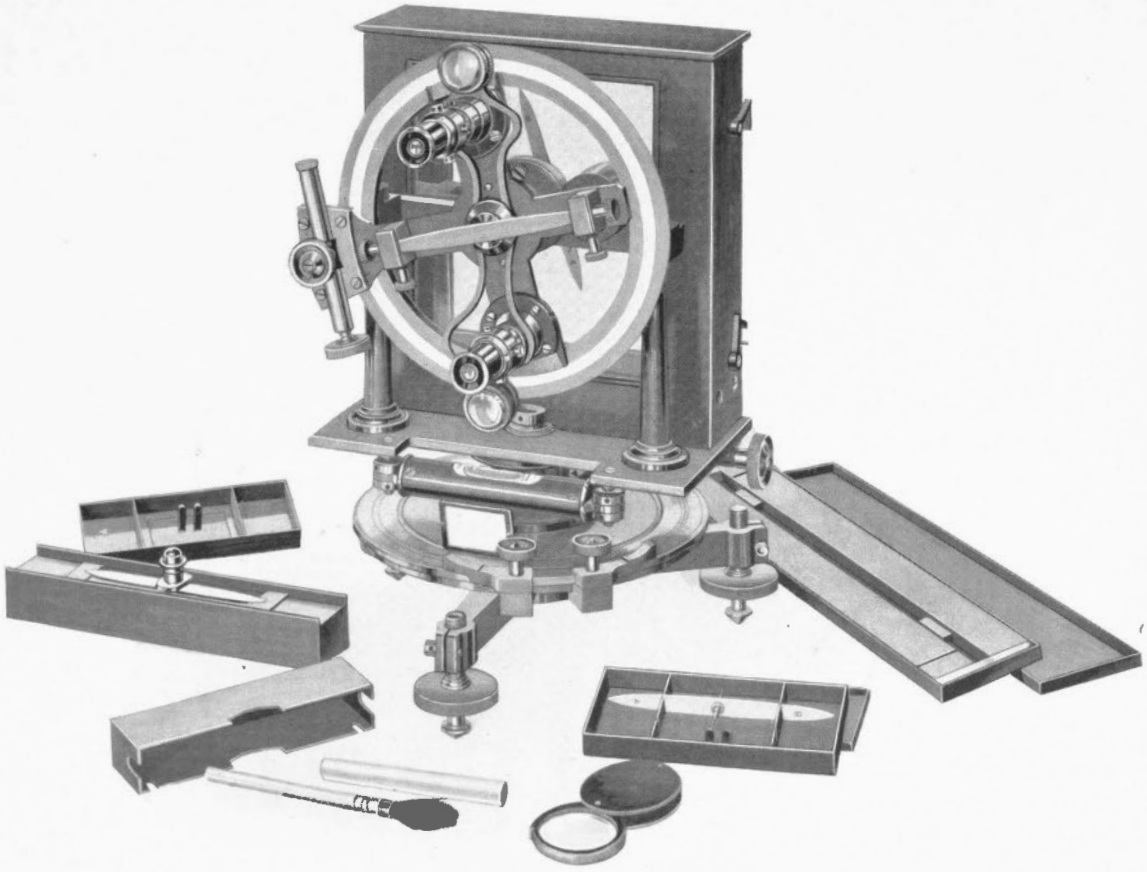

FIG. 2. DOVER DIP CIRCLE NO. 212
View to show intensity needles mounted for deflections, and accessories.

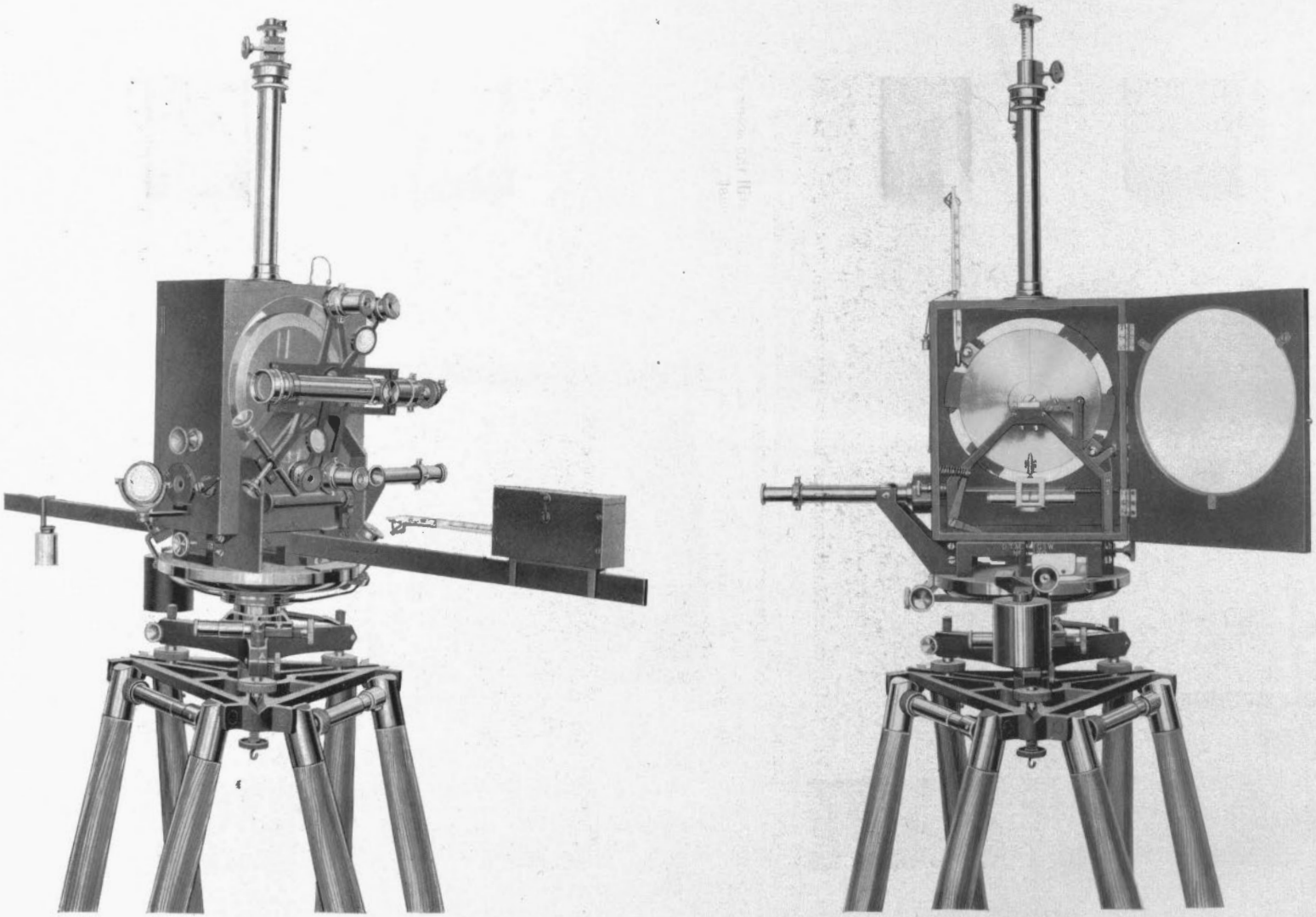

FIG. 3. COMBINED MAGNETOMETER DIP CIRCLE NO. 20

A type of instrument designed and constructed by the Carnegie Institution, Washington, D.C. One view shows the instrument, with the eccentrically mounted theodolite, on tripod, with deflection bar and magnet house in position; the other shows the interior of the instrument with magnet in position for observing.

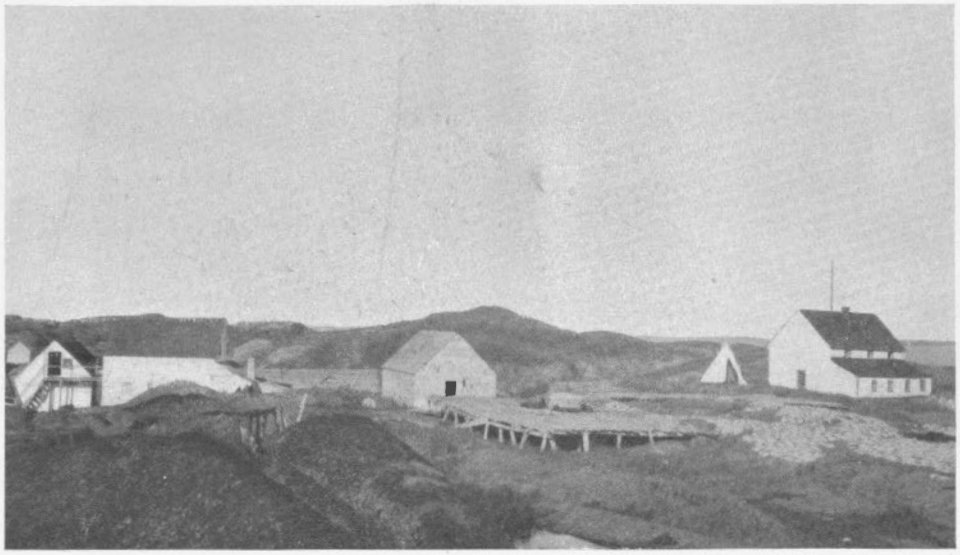

FIG. 4. STATION AT WEST TURNAVIK, LABRADOR

Formerly the island domain of the Bartletts of Arctic fame, West Turnavik is still the scene of cod fishing. The magnetic station was established by the U.S. Coast and Geodetic Survey in 1881.

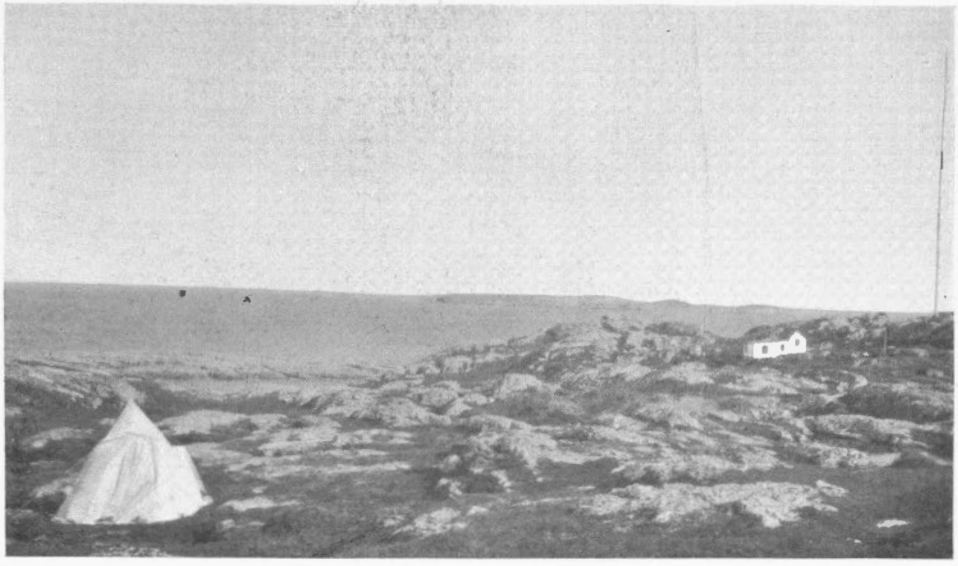

FIG. 5. STATION AT BATTLE HARBOUR, LABRADOR

The station was established by the Carnegie Institution of Washington in 1905. It is near the centre of Battle island, east of the Grenfell Hospital, and north of the Marconi wireless station which appears at the right of the picture.

FIG. 6. STATION AT WHITEHORSE, YUKON
The site of this station, which was first occupied by the Carnegie Institution in 1907, is on the grounds of the R.C.M. Police.

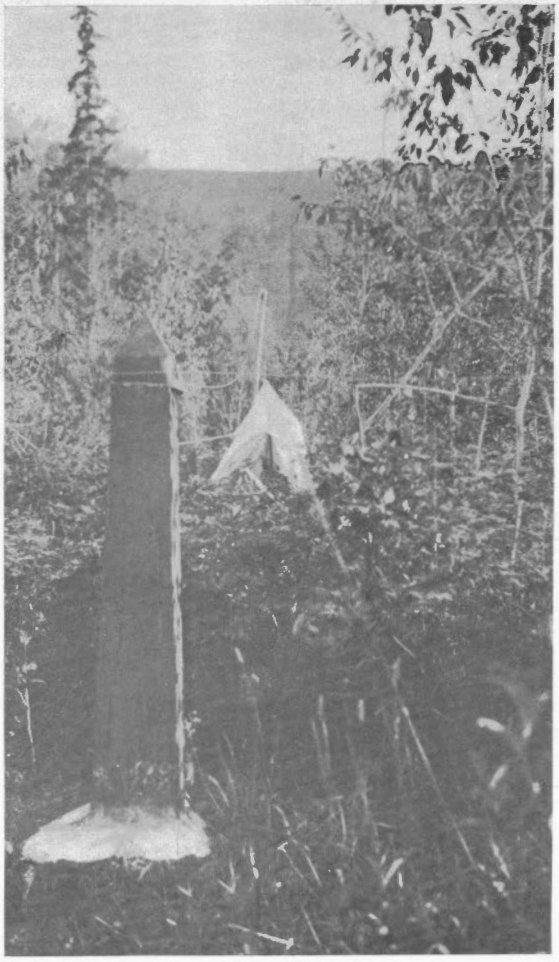

FIG. 7. STATION AT INTERNATIONAL BOUNDARY, YUKON
The monument in the foreground is on the south bank of Yukon river. The magnetic station was established by the Carnegie Institution in 1907.