

Atlantic, the weather was abnormally warm in January.

THE rainfall maps of Australia for 1915, prepared by Mr. H. A. Hunt, Commonwealth meteorologist, have been published. A large map shows the distribution of rainfall for the year, and a number of smaller maps, printed on the back, give the rainfall for each month. The year was characterised by an unusual amount of rainfall in the western part of the continent, which in some parts was the heaviest on record. On the other hand, the drought conditions in Queensland were the most severe ever experienced in that State. There were great losses of stock, and the sugar crops in the east coastal districts, as well as many of the cereal crops on the downs, were everywhere a failure. In the southern wheat belt, however, the conditions of rainfall were all that could be desired. Accompanying these well-sustained rains another important factor was the exceptionally mild winter, with a June and July temperature for the continent about $2\frac{1}{2}^{\circ}$ above the normal. Probably the wheatlands of Australia never before experienced such favourable conditions of temperature and rainfall, and the result was a record harvest. The comparison with the previous year was most marked, for 1914 was a year of drought in South Australia and the Riverina.

THE *Quarterly Review* for July contains an article by Dr. Charles Davison on the sound of big guns. The author has collected together those accounts of the propagation of the sounds of big guns to great distances which are sufficiently numerous and well-authenticated to provide a basis for generalisations on the subject. The firing at Waterloo appears to have been heard in Kent, 140 miles away, and that when the *Alabama* was sunk by the *Kearsarge* in 1864, 125 miles away. The guns fired at the Naval Review in 1897 were heard 135 miles away, and the minute-guns fired at the funeral of Queen Victoria in 1901, 139 miles away. In all cases the audibility was greatest down the wind, owing, as Sir George Stokes showed sixty years ago, to the bending of, the sound-waves downward by the greater speed of the wind as the height above the ground increases. The remarkable zones of silence which sometimes intervene between stations near the guns and the more distant points at which the sounds are heard are equally well explained by the existence of local winds blowing towards the source of sound and tilting up the sound-wave above the heads of the listeners. The author makes no reference to the approximate equality of the maximum distances a century ago and now when the guns are much larger, although this requires explanation.

At the present time, when the production of glass apparatus for scientific and technical purposes is receiving special notice in this country, attention may be directed to Circular No. 9 of the United States Bureau of Standards, which deals with the testing of glass volumetric apparatus. It is drawn up, no doubt, with a view to American requirements, but the principles involved are of general application. For the assistance of manufacturers specifications are given respecting the construction of glass instruments, such as measuring flasks, cylinders, pipettes, burettes, specific gravity bottles, and "Babcock" bottles for milk analysis. The information indicates the requirements of the Bureau as to the dimensions, designs, and types of vessels which are suitable for standardisation, and describes how the graduation of them should be carried out, with the limits of error which are tolerated in the calibration. Useful hints may be gathered from the circular by manufacturers who are taking up the industry in question.

NO. 2440, VOL. 97]

OUR ASTRONOMICAL COLUMN.

MONOCHROMATIC PHOTOGRAPHS OF PLANETS.—Prof. R. W. Wood has given an account of further results obtained by the photography of celestial bodies through filters transmitting limited regions of the spectrum (*Astrophysical Journal*, vol xliii., p. 310). After much preliminary work, successful photographs were readily obtained when the 60-in. reflector at Mount Wilson was placed at his disposal for four nights during last October. For the ultra-violet filter a bromine cell was used, transmitting the region from 3500 to the end of the solar spectrum at 2900; the infra-red screen transmitted the region above 7000, the yellow screen all rays above 5000, and the violet from 4000 to 4500. In the case of Saturn the pictures taken through the infra-red screen only showed the merest traces of the belts ordinarily seen, while through the yellow screen the planet presented its usual appearance. On the plates taken with violet light a very broad, dark belt surrounded the planet's equator, and a dark cap of considerable size was shown about the pole. These features were also present in ultra-violet light, but were less pronounced; they may possibly be due to the existence in the planet's atmosphere of some substance capable of absorbing violet and ultra-violet light. Another point of interest was a decrease in contrast between the inner and outer ring as the wavelength of the effective light decreased, suggesting that the outer ring contains so much finely divided matter that it shines in part by diffusion. In the case of Jupiter, the dark belts were scarcely visible on the infra-red plates, while they were shown in greatest contrast with violet light. The dark polar cap shaded off gradually in the yellow and infra-red pictures, but was sharply terminated in the violet and ultra-violet photographs. It is hoped that it may be possible to investigate the surface of Mars by this method at the next near approach to the earth.

THE POLAR CAPS OF MARS AND SOLAR RADIATION.—An interesting investigation of the rate of melting of the polar caps of Mars in relation to the sun-spot period has been made by M. Antoniadi. An examination of the records of the planet from 1862 to 1914 has shown that, in general, the polar caps melt more rapidly at times of great solar activity than when solar activity is feeble. Out of twenty-one series of observations during the period in question, no fewer than seventeen were definitely in favour of this conclusion, and only four unfavourable. Two of the exceptions were the oppositions of 1862 and 1873, when the melting of the caps was normal, in spite of considerable solar activity; another was in 1877, when rapid melting occurred with feeble solar activity; and the fourth in 1886, when rapid melting was associated with only moderate solar activity. The slowest recorded shrinkage of the caps accompanied the prolonged sun-spot minimum of three years ago, while one of the most rapid rates of melting coincided with great spot activity in 1894. M. Antoniadi's conclusion is in satisfactory agreement with the now generally accepted view that solar radiation is greatest at times of sun-spot maximum, and with the supposition that the polar caps of Mars are very thin, and consequently very sensitive to variations of temperature (Royal Astronomical Society, June).

VARIABLE STARS NEAR THE SOUTH POLE.—In continuation of the search for variables on photographs covering the entire sky, Miss Leavitt has examined plates of the stars near the South Pole, and has discovered nineteen new variables in that region. One of them is apparently of the Algol type, having a normal magnitude 10 and a minimum of 10.6 (Harvard Circular 191).