

the manufacture and uses of ferro-alloys and alloy steels from the raw materials in Australia, and with substitutes for tin-plate containers (tin cans). The latter is a specially interesting report, giving information as to the manufacture of wood and cardboard containers and of the machinery used, varnishes, the properties of the different materials, etc.

BOOKLETS have reached us from the firm of Messrs. Adam Hilger, Ltd., describing the wave-length spectrometer introduced in 1904 and various accessories which may be employed in connection with the instrument. The constant deviation prism is rotated by means of a fine steel screw, to which is fixed a drum provided with a scale of wave-lengths. In the most recent instruments this scale is on the side of the drum towards the eye, so that the wave-lengths can be read without quitting the eyepiece. In one form of the instrument provision is made for the use of a Fabry and Perot etalon, by means of which wave-lengths may be determined to a very high accuracy, or for a Michelson echelon or a Lummer-Gehrcke parallel plate for demonstrating the Zeeman effect. Another development of great importance is the improved form of polarisation photometer, based on that described by P. G. Nutting, which, when used in conjunction with the constant deviation spectrometer, provides a powerful tool for spectro-photometry. The attention of the technical chemist may usefully be directed to this method of investigation, which has already proved of service in research on dyes and on photographic plates.

In a paper on "Electrical Phenomena occurring at High Levels in the Atmosphere," recently read before the Institution of Electrical Engineers, Dr. S. Chapman gives "a general outline of the subject, without detailed argument or references." "The account," he adds, "is not limited to what can be regarded as certain conclusions; without departing too far from the basis of observational evidence, conjectural views have also been admitted." Dr. Chapman seems finally to accept the Birkeland-Störmer theory as to the joint cause of magnetic storms and aurora being electrical ions discharged from the sun, but in opposition to Birkeland he thinks these must be α -rays, not cathode- or β -rays. During magnetic storms he accepts a highly ionised layer coming down to about 100 km. above the earth's surface. At a lower level he supposes normally existent a second conducting layer, its ionising agent being ultra-violet light, which he identifies with γ -rays. In it are the electrical currents to which the regular (solar) diurnal variation is ultimately due. Accepting as a fact that magnetic storms are not accompanied by special changes of electrical potential gradient at the earth's surface, it is supposed that the upper atmosphere is so good a conductor that the charge from the α -rays almost instantaneously distributes itself uniformly over a spherical surface, and so does not influence the electrical field at lower levels. The sudden rise and the subsequent slow decline of horizontal force characteristic of magnetic storms in low and mean latitudes are ascribed to vertical movements of the atmosphere, cutting the horizontal lines of the earth's magnetic field. "The general nature of the movement can be readily inferred. The mutual repulsion of the entangled charge spread over the world-wide spherical layer produces an upward, outward movement, as in a charged soap-bubble. Thus the air travels vertically upwards, except during the first few minutes of a magnetic storm. For at first the downward momentum of the injected particles depresses the air before the electricity has accumulated sufficiently to reverse the motion."

NO. 2590, VOL. 103]

THE possibilities of exploitation of the River Dee, from its source in Wales to the city of Chester, for the development of low-fall water-power, economically utilisable for the generation of electrical energy, is the subject of a recently issued report by Mr. S. E. Britten, arising out of a conference held in June, 1917, by the Board of Agriculture and Fisheries. The *Engineer* for May 30 contains a *résumé* of the report, from which we gather that Mr. Britten's scheme provides for sixteen power-stations at various points along the river's course, with falls generally ranging from $7\frac{1}{2}$ ft. to $12\frac{1}{2}$ ft. (there is one case of a 37-ft. fall), and capable of producing in the aggregate 60,000,000 electrical units per annum. The capital cost of the scheme is estimated at 702,240*l.*, and, with an average sale of about 48,000,000 units at $1\frac{1}{2}$ d. per unit, a surplus balance of 205,468*l.* is counted upon. Included in the estimate are the sixteen hydro-electric stations at 29,700*l.* each, a tunnel at 60,000*l.*, and sixty-one miles of transmission line at 65,000*l.* The possibilities of the scheme for producing power are equivalent to a consumption of 70,000 tons of coal per annum. The valuable characteristics of the river for salmon-fishing have not been lost sight of. The quantity of fish caught annually is about 2500, with a gross weight of 13 tons, valued at 3750*l.* From six years' observation made in connection with the Chester Weir there is no evidence, according to the report, that the fish suffer in the least degree from the establishment of hydro-electric works.

THE following books are announced for early publication:—"Menders of the Maimed: The Anatomical and Physiological Principles underlying the Treatment of Injuries to Muscles, Nerves, Bones, and Joints," Prof. A. Keith; "Fractured Femurs: Their Treatment by Calliper Extension," Major M. G. Pearson and Capt. J. Drummond (*H. Frowde and Hodder and Stoughton*); "Psychology and Parenthood," H. A. Bruce (*W. Heinemann*); "Our Atlantic Flight," H. G. Hawker and Lt.-Comdr. M. Grieve, with an introduction by Major-Gen. J. E. B. Seely (*Methuen and Co., Ltd.*); "Opportunities in Chemistry; or, Chemistry in Everyday Life," E. Hendrick (*University of London Press*); and "Senior Practical Chemistry," H. W. Bausor (*University Tutorial Press, Ltd.*). The following works are in the press for publication by the *Carnegie Institution of Washington* (*Washington*):—"The Cactaceæ: Descriptions and Illustrations of Plants of the Cactus Family," N. L. Britton and J. N. Rose, 4 vols.—vol. i., "The Ecological Relation of Roots," J. E. Weaver; "The Carbohydrate Economy of Cacti," H. A. Spoehr; "Climatic Cycles and Tree-growth," A. E. Douglas; "Plant Indicators: The Relation of Plant Communities to Conditions and Practices," F. E. Clements; and "Hydration and Growth," D. T. MacDougal.

THE price of Norton's "Star Atlas," noticed in NATURE of June 12, was incorrectly given as 3*s.* 6*d.* The publishers ask us to point out that the selling price of the book is 8*s.* 6*d.*

OUR ASTRONOMICAL COLUMN.

THE SOLAR ECLIPSE OF MAY 29.—We have received through the office of the Scientific Attaché of the American Embassy the following message from Dr. L. A. Bauer, director of the Terrestrial Magnetic Laboratory of the Carnegie Institution of Washington, referring to observations of the total solar eclipse of May 29:—"Cape Palmas.—Complete success; inner corona very bright, marked outer corona extensions S.S.E., N.N.W.; brilliant red prominence W.S.W.; several stars seen region sun; no shadow bands; magnetic effect confirmed."

THE ASTROGRAPHIC CATALOGUE.—Reference is made in the report of the Oxford University Observatory for the past year to the progress made in certain zones of this work, which were originally allotted to the observatories that have been unable to complete their undertaking without some help. The plates taken and measured at the Vatican Observatory are reduced and published under the direction of Prof. Turner, and the printing of vol. iv., which will complete nearly half this section, is in progress. The plates taken at the Santiago de Chile Observatory are sent to the University Observatory for measurement and reduction, but the supply is slow and scarcely satisfactory. The Hyderabad Observatory, which took over a zone left undone by a South American observatory, and may be considered an offshoot of Oxford, for both its directors received their training there, has made rapid progress, but this may be somewhat hindered by the death of its young and energetic director, Mr. Pocock, to whose widow the Nizam has granted a pension of 100*l.* a year.

THE BRITISH SCIENCE GUILD.

THE thirteenth annual meeting of the British Science Guild was held (by kind permission of the Master and Wardens) at the Goldsmiths' Hall on Tuesday, June 17, the Right Hon. Lord Sydenham, president of the guild, in the chair.

The adoption of the annual report, which recorded the various activities of committees of the guild, was moved by Sir Richard Gregory. Special reference was made to the report presented by the Education Committee on "Industrial Research and the Supply of Trained Scientific Workers," which has been sent to the Prime Minister, the Minister of Education, and other authorities concerned. Shortly after its issue a deputation of representatives of British universities was received by the Chancellor of the Exchequer and the President of the Board of Education, who expressed sympathy with the plea for more generous State aid to the universities. The Civil Service Estimates for 1919-20, since published, show that 1,000,000*l.* is allotted to the maintenance of university institutions, as compared with 500,000*l.* for the year 1913-14. It is felt, however, that a full inquiry into the provision of university and higher technical education in this country is still needed.

Another subject that has received attention from a committee of the guild is the organisation of research in relation to fisheries. The report emphasises the importance to a maritime nation of investigations of the sea and development of its fishing resources. The work of existing bodies in this field deserves fuller support, and the establishment of an Advisory Council or Board of Marine Research is suggested. Especially it is urged that there should be a properly equipped institute and museum of oceanography in this country similar in scope to those existing in France, Germany, and now being planned in Denmark. A memorandum on the Decimal Coinage Bill is presented by the Metric System Committee, while the Technical Optics Committee has urged upon the President of the Board of Trade the necessity of establishing a strong optical industry in this country.

Simultaneously with the adoption of the annual report, the election of Major-Gen. the Right Hon. J. E. B. Seely, Admiral Sir David Beatty, Field-Marshal Sir Douglas Haig, and the Right Hon. the Lord Mayor of London as vice-presidents of the guild was announced. Major-Gen. Seely, in addressing the meeting, expressed his appreciation of this honour and his sympathy with the aims of the guild in

regard to higher technical education and research, illustrating from his experience the important part played by the latter both in the war and in relation to industry. He referred particularly to aviation, a field in which progress was absolutely dependent on science—a fact repeatedly illustrated in the war and in the recent Atlantic flights. Of great importance was the perfecting of a system by which an aviator could at any moment ascertain his whereabouts or determine when he was flying upside down. He believed within a few years wireless telephony would go far towards the solution of the first of these problems.

An address was then delivered by the president, Lord Sydenham, on "Science and Labour Unrest." Such unrest, he remarked, was largely due to the revolution in industry brought about by the introduction of tools and machinery and the subsequent tendency, still proceeding, towards larger undertakings. In this process the intimate and friendly relation formerly prevailing between master and man had been partially lost. Moreover, the introduction of scientific methods of reproduction rendered work repetitive and monotonous, so that the personal skill of the craftsman to-day was, in general, inferior to that he possessed in the pre-machinery age. Science, however, which was responsible for these causes of unrest, could also remove them by providing for the worker better conditions of living; and among the pressing problems of this nature housing was one of the most important. Science had also shown that unduly long hours meant diminution of output, and research was now being made into the best means of eliminating industrial fatigue. Lord Sydenham also referred to various economic fallacies current among workmen, which found a congenial soil in the present unrest. Fuller education in economic subjects was necessary in order that these errors might be corrected.

Sir J. J. Thomson, who followed, referred to the many developments in applied science which had taken place during the war, and expressed the hope that the manipulative skill and aptitude for research developed in various special industries or for purposes of war would be preserved and utilised in the future in peaceful pursuits. He also emphasised the vital importance of scientific knowledge to officers in the Army and Navy, and especially to the General Staff—a matter which had been much neglected in the past. Similarly we should not make the progress we ought to make until the boards of public companies and the Government Departments included men imbued with scientific method, which he believed could be evolved only by scientific training. Sir J. J. Thomson also referred to the changes which were being made in the conditions of examination for the public service, whereby scientific subjects would be placed in a better position. He did not, however, mean to imply that the selection of men for appointments involving scientific knowledge should rest only on the results of examination. At the present time an opportunity offered itself of selecting men whose record showed ability in some field of science, and it was suggested that advantage should be taken of it.

In conclusion, a vote of thanks to the Wardens of the Goldsmiths' Hall was moved by Lord Avebury and seconded by Col. Sir John Young, who referred to the loss which the guild had sustained in the recent death of Sir Boverton Redwood, who had taken a keen interest in its work for many years, and was a past master of the Goldsmiths' Company. A vote of thanks to the chairman and speakers, moved by Major Sir Ernest H. Shackleton, was adopted by acclamation.