to be tested on wheat plants grown in water culture. The harmful effect of the aldehyde, when added both to distilled water and to nutrient culture solutions, was so striking that an extensive series of experiments was undertaken in order to study the action of this compound on various plants and in various culture solutions, in soil in pots, and finally in the field. The plants used for the water culture experiments included wheat, maize, cow-peas, cabbage, and rice; for pot experiments trials were made with wheat, maize, and clover. In every case the depressing effect of the aldehyde was clearly shown. Thus in the case of wheat the addition of ten parts per million of salicylic aldehyde in distilled water reduced the growth by 31 per cent. compared with the control; with fifty parts per million the plants were killed. The experiments suggest that calcium carbonate and calcium phosphate restrain the toxic action of the aldehyde to a slight extent, but the cultures under alkaline conditions indicate that its harmfulness cannot be attributed to any slight acidity it may possess. Field trials made with cow-peas, beans, and garden-peas showed that these crops were all reduced when grown in soil treated with the aldehyde. Finally, seventy-four samples of soils, taken from various parts of the United States, were examined for aldehyde compounds; seventeen of these gave positive results. Ten per cent. of the soils known to be productive and 33 per cent. of unproductive soils contained aldehyde. The infertility of many of the soils is obviously due to causes other than the presence of toxic compounds, and especially of a particular toxic compound.

AN interesting letter from Prof. John Perry appears in *Engineering* for March 12. The subject dealt with is cheap and rapid gun-making, and Prof. Perry describes some experiments carried out under his instructions at Elswick, in which a cylinder of ordinary nickel steel, such as is used in guns, was constructed in such a manner that successive charges were exploded in it, finally reaching the high figure of 52 tons per square inch, without apparent damage to the cylinder. The cylinder was cast solid, or nearly solid, under pressure, and turned and bored not quite to the finished sizes. The ends were closed, and means adopted for filling it with fluid under pressure. The temperature was maintained by rings of gas jets outside (this prevents the yielding material from hardening too much). The internal pressure was raised rapidly to 17 tons per sq. in., and afterwards, during many hours, the pressure was increased gradually to 40 tons. It had been intended to increase the pressure until the outside diameter became permanently (and not merely elastically) larger. Prof. Perry gives a full account of the theory in his letter, together with tables of values of the internal stresses, from which the thickness of gun tubes can be calculated.

A PAPER was read by Sir Thomas Mason at the Institution of Civil Engineers on March 9, giving particulars of the improvement of the River Clyde and the harbour of Glasgow from 1873 to 1914. In 1873 the river from Glasgow to Port Glasgow had an average depth of 15 to 18 ft. below low water, and 25 to 28 ft. at high water. The largest vessels navigating the river had a draught of 22 ft. The total quayage of the harbour was 6410 yards in length, and the water-area was 76 acres. During the period considered, the Queen's Dock, Prince's Dock, Rothesay Dock, and several graving docks have been completed. Improvements on the river have had the effect of reducing the time of flow between Greenock and Glasgow; low water has fallen at Glasgow about 2 ft., and is now 5 in. lower than at Greenock. In 1873 springs rose 10 ft. 6 in.; now the rise is 12 ft. 2 in. The tonnage of trading vessels has increased by 325 per cent., length by 56 per cent., breadth by 69 per cent., and draught by 48 per cent. Quayage has increased three times; tonnage of goods handled four and a half times; and revenue nearly three and a half times. The water-area of harbour and docks is now 535 acres.

OUR ASTRONOMICAL COLUMN.

MELLISH'S COMET (1915*a*).—A recent number of the *Comptes rendus* (vol. clx., No. 9, p. 301) publishes observations of Mellish's comet made at the Observatories of Lyons and Marseilles. The observations at the former were made by M. J. Guillaume between February 20 and 26. The comet is described as of the eleventh magnitude, with the aspect of a circular nebula about a half-minute of arc in diameter, with vague boundaries, and with a condensation or very small nucleus excentric towards the sun. The note by M. Coggia on the observations at Marseilles describe the appearance of the comet as diffuse, irregular, without any brilliant part or condensation. Its magnitude is given as 11. The ephemeris given in this column last week extends up to March 24.

SUN-SPOT AND MAGNETIC ACTIVITY IN 1913.—Prof. A. Wolfer brings together in the *Astronomische Mitteilungen* (No. 105, p. 115) the very valuable statistics of the solar and magnetic acitivity for the year 1913. The statement is based on the large number of observations made at numerous observatories, and affords a ready means of comparing the relative changes which occur from one year to another. The year 1913 seems to have been a very quiescent one according to the value arrived at for the spot activity, and the diminution in activity from the year 1911 will be seen from the following figures:—

1911, 5·7; 1912, 3·6; 1913, 1·4.

This quiet state of spot activity is in close accord with the condition as deduced from the discussion of the mean areas and heliographic latitudes of sun-spots in the year 1913 at the Royal Observatory, Greenwich (*Monthly Notices*, R.A.S., vol. lxxv., No. 1, p. 16).

The value for the daily variation of magnetic declination, on the other hand, has shown a pronounced indication of activity for the year 1913, showing that the minimum took place in 1912, a year earlier than that of the sun-spot.

REPORT OF MOUNT WILSON SOLAR OBSERVATORY.—The annual report of the Mount Wilson Solar Observatory gives the reader a good insight into the remarkable activity that has been, and is, in progress. Before proceeding to give somewhat in detail an account of the work in the various departments, the director, Prof. G. E. Hale, enumerates in the fifty-nine brief paragraphs the principal conclusions to which the work of the past year have led. These are, of course, too numerous to give here, but many of

the conclusions have been referred to in previous accounts of research work in this column. This report completes the first decade of operations on the mountain, and we are promised a brief outline of the work for this period. The past year is described as "one of the most productive of this period." We are told that solar research has progressed satisfactorily, that a beginning has been made in the application to solar phenomena of Stark's capital discovery of the effect of an electric field on radiation. One of the new conclusions in stellar astronomy promises to furnish the means of determining a star's distance simply by measuring its brightness and the relative intensities of certain lines in its spectrum. Laboratory investigations and the work of construction have gone forward rapidly. With regard to the last-mentioned, it is hoped to complete the dome for the 100-in. reflecting telescope next summer, and to set up the mounting in the autumn. The large mirror has already received an almost perfectly spherical figure, and preparations are being made for the work of parabolising it. The reader must refer to the report itself to note the progress made in the many and various investigations which are in operation, both on the mountain and at the base station.

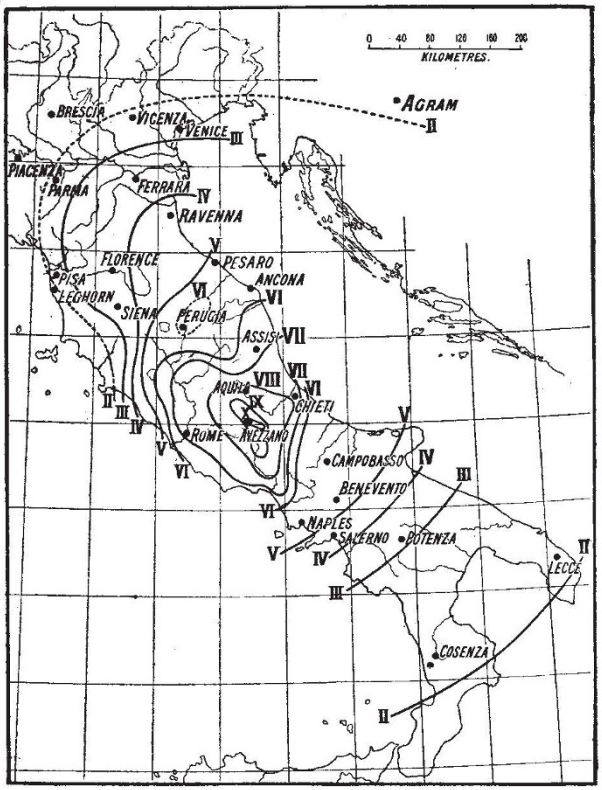
ANNUAIRE ASTRONOMIQUE ET MÉTÉOROLOGIQUE POUR 1915.—The fifty-first issue of the useful handbook entitled "Annuaire Astronomique et Météorologique" has just come to hand. M. Camille Flammarion, the originator and editor of this handy reference book, has, in spite of the recent difficulties met with in Paris, produced the volume up to the high standard of its predecessors. Most of the readers of this column know the arrangement and subjects of the contents so well that it seems necessary only to direct attention to the issue of the volume. Nevertheless it may be added that under the heading, "Scientific Notices," which is an annual review of the progress of astronomy, the reader will obtain a good broad view of the year's work, while in the numerous other sections dealing with the calendar, phenomena, astronomical tables, etc., illustrated by 120 figures of charts and diagrams, a mine of valuable material is included.

THE AVEZZANO EARTHQUAKE OF JANUARY 13.

FOR most of the details contained in the present paper I am indebted to the courtesy of Dr. G. Martinelli, of the Ufficio Centrale di Meteorologia e di Geodinamico at Rome, and of Dr. G. Agamennone, the well-known director of the Geodynamic Observatory of Rocca di Papa, near Rome.

The map of the isoseismal lines is a reproduction of that prepared by Dr. G. Martinelli from the numerous observations forwarded to the Central Office. The scale of intensity employed is that of the late Prof. Mercalli, which, in Italy, has superseded the Rossi-Forel scale. The degree X., for instance, represents the intensity of a shock capable of ruining many buildings and causing much loss of life; the degree VII. that of a shock that will throw down chimneys and produce slight cracks in numerous buildings; while the degree II. corresponds to a shock that can just be felt under favourable conditions by persons at rest. It will be seen that the isoseismal X. is an elongated curve including Avezzano at its western end. The isoseismal of intensity VII. is interrupted by the eastern coast of Italy, and extends beyond Rome to within a few miles of the western coast. The isoseismal of intensity II., which represents the boundary of the disturbed area, includes Parma, Mantua, Verona, and Venice to the north, and to the south approaches within thirty miles of Messina. Thus the area disturbed is not less than 550 miles in length. Its width is, of course, unknown, but, if the mean radius be taken as 275 miles, the total disturbed area must extend over about 240,000 square miles, an area about two-thirds of that shaken by the San Francisco earthquake of 1906.

Dr. Agamennone informs me that the first vibrations were registered at the Rocca di Papa Observatory at 6h. 52m. 54s. a.m. (G.M.T.), but the vibrations soon attained such strength that the seismographs there were thrown out of action. At Rome, a somewhat less sensitive seismograph registered the whole movement, though the pendular masses beat repeatedly against the screws which are arranged to protect the instrument from excessive oscillation. At Eskdalemuir, the first movement was recorded by the Galitzin seismograph at 6h. 56m. 45s., and the beginning of the principal portion at 7h. 1m., the instrument remaining in motion until 9h. 12m. Judging



from the seismogram obtained at this observatory, the epicentre was at the distance of 1930 km. in the direction 40° 50′ south of east; that is, in 42° N. lat., 14° E. long. The centre of the isoseismal line of intensity X. is in 42° 0′ N. lat., 13° 27′ E. long. According to a special seismological bulletin issued by the Georgetown (U.S.A.) University Department of Geology, the first tremors reached that place at 7h. 28m. 40s., and the first oscillations of the principal portion at 7h. 36m. 40s.

The Avezzano earthquake is noticeable for its extraordinary number of after-shocks. At Rocca di Papa, a sensitive microseismograph was at work again an hour after the principal shock, and, from January 13–29, this instrument registered more than 500 after-shocks. That the earthquake was tectonic in its nature is indicated by the extensive disturbed area, the registration of the movement at great distances, and the unusual frequency of the after-shocks.