XIV. *Determinations of the Magnetic Inclination and Force in the British Provinces of Nova Scotia and New Brunswick, in the Summer of* 1847.

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IN an excursion in the provinces of Nova Scotia and New Brunswick in August and September 1847, I took with me some magnetical instruments, with which I made a few observations for determining the magnetic intensity. The observations were of two kinds; those for the relative total force, made with a pair of LLOYD needles, which I shall designate L(1) and L(2), and an inclination circle, seven inches in diameter, with two verniers reading to single minutes, constructed by BARROW, successor to ROBINSON; and those for the absolute horizontal force, made with a unifilar magnetometer by JONES. The positions of the needles in the inclination circle are determined by two reading microscopes with micrometer scales. The unifilar has a theodolite base and circle of six inches, divided on silver, and reading to twenty seconds. Both instruments are described in Captain RIDDELL's "Supplement" to his "Magnetical Instructions." Observations to determine the temperature coefficients of the LLOYD needles were made in a small building fastened with nothing but copper, and containing a copper stove. For the weights sent by the maker with these needles, which were inconvenient, I substituted two platinum weights, which have never been removed from the holes in which they were placed before my observations commenced. Using $t, t', v, v', \theta, \theta', \varphi, \varphi'$ for the temperatures, the angles of deflection, the inclinations, and the relative forces, respectively, at low and high temperatures, the following Table exhibits the observations and results by the well-known formula $\varphi=\frac{\cos v}{\sin(\theta+v)}$. I find the results the same whether the mean values of t, v, and θ, &c. are used to obtain φ and φ', or a mean of the daily results is taken.

Table I.

Observations for the Temperature Coefficient of L(2). Waterville Mean Time.

Low temperatures.					High temperatures.				
1847.	t.	v.	θ.	ϕ.	1847.	t'.	v'.	θ'.	ϕ'.
d h					d h				
Feb. 10	26°·1	26° 26′ 33⅛″	75° 55′ 57¼″	0·9166800	Feb. 10	72°·1	26° 59′ 46¼″	75° 55′ 57¼″	0·9142133
18 20·4	11·4	26 16 33¾	76 02 14	0·9177840	20 00·5	70·0	27 11 41	75 56 45⅝	0·9133754
19 20·3	14·8	26 18 13¾	75 56 45⅝	0·9173431	21 23·7	64·5	27 15 33⅛	75 56 17⅜	0·9130579
21 20·5	17·6	26 39 35	75 56 17⅜	0·9157335	22 23·7	60·5	27 09 20⅝	76 00 58½	0·9138112
22 20·5	15·6	26 24 20⅝	76 00 58 7/16	0·9171375	23 23·7	84·2	27 50 06⅞	75 55 26¾	0·9104202
23 20·7	34·1	26 59 42½	75 55 26¾	0·9141865	26 00·3	80·6	27 38 39⅜	75 56 16⅞	0·9113319
25 21·3	33·5	26 52 51⅞	75 56 16⅞	0·9147465	27 00	73·3	27 38 46⅞	75 57 38⅞	0·9114102
26 21·3	25·6	26 59 49⅜	75 57 38⅞	0·9143125	28 23·7	69·7	27 27 59⅜	76 00 01½	0·9123667
28 20·5	35·4	27 00 01¼	76 00 01½	0·9144437	Mar. 1 23·5	67·7	27 26 27½	75 57 30¾	0·9123212
Mar. 1 20·5	31·0	26 56 56	75 57 30¾	0·9145187	Feb. 18 23·5	62·3	27 04 12½	76 02 14	0·9142698
Means.........	24·51	26 41 27¾	75 57 54¾	0·9156886	Means.........	70·49	27 22 15⅜	75 57 54¾	0·9126578
Calculated value from means of t, v, and θ ...... 0·9156908					Calculated value from means of t', v', and θ'...... 0·9126596				

Observations for the Temperature Coefficient of L(1). Waterville Mean Time.

Feb. 7 20·5	29·9	35 55 26⅞	75 54 21½	0·8723502	Feb. 8 03	75·1	36 11 41¼	75 54 21½	0·8710132
8 20	31·9	36 00 08⅛	75 57 55	0·8723284	9 02	86·9	36 23 47½	75 57 55	0·8703828
9 20	34·2	35 59 36¼	75 56 05½	0·8721856	10 01	78·3	36 15 45⅝	75 56 05½	0·8708558
10 20	32·6	35 52 53⅛	75 58 51½	0·8730186	10 23	78·8	36 16 50	75 58 51½	0·8710536
11 20·5	24·0	35 51 37½	76 00 06¼	0·8732486	12 01	74·8	36 15 36¼	76 00 06¼	0·8712842
12 20	25·9	35 53 28¾	75 58 32¾	0·8729382	13 00	74·3	36 13 11⅞	75 58 32¾	0·8713204
14 20·5	16·7	35 44 27½	75 58 34½	0·8736786	14 23	63·0	36 13 38¾	75 58 34½	0·8712866
15 20·5	7·0	35 44 33¾	75 58 24¾	0·8736534	15 23	71·0	36 18 04⅜	75 58 24¾	0·8709048
16 21	19·0	35 54 58¾	75 58 04½	0·8727674	16 23·5	75·7	36 24 26¼	75 58 04½	0·8703460
18 20·7	15·0	35 57 57½	76 02 14	0·8729488	19 00·7	67·8	36 29 45⅝	76 02 14	0·8703426
19 20·7	20·4	35 55 41⅞	75 56 45⅝	0·8725744	20 01	81·0	36 28 25	75 56 45⅝	0·8698804
Means.........	23·33	35 53 42⅘	75 58 10½	0·8728811	Means.........	75·15	36 19 12	75 58 10½	0·8707882
Calculated value of ϕ from means of t, v, and θ ...·8728810					Calculated value of ϕ' from means of t', v', and θ'...0·8707881				

whence by the formula $q=\frac{\phi-\phi'}{\phi'(t-t')}$ we have for L(1) the coefficient ·0000463; and for L(2) the coefficient ·0000722.

The values of θ in the above observations were obtained by the two dipping-needles accompanying the Lloyd needles, and which I shall call A(1) and A(2). The observations were made in the usual way with poles direct and reversed, in each case the marked limb of the circle facing both east and west; each single reading being a mean of from four to eight, successively obtained by lifting the needle from its agate supports by the lifting frame. The mean of the whole is, for A(1), twenty complete observations, 75° 57′ 03″; for A(2), nineteen complete observations, 75° 58′ 50″; whence the mean dip for Waterville (lat. 44° 33′ N., long. 293° 23′), Feb. 17, 1847, is 75° 57′ 56½″. Between June 14th and June 30th I made at the same place, with each of the needles, six complete observations, on as many days, and when, from the less variations of temperature, the adjustments were more under control; the results were for A(1), 75° 56′ 27″; for A(2), 75° 59′ 31″; mean dip for June 22nd, 75° 57′ 59″. In all my observations with these dipping-needles, up to the time of my excursion, I had observed far greater irregularities in A(2) than in A(1); in this last set, for instance,

the greatest difference between any partial result by A(1) and the mean dip was 01′·7, while for A(2) it was 03′·2; the difference for A(1) indeed was, in two-thirds of the results, less than 1′. Though this might not affect the means of a great number of observations, it is evident that if the observer is limited to one observation with each of these needles, he is far more likely, setting aside the effects of carelessness, to obtain a truly comparable value of θ by needle A(1) alone, than by a mean of the two. I have therefore confined my observations for θ, on my tour, with one exception, to A(1). The direction of the meridian has always been obtained with A(1), by considering the meridian as 90° from a mean of the positions of the vertical limb of the circle, when the needle resting on its supports had an inclination of 90° with its marked face alternately north and south. Moreover, in all my observations with the dipping or force needles, whenever the instrument was newly placed, the adjustments for correct position of the microscopes, the axis, the level, and the planes of support, were duly made if necessary. Table II. gives the details of the observations made in the provinces for v and θ with the logs of ϕ, by each needle reduced to 50° Fahr.

Table II.

No. for reference.	Place.	Date. 1847.	Latitude to nearest minute.	Longitude to nearest minute.	For inclination. Needle.	Poles direct.	Poles reversed.	θ.	Observations with Lloyd needles. Needle.	Temp. Fahr.	v.	Logarithms of ϕ.
1.	Halifax, N.S.	Aug. 20.	44° 39′	296° 23′	A(1)	75° 37′	75° 37′·1	75° 37′	L(1)	77°·3	39° 32′·1 }	Means used. $\bar{1}$·9310218
	Halifax, N.S.	21.	....	....	A(1)	75 37·6	75 38·3	75 37·9	L(1)	77·5	39 32·5 }	
	Halifax, N.S.	21.	....	....	....	....	....	....	L(2)	76·9	32 15·1	$\bar{1}$·9495554
2.	Hiltz's, N.S.	23.	44 57	295 9	A(1)	75 37	75 37	75 37	L(1)	74·0	39 36·5	$\bar{1}$·9307381
3.	Windsor, N.S.	24.	45 10	295 44	A(1)	75 40·6	75 42·2	75 41·4	L(1)	76·8	39 38	$\bar{1}$·9309837
4.	Kentville, N.S.	25.	45 12	295 14	A(1)	75 45·1	75 46·3	75 45·7	L(1)	52·1	39 09·6	$\bar{1}$·9320107
5.	Bridgetown, N.S. ...	26.	44 51	294 22	A(1)	75 40·9	75 41·9	75 41·4	L(1)	75·3	39 05·2	$\bar{1}$·9323155
6.	Annapolis, N.S.	27.	44 45	294 04	A(1)	75 41·7	75 41·2	75 41·5	L(1)	68·5	38 58·8	$\bar{1}$·9325703
	Annapolis, N.S.	27.	....	....	....	....	....	....	L(2)	70·3	31 41·2	$\bar{1}$·9508199
7.	St. John, N.B.	Sept. 1.	45 14	293 57	A(1)	75 55·7	75 55·7	75 55·7	L (1)	59·9	38 22·2	$\bar{1}$·9348103
8.	Fredericton, N.B. ...	2.	....	....	A(1)	76 59·2	76 58·5	76 58·9	L(1)	72·0	39 19·7	$\bar{1}$·9364098
9.	Woodstock, N.B. ...	4.	46 09	292 25	A(1)	{ 77 12	77 10·2	77 11·1	L(1)	73·2	39 14·8	$\bar{1}$·9373967 }
	Woodstock, N.B. ...	....	....	....	....	{	....	76 59·6	....	....	....	$\bar{1}$·9377287 }
	Woodstock, N.B. ...	11.	....	....	....	....	....	....	L(2)	63·2	30 56·1	$\bar{1}$·9553924
10.	Riviere des Chutes ...	6.	46 36	292 16	A(1)	77 11·1	77 11·7	77 11·4	L(1)	69·0	38 54·3	$\bar{1}$·9381584
	Riviere des Chutes ...	11.	....	....	....	....	....	....	L(2)	45·3	30 37·8	$\bar{1}$·9559425
11.	Grand Falls of St. John	7.	47 03	292 15	A(1)	77 28·1	77 31	77 29·5	L(1)	70·7	39 29·1	$\bar{1}$·9379492
	Grand Falls of St. John	10.	....	....	....	77 27·5	77 31·6	77 29·5	L(2)	59·0	31 09	$\bar{1}$·9561125
12.	Grand River	8.	47 11	292 03	A(1)	77 36·4	77 34·8	77 35·6	L(1)	49·2	38 51·4	$\bar{1}$·9392578
	Grand River	8.	....	....	....	....	....	....	L(2)	61·4	31 01·6	$\bar{1}$·9565685
13.	Madawaska	9.	47 22	291 41	A(1)	77 44·9	77 44·8	77 44·8	L(1)	65·1	39 09·3	$\bar{1}$·9395932
	Madawaska	9.	....	....	A(1)	....	....	....	L(2)	77·6	31 08·7	$\bar{1}$·9573159
	Madawaska	9.	....	....	A(2)	77 49·3	77 42	77 45·6				

Remarks on Table II.

1. This station was on the east side of Citadel Hill, in an enclosure surrounded with a picket fence, and as much as forty or fifty rods from the N.E. outer line of the works. There were no iron stores in the works, and only two or three guns mounted, which were on the S.W. side. To ascertain if there was local attraction, I took the dip again in the plain on the west side of the hill, at least 100 rods from the works, and found it did not vary by one minute.

2. On the hill, back of Hiltz's Tavern, half-way from Halifax to Windsor.

3. McBride's Garden, one-fifth of a mile N. of the Catholic Chapel.

4. Garden, back of Terrey's Hotel.

5. Forty rods S.E. of Quirk's Tavern.

6. An open field back of Hall's Tavern, and about forty rods S. of Catholic Chapel.

7. On the sea-side E. of the Barracks.

8. River-side in front of the Province House.

9. In an open field, a few rods, say thirty, N. of the Woodstock Hotel. On examining my notes at home, I found that a somewhat thick pencil-mark, in noting the azimuths for meridian, had caused the observations for θ and v on the 4th to be made just 10° out of it: calling those angles θ' and v', θ' was reduced to the meridian by the formula $\cot\theta = \cot\theta' - \cos 10°$; I then obtained the value φ' from θ' and v', as if rightly observed; and then obtained φ from the equation $\varphi = \varphi' \frac{\sin\theta'}{\sin\theta}$, which, I believe, will be found a correct process.

10. In the road near Woolverton's.

11. Near the Barracks; needles unsteady on the 7th.

12. On the lower cape, at the junction with the St. John. Observations with L(1) disturbed.

13. On the lower cape, at the junction of the Madawaska with the St. John.

In regard to the latitudes and longitudes, I am indebted to Major Graham for those of Nos. 9, 10, 11, 12 and 13. Messrs. Crauford and Agnew, chronometer raters at Halifax and St. John respectively, furnished me with those for Nos. 1 and 7; the rest were obtained from the best authorities of books or maps that I could procure.

Table III. exhibits the change in force of needles L(1) and L(2); the results are reduced to a temperature of 50°.

Table III.

1847.	No. of observations.	φ for L(1).	Difference.	1847.	No. of observations.	φ for L(2).	Difference.
February 13.	22	·8718039	·0010902	February 23.	21	·9140079	·0069450
June......17.	10	·8707137	·0000015	June......30.	10	·9070629	·0002127
August...16.	5	·8707122		August...16.	5	·9068502	

From the above Table it is obvious that both needles lost considerable force between February and June, and that after that time L(2) continued to lose, while L(1) retained its force. I have therefore reduced all observations made with L(2) to the 30th of June, by considering the loss as proportional to the time, the coefficient of reduction being $(1+{\cdot}000005.d)$, d being the number of days after the 30th of June. Column (3.) in Table IV. contains the logarithms corrected in this manner for L(2), and those of L(1) as originally found. The numbers ·8707137 and ·9070629 are the values of ϕ *at Waterville* on the 30th of June by L(1) and L(2) respectively; if the factor 1·04175 which connects them is compared with the corresponding factors in column (4.) (omitting that for Grand River for a reason already stated), these factors will all be found to exceed it by a small quantity: waiving discussion, at present, on the cause of this difference, I shall assign half the difference between the mean of these factors and 1·04175, or 0·00036 as a correction common to both, positive for L(1) and negative for L(2), which, while it leaves the mean determinations where both needles were used unaltered, will secure a more just comparison for stating where but one needle was used. I believe the difference, however, has hitherto been considered wholly within the errors of observation. Column (5.) contains the corrected logarithms, that is, the values of ϕ for L(1) increased in the ratio of 1 to 1·00036, and those of ϕ for L(2) reduced in the same ratio. Column (7.) contains the total forces for both needles, considering ·8707137, or the number expressing the relative force by L(1) on the 30th of June at Waterville, as the unit of force; and column (8.) contains the means.

Table IV.

(1.) Station.	(2.) Needle.	(3.) Logarithms corrected for change of force in L(2).	(4.) Factors connecting the numbers corresponding to the logarithms (in col. 3) for L(1) and L(2).	(5.) Logarithms corrected for factor connecting L(1) and L(2).	(6.) Logarithms reduced to Waterville as unit.	(7.) Forces to Waterville unit.	(8.) Means.
Halifax	L(1)	$\bar{1}$·9310218	1·04387	$\bar{1}$·9311781	$\bar{1}$·9913028	·98017	·98081
Halifax	L(2)	$\bar{1}$·9496683		$\bar{1}$·9495120	$\bar{1}$·9918746	·98146	
Hiltz's..................	L(1)	$\bar{1}$·9307381		$\bar{1}$·9308944	$\bar{1}$·9910191	·97953	·97953
Windsor...............	L(1)	$\bar{1}$·9309837		$\bar{1}$·9311400	$\bar{1}$·9912647	·98009	·98009
Kentville	L(1)	$\bar{1}$·9320107		$\bar{1}$·9321670	$\bar{1}$·9922917	·98241	·98241
Bridgetown	L(1)	$\bar{1}$·9323155		$\bar{1}$·9324718	$\bar{1}$·9925965	·98310	·98310
Annapolis	L(1)	$\bar{1}$·9325703	1·04322	$\bar{1}$·9327266	$\bar{1}$·9928513	·98367	·98401
Annapolis	L(2)	$\bar{1}$·9509458		$\bar{1}$·9507895	$\bar{1}$·9931521	·98436	
St. John	L(1)	$\bar{1}$·9348103		$\bar{1}$·9349666	$\bar{1}$·9950913	·98876	·98876
Fredericton	L(1)	$\bar{1}$·9364098		$\bar{1}$·9365661	$\bar{1}$·9966908	·99241	·99241
Woodstock............	L(1)	$\bar{1}$·9377287	1·04189	$\bar{1}$·9378850	$\bar{1}$·9980097	·99543	·99514
Woodstock............	L(2)	$\bar{1}$·9555509		$\bar{1}$·9553946	$\bar{1}$·9977572	·99485	
Riviere des Chutes...	L(1)	$\bar{1}$·9381584	1·04218	$\bar{1}$·9383147	$\bar{1}$·9984394	·99641	·99626
Riviere des Chutes...	L(2)	$\bar{1}$·9561010		$\bar{1}$·9559447	$\bar{1}$·9983073	·99611	
Grand Falls	L(1)	$\bar{1}$·9379492	1·04308	$\bar{1}$·9381055	$\bar{1}$·9982302	·99593	·99621
Grand Falls	L(2)	$\bar{1}$·9562688		$\bar{1}$·9561125	$\bar{1}$·9984751	·99649	
Grand River	L(1)	$\bar{1}$·9392578	1·04102	$\bar{1}$·9394141	$\bar{1}$·9995388	·99894	·99823
Grand River	L(2)	$\bar{1}$·9567205		$\bar{1}$·9565642	$\bar{1}$·9989268	·99753	
Madawaska	L(1)	$\bar{1}$·9395932	1·04202	$\bar{1}$·9397495	$\bar{1}$·9998742	·99971	·99948
Madawaska	L(2)	$\bar{1}$·9574700		$\bar{1}$·9573137	$\bar{1}$·9996763	·99925	
Waterville	L(1)	....	....	$\bar{1}$·9398753	10·	1·	1·0000
Waterville	L(2)	....	....	$\bar{1}$·9576374	10·	1·	
Logarithmic factors used in the above changes.	L(1)	....	....	+·0001563	+·0601247		
	L(2)	....	....	−·0001563	+·0423626		

Observations with the Unifilar.

At Halifax, Kentville, Annapolis and Fredericton, I made observations with the unifilar; the magnet vibrated, and used also as a deflector, was marked H(10) and was a cylinder 2·953 inches in length; the deflected magnet was marked I(14), a cylinder 2·414 inches in length.

The magnet H(10) being suspended,—by turning the telescope through arcs of three or four degrees, and applying a correction for torsion, observed at the same times,—I obtained on the 27th of March for a scale division 10′·0999, and on the 29th 10′·0963; the value used is 10′·1.

Table V. exhibits the results of observations to determine the temperature coeffi-

cient of magnet H(10); and Table VI. shows the values of P from the formula $P=-\frac{r^2r'^5 \sin u' - r'^2r^5 \sin u}{r'^5 \sin u' - r^5 \sin u}$, using the distances 1 foot and 1·4 foot.

TABLE V.

April 29th and 30th.	·000160 ·000169 ·000158 ·000168
Mean......	·000164

TABLE VI.

Date.	Values of P.
July 28.	—00042
July 29.	—00091
Sept. 25.	—00157
Nov. 27.	—00162
Dec. 8.	—00102
Mean ...	—00111

LAMONT'S method was adopted of obtaining the moment of inertia of cylinder H(10) by means of a brass ring accompanying the instrument, whose dimensions were,—

	ft.	
External diameter . .	0·2153	
Internal diameter . .	0·1667	Whence log k'=·5489695.
Weight*		

The cylinder H(10) had on it, at the ends, two small brass rings, the contour of which I shortened by filing, so as to bear conveniently the metal ring in vibration. Twenty-one sets of vibrations without the ring, and eight sets with it, made between the 2nd and 6th of October, varying, in number of vibrations, from 340 to 466 each, and corrected for temperature, arc, torsion and rate of chronometer, all observed at the same times, gave for log π^2k at a mean temperature of 63°·3, 1·3320923. Observing, however, that the cylinder suspended seemed very slightly depressed at the N. end, I shifted the little ring there to the S. end, putting it in contact with the other ring, and at such a distance from the end of the cylinder as I had calculated would give the same moment of inertia; and then on the 8th and 9th of October made more observations for π^2k, the particulars of which are in Table VII.

TABLE VII.

Date. Civil reckoning.	Whole time.	Number of vibrations.	Time of one vibration.	Commencing arc.	Final arc.	Temperature.	Torsion for 90° in scale divisions.	Rate chron.	k.
d h m				Sc. div.	Sc. div.	°		″	
Oct. 8 9 33 A.M.	1448·3572	330	4·38896	3·0	·4	50·5	·8725	—6·5	2·1743 by 1st set.
8 10 21 A.M.	2091·8929	294	7·11528	3·0	·9	54·5	1·1800	—6·5	
8 01 18 P.M.	1500·8215	342	4·38836	2·9	·7	65·4	·76	—6·5	2·1787 by 2nd set.
8 02 32 P.M.	2103·	296	7·10473	2·8	·1	65·75	1·065	—6·5	
8 03 17 P.M.	1490·7857	340	4·38466	3·0	·6	64·0	·69	—6·5	
9 01 00 P.M.	1501·	342	4·38889	2·9	·7	59·5	·55	—6·5	2·1766 by 3rd set.
9 01 55 P.M.	2217·2643	312	7·10662	2·9	·1	59·3	·945	—6·5	
9 02 53 P.M.	1499·0357	342	4·38314	2·9	·4	56·0	·6875	—6·5	
9 03 47	2228·8857	314	7·09836	2·7	·9	56·1	1·0925	—6·5	2·1764 by 4th set.
9 04 33	1523·4785	348	4·37781	3·0	·6	50·5	·795	—6·5	
									2·1765 mean value.

* Weight not stated in the MSS.—E. S.

These observations gave for the mean value of log k, ·3377587, at a mean temperature of 58°·2, and hence log π^2k = 1·3320584. If this value of π^2k is reduced to the temperature of 63°·3, by the formula $1+2e(t'-t)$, it gives 1·3320885, differing from the former observed value only ·0000038. Where in the table three observations are included in one set, the mean of the true corrected values of T for the first and third was taken and combined with T′, so as in some degree to eliminate changes of force.

Table VIII. contains the uncorrected particulars of my observations of vibrations and deflections at Halifax, Annapolis and Fredericton, and those of vibration only at Kentville; with the nearest observations, before and after my tour, at Waterville.

Table IX. contains m, X, and the total force; a mean for the value of m at Kentville having been taken from the values at Halifax and Annapolis.

Table X. contains the total forces at the four stations obtained by the unifilar reduced to Waterville by the observations of the Lloyd needle L(1) at the same stations, in order to test the accuracy of the observations; an additional column shows the same comparison for the only two stations where the two Lloyd needles and unifilar were all used; in other words, having obtained the total force at, say, Halifax by the unifilar, and also the relative force by the Lloyd needles, and knowing also the relative force at Waterville by the Lloyd needles, and therefore the *ratio* of the force at Halifax to the force at Waterville by the Lloyd needles, I multiply the aforesaid total force at Halifax got by the unifilar by this *ratio*, and obtain the total unifilar force at Waterville, and so with the rest.

Table VIII.

Station.	Date.	Magnet.	u.	Temperature.	u'.	Temperature.	Time of one vibration.	Number of vibrations.	Temperature.	Commencing arc.	Final arc.	Rate of chron.	Torsion for 90° in sc. divisions.
			° ′	°	° ′	°			°	Sc. div.	Sc. div.	″	
Waterville ...	July 29.	H(10)	12 21·3	63·8	4 28·5	64·1	4·35021	548	66·4	6·5	1·1	......	·8925
Waterville ...	30.	H(10)	12 21·6	67·6	....	......	4·35277	460	72·0	5·25	0·75	......	1·009
Halifax	Aug. 21.	H(10)	....	......	4 26	64·9	4·34901	338	71·5	5·0	1·0	−8·5	·69
Kentville......	24.	H(10)	....	......	....	......	4·36005	238	61·9	5·0	1·0	−8·5	·6018
Annapolis ...	27.	H(10)	....	......	4 26·2	65·0	4·35008	344	68·5	5·5	0·8	−8·0	·52
Fredericton...	Sept. 2.	H(10)	....	......	4 49	71·2	4·53733	344	72·5	4·9	0·7	−7·0	·7225
Waterville ...	25.	H(10)	12 10·9	61	4 24·9	60·4	4·37520	356	56·0	8·4	1·4	−6·2	1·01

In this Table u and u' are given to the nearest tenth of a minute, but in the calculations the value in seconds was employed.

Table IX.

Station.	Date.	Corrected angles of deflection.	Time of one vibration.	*m.*	X.	Total force.
Waterville	July 29.	12° 23′ 02″·5	4·34798	·34928	3·2536	13·4174
Waterville	29.	4 29 04·8		·34926	3·2538	13·4181
Waterville	30.	12 23 43·9	4·34901	·34937	3·2515	13·4086
Halifax	Aug. 21.	4 26 41·2	4·34457	·34799	3·2710	13·1757
Kentville............	24.	....	4·35914	*	3·2493	13·2112
Annapolis	27.	4 26 54	4·34777	·34787	3·2672	13·2198
Fredericton.........	Sept. 2.	4 49 58·7	4·53242	·34780	3·0071	13·3491
Waterville	25.	12 12 15·6	4·27832	·34437	3·2544	13·4207
Waterville	25.	4 25 19·8		·34441	3·2540	13·4192

Table X.

Halifax reduced to Waterville	13·442	13·435
Kentville reduced to Waterville	13·448	
Annapolis reduced to Waterville	13·439	13·437
Fredericton reduced to Waterville	13·451	
	13·445	13·436