The variation of the mean monthly diurnal inequality of D and of H has certainly a well-defined annual part, and the analysis of the curves for a number of years must be undertaken before the connection between diurnal and annual variations can be made clear.

I have not had time to investigate the question whether the seasonal diurnal variations in H in the years 1905, 1910, 1914, and 1919 are related at all in the same way as the annual marches of H in these years have been shown to be related—it seems most probable that they are; and, if so, some relationship will be definitely shown to exist for Christchurch between the annual and diurnal variations. It would indeed be pleasant to have a clerical staff at the Observatory sufficient to enable such work to be rapidly dealt with. One naturally wants to get the cream from the milk, and such is only possible by the proper machine.

As further showing the connection between annual marches of H.F. five years apart, it is notable that the year 1918 of sun-spot maximum was five years after the year of sun-spot minimum, 1913. The curves of annual march of H.F. for these years (see diagrams) exhibit a surprising general resemblance, much more than we should expect if sun-spottedness was the only variable correlated with the trend of the curves. It is noteworthy that the areal differences of these two curves are equal on either side of the mid-year ordinate, suggesting that the excess of the drop from January to April in 1918 was exactly balanced by the excess of the drop from June to September in 1913. The total change of H.F. from January, 1913, to January, 1914, happened to be only 1γ less than the total change from January, 1918, to January, 1919. The mid-points of excess of fall differ by four years and a half, changing in that time from late winter to late summer. The mid-points of defect differ by five years and a half, changing in that time from late summer to late winter. After October they seem to become opposite, the similarity of trend being confined to ten months of the year, a fact apparently not unconnected with what was found in the mean curve of H.F. for 1914 and 1919, that symmetry could only be found to exist over ten months of the year, and that beyond that the asymmetry exceeded possible observational errors.

The curve for the previous sun-spot minimum, 1901, is not available for Christchurch, as magnetograph registration only commenced here at the end of 1901. The sun-spot maximum previous to 1918 was in 1907, and measurements of magnetograms for that year are in progress. Nine months of declination curves have been measured and declination values got out, but it is not expected to have H.F. hourly values tabulated for 1907 for some months yet. The measurements of 1912 magnetograms have been completed, but the conversion of ordinates and tabulation are still incomplete. It is hoped to complete it this year. The provisional value of H.F. for 1912 is 0·22476, which shows a small secular change of 18γ from 1911. Similar small changes occurred from 1904 to 1905, and from 1919 to 1920, and were both accompanied by marked change in the form of the curves representing the march of H.F. throughout the years. Between 1904 and 1905 a certain amount of inversion of the curve is noticeable, evidenced in the analysis by the change of A_2 to the adjacent quadrant. From 1919 to 1920 a slight amount of inversion may be perceived; the change of A_2 is in the opposite direction. The sum of A_2's in 1904 and 1905 is 173°; in 1919 and 1920 it is 177°.

Seasonal Vector Diagrams of Mean Diurnal Horizontal Disturbing Forces.

These are published for 1910 and 1920 herewith, and require some comments. Those for 1905 and 1919 were published in the preceding year's report.

Looking at these one is struck by the very great similarity in general shape of the summer diagrams in 1919 and 1920, and the decided difference in the winter diagrams. From 21h. to 2h. G. the winter diagrams do not differ much, except that the earlier hours are retarded on the diagram (or the variation accelerated), but from 16h. on to 20h. the difference is marked, and during these hours 1905 and 1910 winter diagrams correspond fairly closely, while from 17h. to 20h. the general trend is somewhat the same, only somewhat smoother and inclined to the full rounded nature characterizing the whole winter diagram in 1919, in which year it indeed seems that the whole diurnal variation in winter was of simpler composition, and gives one the impression of a series of spirals, curves which I believe have in the past been unsuccessfully invoked in the interpretation of these phenomena. It is curious, however, that in many of these curves the position of the hours on the diagram gives one the impression of action in spirals.

The slight constriction between 1h. and 6h. evident in the 1919 diagram is also seen in the 1920 diagram.

In the winter of 1910, 1919, 1920 the westerly disturbing force at about local midnight is large, and exceeds that at 23h. G. to 0h. G., or local late morning. In the equinoctial night variation, 1910 much more closely resembles 1919 than it does 1920.

A striking difference between the winter vector diagrams in 1905 and 1919 occurs between 6h. and 10h. G. In both years this part of the curve is full and rounded, but the convexity is directed inwards and south in 1905, and outwards and north in 1919. 2h. G. seems to generally occupy the same position on the diagram, which means that at that time of day the direction and intensity of the disturbing force has on the average for the season the most constancy in the different years.

Visit of the "Carnegie."

The ocean magnetic surveying-yacht "Carnegie," of the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, revisited Lyttelton in October. The following account of her voyage from Fremantle is taken from the official report of Commander Ault, and after reading it one