

of the gauge above the ground is 1.5 to 1.8 metres in France, so that a correction would be necessary before making comparison of the results with British records.

An excellent series of charts at the end of the volume indicates the rainfall distribution in each month and in the year as a whole. In the study of these charts one misses a contour map of the country. The annual fall varies from 500 mm. in two small areas on the shores of the Mediterranean to more than 1500 mm. in the mountainous regions. It is noteworthy that, after the Mediterranean seaboard, parts of the Atlantic coast take a high place among the driest regions of southern and south-western France. This is particularly the case in the summer months. A wise discretion has evidently been used in rejecting stations of doubtful accuracy in the preparation of the district means, and in other ways it is evident that trouble has not been spared to render the results as trustworthy as possible.

J. S. D.

Volumetric Testing of Scientific Glassware.

ACCURATE work in the chemical and physical laboratory depends not only on the worker, but also to a large extent on the trustworthiness of his glass measuring apparatus, such as burettes, pipettes, and calibrated flasks. Whilst it is no doubt true that every operator who is master of his craft should be able, on occasion, to verify the accuracy of his measuring instruments, it is also true that both time and practice are required to do it well, to say nothing of the fact that special equipment is necessary for some of the verifications. Hence it is important, both to makers and to users, that facilities should be available for the testing of such instruments by experts, upon whose testimony reliance can safely be placed.

At the National Physical Laboratory apparatus of the kind in question has been tested, in respect of its accuracy, for the past fifteen years, but on a small scale only. Such instruments were mainly obtained from abroad in pre-war days, and it is only within the last two or three years that the making of them has developed appreciably in this country.

With the growth of the industry here it became necessary to make arrangements for testing and certifying glass volumetric apparatus on a larger scale than heretofore. Facilities were therefore provided and regulations drawn up, in co-operation with manufacturers and users of scientific glassware, for carrying out systematically what are known as "Class A" tests—that is, tests on apparatus required to be of the highest degree of accuracy. A pamphlet describing the arrangements and regulations was issued in July, 1918, and a new building has just been completed, with special equipment for dealing with this class of work on a large scale.

Instruments required to be only sufficiently accurate for commercial purposes are designated as "Class B." A permanent scheme for commercial testing of such articles by State institutions, or by other approved bodies, is now under the consideration of the Government. Pending the settlement of this scheme, manufacturers may note that the National Physical Laboratory is prepared to undertake "Class B" tests, which for the present will be carried out at Teddington. It is hoped eventually to arrange for this work to be done at local centres.

A full account of the methods of testing, limits of error allowed, details of construction, and fees charged is given in a new edition of the laboratory pamphlet, "Volumetric Tests on Scientific Glassware." Copies of this pamphlet may be obtained free of charge on application to the Director.

The "Class A" tests are designed for instruments

intended to possess the highest degree of accuracy required in scientific use. Whilst the "Class B" tests are less stringent, the limits of error assigned are such as all graduated apparatus of good commercial quality should comply with, and are necessary for obtaining satisfactory results in ordinary routine analysis.

It is very desirable that the scientific glass-making industry developed in this country during the war should remain as a permanent asset. To attain this end the graduated apparatus produced should be not only well made, but trustworthy in respect of accurate calibration. From the maker's point of view, the advantage of having apparatus guaranteed by an impartial institution is invaluable for establishing a reputation for accuracy. As regards users, they will no doubt be glad to know that it is now possible to obtain apparatus the correctness of which has been impartially verified. The monogram of the National Physical Laboratory is the hall-mark of British scientific glassware so far as accuracy of measurement is concerned.

University and Educational Intelligence.

ABERDEEN.—Mr. W. G. Craib, formerly assistant at Kew, and now of the botanical department, Edinburgh University, has been appointed to the chair of botany vacant by the death of Prof. J. W. H. Trail.

BIRMINGHAM.—Mr. A. A. Dee has been appointed an assistant lecturer in physics.

CAMBRIDGE.—The governing body of Emmanuel College offers to research students commencing residence at the college in October, 1920, two exhibitions, each of the annual value of 50*l.* and tenable for two years and, on the recommendation of the student's director of studies, for such longer period as the degree course may require. The governing body may also make additional grants to students whose means are insufficient to cover the expense of residence at Cambridge or whose course of research may entail any considerable outlay in the provision of apparatus or materials. The exhibitions will be awarded at the beginning of October, and applications should be sent so as to reach the Master of Emmanuel (The Master's Lodge, Emmanuel College, Cambridge) not later than September 18.

The new statute authorising the degree of Doctor of Philosophy for Research has been approved by his Majesty the King in Council, and regulations giving effect to the new statute will be offered for acceptance at the first Congregation in the Easter term.

Mr. F. B. Smith, of Downing College, has been appointed reader in estate management.

Vacancies are announced in the Cayley lectureship in mathematics and in the University lectureships in physiology and zoology. Candidates must apply to the Vice-Chancellor by April 20.

EDINBURGH.—In consequence of the appointment of Mr. W. G. Craib, of the botanical department, to the chair of botany in the University of Aberdeen, it has been arranged as a matter of urgency that Sir George Watt, formerly professor of botany in the University of Calcutta, deliver the course of lectures on Indian forest trees during the summer term.

Mr. James Templeton has been appointed lecturer in botany in succession to Mr. Pealling (resigned), and Dr. Bella D. MacCallum full-time assistant in the same department.

With the assistance of the Scottish Committee of the Royal Aeronautical Society, the services of four lecturers had been obtained to give a series of lectures

on aeronautics in connection with the engineering classes at the Universities of St. Andrews, Glasgow, and Edinburgh. The University Court voted a grant of 50*l.* to defray the cost of the lectures in Edinburgh, and suggested that the lectures should be open to the public.

M. l'Abbe Breuil, of Paris, has been appointed Munro lecturer on prehistoric archæology for the academical year 1920-21.

LIVERPOOL.—The University, through its Chancellor, Lord Derby, has just issued an appeal to its constituency, the counties of Cumberland, Lancashire, Cheshire, and North Wales, for funds that will enable it to come abreast of present needs. Some of the laboratories have been in existence since 1881, and are obviously inadequate, while all of them are now too small; thus the practical course in elementary physics is being repeated eleven times each week. The library needs to be extended; the chemical laboratories are so overcrowded that work is being carried on in Army huts; new departments are contemplated and interesting developments are being thought out. A chair in the mathematical theory of statistics, a ship-model tank, a department of colloidal chemistry, and a department of marine food industry are among the "futurist" ideas that make this appeal so relevant to a great industrial and commercial centre. It is hoped that the sum of a million pounds may be obtained, and of this about 500,000*l.* is urgently required for pressing expansions. Already about 200,000*l.* has been promised.

ON Saturday last, March 20, the third annual dinner of the metallurgy department of the Sir John Cass Technical Institute was held, Mr. G. Patchin, the head of the department, being in the chair. Dr. C. A. Keane, the principal, replying to the toast of the institute, stated that at the present time there are more than a thousand individual students attending the various courses. In 1904 there were three courses and twenty-two students in the metallurgy department, and this year there are eleven courses and one hundred and twenty students.

ONE of the most valuable provisions of the new Army scheme is that which relates to the education of the rank and file. The intention is to provide men in the Army with an educational training equal, or even superior, to what is available in civilian life. Every officer in command of a company will be held responsible for the instruction of his men, not only in drill and discipline, but also in the class-room and workshop, and the result will certainly be increased intelligence and efficiency. For the introduction of this substantial reform Col. Lord Gorell, who since 1918 has been Deputy Director of Staff Duties (Education) at the War Office, Sir Henry Hadow, and Mr. P. A. Barnett are largely responsible, and they are to be congratulated cordially that the scheme of Army certificates of education is to come into operation on July 1, 1921. Four classes of certificates are to be awarded on the results of examination. For the third-class certificate candidates must be able to read intelligently a selected piece of English prose, write a simple letter, work simple sums up to and including vulgar fractions in reference to concrete examples, and answer questions on a course of citizenship and history. The second-class certificate will apparently require a standard of attainment comparable with those of the former Preliminary Local Examinations of Oxford and Cambridge; and the first class, involving English, mathematics, geography and map-reading, and (optional) an ancient or modern language, approximately that of the First School Examination.

By taking, in addition, two or three single subjects from different groups, a special certificate may be obtained. Various practical subjects may be taken for the second-class certificate, and the groups for the special certificate include mechanics, chemistry, physics, botany, zoology, geology, physiology, civil, mechanical, and electrical engineering, agricultural chemistry, and commerce. We shall watch with close attention the application and results of this educational scheme.

Societies and Academies.

LONDON.

Royal Society, March 11.—Sir J. J. Thomson, president, in the chair.—W. G. Duffield, T. H. Burnham, and A. A. Davis: The pressure upon the poles of metallic arcs, including alloys and composite arcs. In a previous communication (Phil. Trans., A, ccxx, p. 209, 1919) the authors showed that the poles of a carbon arc behaved as though they repelled one another, and methods were described by which the pressure upon each pole could be measured. Reasons were given for attributing this effect to the reaction consequent upon the emission of electrons from the poles under the influence of thermionic or photo-electric action. The present experiments relate to arcs between iron, copper, and silver terminals, the rate of variation of the pressure with current density being measured for the anodes and cathodes. The pressures were greater than in the carbon arc, that within the copper arc being the largest. Assuming that the pressure is due to the projection of electrons, a comparison between the kinetic energy of the electron and that of the metallic atom at the temperature of the poles showed sufficient agreement to suggest that the electrons before projection were in thermal equilibrium with the metal of the pole. The reactions upon electrodes composed of an alloy of silver and copper were also measured, likewise those within an arc between a silver and a carbon pole. In this case the pressure was determined mainly by the material of the pole under examination. The problem of the mechanism whereby a gas may be heated is briefly discussed. Some account is also given of the variation in the potential difference between the poles when the material of one is altered.—J. H. Vincent: Further experiments on the variation of wave-length of the oscillations generated by an ionic valve due to changes in filament current. Eccles and Vincent have found that in an oscillatory circuit maintained by a thermionic valve with a grid coil coupling, the wave-length has a maximum value for a certain filament current. This effect is studied further in this paper. In order to vary the filament current, rheostats were designed and used in which the change of resistance was unaccompanied by any sensible change in the self-induction of the filament circuit. The methods of measuring the change of wave-length due to the variation of filament current were different from that employed by Eccles and Vincent, but it was found that the results obtained were independent of the particular method by which the wave-length was studied. It is suggested that changes in several of the variables of a valve-maintained circuit produce effects of the same sign on the wave-length and the amplitude of the oscillations. The wave-length and amplitude decrease with the decrease of the grid voltage or of the plate voltage. They also decrease when the coupling of the grid coil with the main oscillator coil decreases. Increasing the resistance in either the condenser branch or the induction branch of the main oscillating circuit lessens the amplitude and wave-length; while altering the filament current