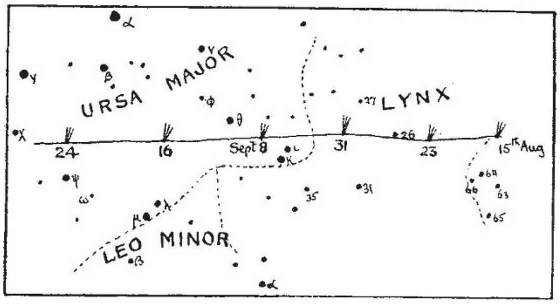
Sons and Co., Ltd., of Kilmarnock, and supplied to the Admiralty for service at one of the explosive depôts, where the question of absolute safety from fire is of the first importance. The locomotive has a reservoir partly filled with water, and is charged with high-pressure steam from a boiler placed outside the danger zone. It can work on one charge of the reservoir for several hours on continuous hauling, or for a much longer time on ordinary shunting work. It can stand for twelve hours in ordinary open-air temperature with small loss of steam, and can run back to the charging station under the very low pressure of 15 lb. per square inch. All the test conditions were more than fulfilled at the trials. The engine is not only fireless, but the rubbing surfaces, such as the brake blocks, and the impact points, such as the buffers, have been rendered sparkless by the use of special facings.

THE lack of supplies of glass and porcelain from Germany and Austria, on account of the war, has affected various businesses depending upon them. We are informed, however, by the Thermal Syndicate, Ltd., manufacturers of pure fused silica, that it is still in a position to supply its "Vitreosil" ware promptly, as this substitute for porcelain and glass is made entirely in the works of the syndicate at Wallsend-on-Tyne.

"THE Report of the Fourteenth Meeting of the Australasian Association for the Advancement of Science" has been recently issued by the Association from its permanent office in Sydney. It is edited by Dr. T. S. Hall, and contains a full account of the proceedings of the meeting held at Melbourne in 1913.

OUR ASTRONOMICAL COLUMN.

COMET 1913*f* (DELAVAN).—Little news is at hand concerning observations of Delavan's comet. During the present week the object will be situated in the constellation of the Lynx pursuing a course nearly midway between the stars 27 and 31 in that constellation, and at right angles to a line joining these two stars. The small chart below, given previously in this column on August 13, is reproduced here again for reference :—



Mr. W. B. Tripp, writing from Isleworth on August 22, says that he observed the comet on the night of August 21 with a binocular field-glass. He describes it as of "substantial proportions promising to be a fine object later."

THE LARGE CANADIAN REFLECTOR.—The Journal of the Royal Astronomical Society of Canada for May-June (vol. viii., No. 3) contains two illustrated articles dealing with the proposed site and the observing conditions for the large 72-in. reflector; these are contributed by Messrs. W. E. Harper and J. S. Plaskett. An examination of the seeing conditions of many scattered regions has resulted in the choice of a hill, Little Saanich, 732 ft. high, situated seven and a half miles from Victoria. While Mr. Harper admits that the transparency of the air at the Lick Observatory is superior to any place examined by him in Canada, he holds the opinion that in the matter of low temperature range and the character of the seeing itself conditions may be looked for to equal those upon Mount Hamilton. The Government of British Columbia has considered the whole project in a broad-minded way and agreed to provide 10,000 dollars for the purchase of the land and to build a road to the summit of the hill. Fifty acres of land have been secured. As regards the instrument itself, the disc for the mirror is ready for shipment, and it is stated that there is every prospect of the telescope being ready for erection next year. Messrs. Warner and Swasey are the constructors, and Mr. Plaskett says that he is in the highest degree delighted with their work, and firmly convinced that "this telescope in rigidity, suitability, and convenience will be away ahead of any hitherto built."

RAPID CONVECTION IN STELLAR ATMOSPHERES.—In this column for April 30 of this year (vol. xciii., p. 224) reference was made to the new interpretation to the observed displacements of the solar lines suggested by Mr. Evershed. The observations were explained by a very rapid descent of the cooler gases and vapours upon the body of the sun, most rapid in the higher levels, and less rapid as the successively lower levels were reached, combined with small effects due to pressures less than one atmosphere. Prof. W. W. Campbell points out (Lick Observatory Bulletin, No. 257) that these observations give us apparently a measure of the general convectional circulation in the sun's atmosphere, which, if confirmed, "must be considered as of very great importance." These considerations lead him to inquire into what may be occurring in the atmosphere of other suns. Assuming that surface temperatures of stars must be largely a function of their convection-activity, a sluggish star, *i.e.* one with little convection, should have a relatively cool surface, while a massive star, approximating to a perfect gas, should have a large convection and have relatively a hot surface. Having found that the radial velocities of Class B stars are observed about 4·5 km. a second too great (then attributed to pressure in the absorbing layers), Prof. Campbell, in the light of Evershed's results as regards the solar atmosphere, puts forward the view that this excess is probably due to the existence of relatively unobstructed radial circulation. This circulation would bring the internal heat to the surface, with little loss of time, to replenish loss by radiations to surrounding space. If the sun's atmosphere, which is sluggish, can account for a speed of 1 km. a second, a relatively hot star like those of Class B might rationally have a velocity of 4·5 km. a second.

A NOVEL COMBINATION OF INSTRUMENTS.—Dr. Frank Schlesinger in the Publications of the Allegheny Observatory (vol. iii., No. 13), gives an account of the solar spectrograph of that observatory and the vertical telescope with which it is used. These instruments are the gift of the Hon. H. Kirke Porter, and they form part of the Keeler memorial telescope. The Keeler memorial telescope is a 30-in. reflector, and its mounting is used not only as a polar heliostat carrying an 18-in. mirror, but as a coelostat also with an 18-in. mirror. The telescope is mounted on a tall pillar circular at its upper end, and the dome is raised correspondingly high. Round the upper portion of this pillar is a strong lattice work structure, capable of rotation round the pillar, and to this is fixed the vertical telescope with a second mirror and the objective at its upper end, the lower end carrying the large spectroscope, the collimator of which is vertical. For different declinations of the object under investigation the vertical telescope can be moved round in azimuth. In the communication in question Dr. Schlesinger describes all the chief portions of the instruments in detail, and numerous reproductions accompany the text. The latter part of the paper contains an investigation on the rotation of the sun by spectroscopic means made with the instrument described briefly above. Reference should be made to the paper itself for details, but the interesting table, showing the formulæ derived for the solar rotation by the spectroscopic method, may be here reproduced:—

	Formula	Equatorial Velocity km.
Duner	$14^\circ{\cdot}81 - 4^\circ{\cdot}2 \sin^2\phi$	2·09
Halm	14·53 − 2·5	2·05
Adams	14·54 − 3·5	2·05
Storey and Wilson	14·75 − 3·2	2·08
Plaskett	14·37 − 4·0	2·02
De Lury	14·04 − 4·0	1·97
Hubrecht	13·23 − 3·2	1·86
Evershed and Royds	13·77	1·94
Schlesinger	14·17 − 3·4	2·00

It should be stated that Duner's and Halm's observations were visual, and that Hubrecht found a difference of 0·8° between the coefficients of $\sin^2\phi$ for the two solar hemispheres and the value given above is the mean. Dr. Schlesinger is strongly of the opinion that the causes of the diversity of the results are due to systematic errors at the telescope and at the measuring machine.

FLUCTUATIONS IN THE YIELD OF SEA FISHERIES.[1]

THERE can be little doubt that this report by Dr. Hjort will mark an epoch in the history of scientific fishery investigations. If the arguments upon which its conclusions are based successfully withstand the test of criticism, there has been established a method of predicting the probable future course from year to year of some of our most important fisheries, which should be of the utmost value both to those engaged practically in the fishing industry and to those responsible for fishery administration.

The report is the result of many years of observation, and although the lines upon which the work has proceeded, and the character of the results which were expected, have been described by Dr. Hjort and his fellow-workers from time to time, this is the first report in which the whole matter has been brought forward in a comprehensive way, and the first time that all the data upon which the conclusions are based have been available. It is now possible to form a judgment as to the value of the work already done and as to the promise which it holds out of still more useful results in the future.

It is one of the most characteristic features of the great sea fisheries that they are subject to remarkable fluctuations from time to time. Sometimes these fluctuations are seasonal, sometimes annual, but more often, perhaps, we have a series of years of successful fishery, followed by another series of comparatively lean years. These fluctuations are especially noticeable in the case of the fisheries for the so-called pelagic fish, such as the herring, mackerel, pilchard, and anchovy, and, to a less-marked degree, in the case of the cod and haddock. Dr. Hjort's principal results refer to the herring, but a considerable amount of attention has also been given by him and his colleagues to the cod and haddock.

The case of the herring is the most conclusive. The main evidence has been obtained by the determination of the age of the fish from the markings on the scale. As in the case of many other fishes, there is little or no growth of the fish during the winter, and the difference in growth between winter and summer is clearly marked on the scale of the fish, the period of small winter growth being represented by a dark mark or ring. By counting the number of such rings the age of the fish can be determined, so that the year in which it was born becomes known. In a sample of the fish taken at any particular time it is therefore possible to determine in what proportions the different year classes are represented.

This method of age analysis has now been applied to Norwegian herring for a series of years with somewhat remarkable results. It has been found during the period 1907 to 1914 that fish of the year class 1904, that is to say, fish born in the year 1904, have occupied a very prominent position throughout, at first forming a large proportion of the shoals of smaller herring ("fat herring" as they are called in Norway, fish from 19–26 cm., still quite immature), and in later years being equally prominent amongst the larger fish ("large herring," fish from 27–32 cm., and "spring herring," the actually spawning fish). The following table shows the percentage of fish of the 1904 year class in the samples examined each year from 1907 to 1913:—

Per cent. 1904	in 1907	1908	1909	1910	1911	1912	1913
Among fat herring ...	51·3	37·8	16·9	4·5	0	0	0
Among large herring	7·7	51·6	48·8	59·6	46·0	52·5	58·6
Among spring herring	1·6	34·8	43·7	77·3	70·0	64·3	64·7

The 1904 fish, therefore, formed more than 50 per cent. of the immature "fat herring" in 1907, and occurred amongst this class of fish in diminishing proportion until 1910. Amongst the "large herring," 51·6 per cent. were 1904-spawned fish already in 1908, and fish of the same year class occurred in large proportions each year until 1913, when there were still 58·6 per cent. Turning to the "spring herring"—the large spawning fish—the 1904 group was represented each year by a larger percentage, until in 1910 it constituted 77·3 per cent. of all the fish. Since that time the percentage has only slightly fallen off, being still 64·7 per cent. in 1913. In the last chapter of the report the figures for 1914 are given, the percentages of the different year groups amongst the spring fish being as follows (p. 219):—

Spring Fish, 1914. *Total number of Herrings examined* 2205.

Age in Years ...	4	5	6	7	8	9
Year of Birth ...	1910	1909	1908	1907	1906	1905
Percentage of fish in each age group ...	0·6	3·3	6·9	5·2	7·2	13·9
Age in Years ...	10	11	12	13	14	15
Year of Birth ...	1904	1903	1902	1901	1900	1899
Percentage of fish in each age group ...	54·3	5·0	1·5	1·2	0·4	0·5

In the year 1914, therefore, we still have, in the samples examined, 54·3 per cent. of the fish derived from the spawning of the year 1904. It should be added that the 2,205 fish are the combined total of eight samples taken at different points on the Nor-

[1] Fluctuations in the great fisheries of Northern Europe viewed in the light of biological research. By Johan Hjort. Con. perm. internat. Explor. Mer. Rapp. et proc. verb. XX. Copenhagen, 1914.