APPENDIX II.

THE MAGNETIC OBSERVATORY.

ANNUAL REPORT OF THE DIRECTOR.

DURING the past year this Observatory has operated as previously in all branches, and an exceedingly valuable series of records has been obtained.

Before dealing with the more interesting details of the work it is necessary first to give those mean values of the magnetic elements for the year which are looked upon as exceedingly valuable by magneticians in other parts of the world, because this Observatory is the most southern outpost of the group of observatories surrounding this globe.

We must then epitomize the year's magnetic work in the following table :—

	Mean Values for the Year 1919.	Change since 1918.
Magnetic declination	16° 58·6′ E. of N.	+2·8′
Horizontal magnetic force	0·22280 C.G.S. unit	−24 γ
Magnetic inclination	68° 7·8′ S.	+1·1′
Northerly component	0·21309 C.G.S. unit	−28 γ
Easterly component	0·06505 „	+10 γ
Vertical component	0·55507 „	−9 γ
Total magnetic force	0·59812 „	−16 γ

The values of these elements for the year 1905 have also now become available for publication. They are included in the table of the mean values of magnetic elements at Christchurch Observatory, published herein.

Full tables of hourly values of magnetic declination (D) and of magnetic horizontal force (H) are published herewith, also the vector diagrams of diurnal horizontal disturbing forces for the three seasons and the year, and diagrams showing the average monthly diurnal variation of D and H. Diagrams are also given showing the monthly diurnal range in D and H throughout the year.

ANNUAL VARIATION OF HORIZONTAL FORCE AT CHRISTCHURCH.

The diurnal change in H is obviously connected with the apparent daily revolution of the sun around our earth from east to west. The change of seasons throughout the year is accomplished by the apparent partial revolution of the sun around the earth from south to north and back again, the sun apparently oscillating through an angle of about 47°, or just over one-eighth of a revolution, in a direction, of course, at right angles to that of the sun's apparent daily revolution. It might be expected, then, that some annual inequality should exhibit itself in the mean monthly values of the magnetic elements. It might further be expected that the daily and annual inequalities might have some relation, and perhaps that the curve of annual inequality in H should be somewhat similar to the midday portion of the curve of daily variation in D, and similarly for annual D and diurnal H variations.

It is surmised that one reason why this effect is not always evident is that the secular change proceeds irregularly throughout any individual year. It may happen, however, that for a considerable portion of a year the secular change may go on uniformly, or that for a large part of one year the irregularity of secular change may balance the irregularity of the change for a large part of another year, and when the mean results for the two years are considered, the seasonal changes, after allowing for a uniform secular change, may be exhibited by a symmetrical curve. This might more reasonably be expected to happen in the case of two years separated by half a sun-spot period, or about five years and a half.

Taking the mean monthly value of H for the two years 1914 and 1919 at Christchurch, we have the horizontal forces—

0·22 C.G.S. + γ

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Mean.
1914 ..	431	424	420	415	421	416	414	410	409	401	400	401	413
1919 ..	295	287	271	280	273	293	291	274	271	268	282	279	280

Apparent inequalities in γ

1914 ..	+18	+11	+7	+2	+8	+3	+1	−3	−4	−12	−13	−12
1919 ..	+15	+7	−9	+0	−7	+13	+11	−6	−9	−12	+2	−1
Means ..	+16·5	+9	−1	+1	+0·5	+8	+6	−4·5	−6·5	−12	−5·5	−6·5

Now, correcting these mean apparent inequalities for a uniform rate of secular change of about −19 γ per annum, or −1·6 per month, the corrections are approximately—

Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
−8·8	−7·2	−5·6	−4·0	−2·4	−0·8	+0·8	+2·4	+4·0	+5·6	+7·2	+8·8

Giving corrected inequalities—

+7·7	+1·8	−6·6	−3·0	−1·9	+7·2	+6·8	−2·1	−2·5	−6·4	+1·7	+2·3