

and concave mirrors, the coelostat mirror, and consequently the whole system is kept shaded by a blind except during the actual exposures, which occupy from 30 to 60 seconds each.

7. Precautions *c* and *d*, conditions external to the spectrograph, were always carefully looked after. The solar definition during the summer months, on the clear and bright days which only were employed, is usually fairly good and, as undue heating of the mirrors was prevented by keeping them shaded for suitable intervals between the exposures, the definition did not much deteriorate. It is essential that there be fair definition to ensure that the light reaching the slit may be confined to a small region around the desired portion on the sun's disc. Great care was taken in the relative adjustment of guide plate and prisms, so that when the image was kept central and the spectrograph rotated to the desired and previously calculated position angle from the E. W. line (determined by the drift of the solar image when the coelostat clock was stopped), the positions of the points on the disc from which the light was taken were accurately known. This is rendered much easier and more certain by the large size of the solar image (about 227 mm.), and consequently it is improbable that any errors can have arisen either in this regard or due to poor definition. The only effect of the latter would be to introduce a small amount of light at slightly higher and lower latitudes or at greater and less distances from the limb, and the effects thereby produced would practically compensate one another. The necessity of observing only when the sky is free from haze will be evident when it is realized that the effect of the superposed sky spectrum, which is a blend of the spectrum from the whole disc of the sun is, to diminish the displacement and give too low a value of the velocity. DeLury made some experiments on this effect, and found a measurable influence on the equatorial displacement only when the ratio of intensity of sky spectrum to limb spectrum reached about 1 to 20. As on a clear day this ratio is 1 to 100 or less it is evident that no error can thereby be introduced.

#### OBSERVATIONAL DATA.

8. The plates were made by the authors jointly, as to make the focus and illumination tests and to guide the sun's image carefully can be much more easily and satisfactorily done by two than one. The dates of the plates used will be given in the tables of measures to follow to save space.

As stated above, in the  $\lambda 5600$  region, rotation spectra of each of the six latitudes to be observed,  $0^\circ$ ,  $15^\circ$ ,  $30^\circ$ ,  $45^\circ$ ,  $60^\circ$ ,  $75^\circ$ , with one of the pole,  $90^\circ$ , for check purposes were made on each plate, but in the higher latitudes  $80^\circ$  and  $85^\circ$ , three of each with one of the pole were

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made of latitudes of the pole than other latitudes

9. the Report those of the Machine at  $\lambda 5600$  constants line in the measurement remeasured also, as the and the

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