

### Meteorological Observations at Calcutta.<sup>1</sup>

THESE is a perpetual struggle between the advocates of continuity and of uniformity in such matters as meteorological observations. For a network of official stations under a central authority, the results of which have to be co-ordinated, uniformity is of very great importance. On the other hand, experiments with different methods are much less likely to be discouraged in an independent observatory, the work of which has a value of a totally different kind. In such a place continuity has a special significance, and it is refreshing to meet with a volume of data from a station that has been on the same site for fifty years, even though that site was criticised very soon after the beginning of the period.

The official observatory at Alipore is only two miles from St. Xavier's College, so that the latter is not required as a vital station for the Indian Meteorological Service, and the Jesuit Fathers, who have maintained their observatory for half a century, have received no special blame for departures from established practice, or any financial support. The Rev. E. Francotte, S.J., has been director for thirty-two years out of the fifty, and is responsible for the present volume of some 350 pages of very clear print with large figures not at all crowded. His full plan consists of four parts, of which the volume before us is the first. It contains for each day in the fifty years, 1868-1917, maximum, minimum, and mean shade temperature, with maximum solar radiation and minimum terrestrial radiation, barometric pressure, wind direction and velocity, relative humidity and rainfall; the monthly extremes in heavy type, with notes on absolute extremes where encountered. This is intended to show the mutual relations of climatic elements, and to further this object, in addition to the tables, some graphs are added. The original scheme was to publish at the end of forty-six years, and part of the volume is summarised for that period. The war, which held back publication, enabled four more years to be included in an appendix.

We have not space to consider in any detail the mass of data contained in the volume, but a few points of interest may be mentioned. In forty-six years the average number of days with at least 1 in. of rain was nineteen per annum. Daily falls of at least 10 in. occurred five times in the period, including one total fall of 14 in. The shade temperature reached 100° F. on 527 days in forty-eight years: 59 in March, 282 in April, 136 in May, 48 in June, and only 2 in July, both in 1897. Father Francotte examines some of the tables for periodicity, but is reserving a great deal more analysis for the second volume, the publication of which will be awaited with interest by those who have seen the first.

W. W. B.

### The Road to Industrial Peace.<sup>2</sup>

FROM time to time the Advisory Council of Science and Industry in the Australian Commonwealth issues bulletins dealing with various industrial problems, and the latest of its publications is entitled "Welfare Work," though it is wider in scope than the title is usually taken to imply. The preface tells us that the bulletin is prepared for the benefit of all who are seeking for some road to industrial peace and the establishment of more satisfactory and har-

<sup>1</sup> "Meteorological Observations at St. Xavier's College, Calcutta. (With a Short. Cursory Discussion on the Same)." Part I., Forty-six Years, 1868-1913. With Appendix, 1914-17. By E. Francotte. Pp. xiv+359. (Calcutta: St. Xavier's College, 1918.) Price, unbound, Rs. 3 per copy.

<sup>2</sup> "Welfare Work." Bulletin No. 15 of the Advisory Council of Science and Industry. (Melbourne, 1919.) Pp. 110. Price 6d.

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monious relations between capital and labour. It points out that these relations are far wider than questions of wages and hours of labour. A comprehensive industrial policy considers the responsibilities which fall on the shoulders of employers, the effect of industrial conditions on the employee, his well-being outside working hours, the distribution of the wealth produced, and the participation of the employees in the management and control of industrial operations. The bulletin sets out what has been done on these lines in Great Britain, the United States, and other countries, and in order to encourage its circulation it is issued at a very low price. It is to be hoped that it will receive the wide publicity it deserves, not only in Australia, but in this country as well. It is, in fact, of more direct interest to us than to its country of issue, in that all reference to welfare work in Australia is reserved for publication in a later bulletin.

The bulletin is admirably written, and affords a most valuable and impartial summary, especially of the large body of information which has been acquired during the war through the activity of the Health of Munition Workers Committee and other bodies. It describes the motives, scope, and administration of welfare work, and the social life, recreation, education, and housing of the workers. It discusses wage-payments, profit-sharing and co-partnership, provision for old age and sickness, and it goes somewhat fully into what is being more and more recognised as the most important factor of all in the attainment of industrial peace, viz. co-operation between employers and employed in control. The health and safety of the worker and the provision of a healthy industrial environment are debated at some length, whilst there is an excellent summary of problems of industrial fatigue in relation to hours of labour, overtime, and rest pauses. An extensive bibliography is included.

H. M. V.

### Wireless Telephony in Aeroplanes.

IN a paper read before the Wireless Section of the Institution of Electrical Engineers on February 18 Major C. E. Prince lifted the veil from the important results in wireless telephony from aeroplanes which were achieved in consequence of the stimulus of the necessities of war. Up to the summer of 1915, the author believes, wireless speech had not been received in an aeroplane, and, indeed, great were the difficulties that had to be surmounted before practical apparatus for working between ground and aeroplane or between aeroplane and aeroplane could be produced. In the earlier experiments, transmission from air to ground only was attempted by a small oscillation-valve set, but an aeroplane-carried receiving set, also of the oscillation-valve type, was successfully used in 1916. This, however, did not meet the immediate military requirements overseas, and attention was more particularly devoted to the urgent, but more difficult, problem of telephonic communication between machines in the air.

Major Prince gave a good idea of the difficulties encountered and the ingenuity with which he and his colleagues surmounted them. The crux of the problem is the method of controlling the radiation. Direct control was found to suffer from grave disadvantages. Placing a microphone in the grid circuit of the oscillation valve was tried with some success, but finally a method known as "choke" control, in which the modulation is applied to the anode circuit of a second or control valve, was employed. The grid of the control valve is acted on by the microphone transformer, the anode of which is in series with a one-to-one transformer, or choke coil, in the

anode circuit of the main valve. When variations take place in the control anode at speech frequency, very large surges are set up in that of the power valve, which may approximate to the original high-tension direct-current potential, and so sweep the output from nearly double its steady value to zero. The standard R.A.F. set is of the 20-watt size, with a high-tension supply of 600 volts direct current. A great advantage in the system for aeroplane work is that no critical adjustments are required. The arrangement of the apparatus is such that the set proper can be mounted in any convenient position, and only a very small control unit brought within reach of the user's hand. One switch makes or breaks the dynamo field, filament, and microphone circuits. A great deal of experiment was necessary before a suitable microphone was found, as it had to be almost insensible to sounds of "noise" intensity, but responsive to the powerful concentrated waves of a voice impinging upon it at a very short distance.

The receiving set depended upon high-frequency magnification, and was, in its first form, a three-valve arrangement. It consisted essentially of a detector valve with reaction and two note magnifications. The detector valve was not energised direct from the aerial, but through an aperiodic circuit, which was a circuit approximately syntonised by its self-capacity. The final adjustment for obtaining the best effect is made on a rheostat in the filament circuit carried on the "joystick" itself. These three-valve sets were employed to a considerable extent both before and after the armistice, but a five-valve receiver was developed later in which a choice was made of two high-frequency magnifications and two low, with a detector valve. This set was very much more sensitive than the three-valve arrangement, and enabled fixed aeriols rigidly connected to the wings and fuselage to replace the trailing aerial, which latter was a great embarrassment in fighting. The normal safe range of the apparatus is about four miles from machine to machine, while the range to a ground station is from twenty to fifty miles or more. The author anticipates that in the future the wireless apparatus will be able to be plugged through on to the ordinary exchange lines, so that a man sitting in his office will be able to hold a conversation with a machine in the air.

#### Magnetic Storm of March 4-5.

THE Director of the Meteorological Office has been good enough to send us the subjoined communication from Dr. Chree concerning a magnetic storm which occurred on March 4 and 5. It may be mentioned that on these days the sky was mostly overcast in Scotland, though there was very fine weather in the South of England. We are informed that the only aurora observation reported so far was made at Aberdeen at 1h. 30m. on March 4, *i.e.* ten hours before the "sudden commencement" of the storm:—

"A considerable magnetic disturbance was recorded at Kew Observatory on the night of March 4-5.

"There was a well-marked S.C. (sudden commencement) at about 11h. 40m. on March 4. This was of an oscillatory character both in D (declination) and H (horizontal force). The first, smaller, movement was a fall in H and an easterly swing in D, the range of the oscillation being about 45 $\gamma$  in H and 7' in D. H retained an enhanced value for four or five hours after the S.C., and no really large movements occurred until after 17h. on March 4. The most disturbed time was from 18h. on March 4 to 9h. on March 5. On the whole, H was falling from

17h. on March 4 until after 2h. on March 5, the maximum being recorded at about 16h. 20m. on March 4, the minimum at about 2h. 5m. on March 5, and the range being approximately 300 $\gamma$ . The H curve had become quiet before 10h. on March 5, but still showed a depression of about 75 $\gamma$ .

"The D trace was off the sheet, in the direction answering to easterly displacement, for fully twenty minutes between 22h. and 23h. on March 4; so the range recorded, 60', may have been considerably exceeded. The maximum westerly displacement occurred at about 18h. 35m. on March 4.

"From 12 $\frac{1}{2}$ h. to 17 $\frac{1}{2}$ h. on March 4 the D trace was practically normal except that the declination was 1' or 2' more westerly than usual. Thus the disturbance was rather a conspicuous example of the lull that not infrequently intervenes between the S.C. and movements that would be recognised as constituting a magnetic storm."

#### University and Educational Intelligence.

CAMBRIDGE.—Mr. E. V. Appleton, of St. John's College, has been appointed an assistant demonstrator in experimental physics.

It is proposed to confer the honorary degree of D.Litt. on the Abbé Henri Breuil, professor of the Institute of Human Palæontology at Paris.

It is proposed to create a readership in the morphology of vertebrates and a lectureship in zoology in place of the present readership in zoology.

Besides additions and improvements to the chemical laboratory and the erection of the Molteno Institute for Parasitology, other building schemes are in view for engineering, physics, and also for the University library. The last proposal to meet the difficulty of finding room for books was to excavate a large underground chamber. The cost of this has been found to be prohibitive, and the Senate has recently discussed a revival of an old scheme to erect a new building akin to the Senate House and on the south side of Senate House Yard. If this scheme is adopted a public appeal will be made for subscriptions towards the erection of the building.

LEEDS.—Mr. W. E. H. Berwick has been appointed lecturer in mathematics in the University. Mr. Berwick was assistant lecturer in the University of Bristol for two years, and afterwards became lecturer in mathematics in University College, Bangor. For two years he was engaged on the technical staff of the Anti-Aircraft Experimental Section of the Munitions Inventions Department at Portsmouth, where he made important contributions to the experimental and computational theory of gunnery. He has published a long series of papers in the Proceedings of the London Mathematical Society and elsewhere.

OXFORD.—Prof. R. A. Sampson, Astronomer Royal for Scotland, has been appointed Halley lecturer for 1920.

The governors and trustees of Tancred's studentships propose to elect a student in physic at Gonville and Caius College, Cambridge, at Whitsuntide. The annual value of the studentship is about 95*l.* Particulars are obtainable from Mr. E. T. Gurdon, 28 Lincoln's Inn Fields, W.C.2.

The sixth annual report of the Carnegie United Kingdom Trust is an account of the work done by the Trust in 1919, and contains a statement of income and expenditure for the year. The committee had hoped that the coming of peace would have brought with it a great opportunity for institutions which