boiler before making the holes, which were then drilled in position, and were necessarily true. This procedure involved the use of special drilling machines, whilst economy demanded that several drills should work at once in one machine so as to save time and be under the care of only one attendant. The chief object of Mr. Dixon's paper was to describe the most recent of these machines. The drill spindles are carried on supports which bring them to the work, and are adjustable to the varying pitches and angles required. There is a cross-slide which can be raised or lowered for carrying the drills for the circular seams, and this is adjustable so as to suit the varying threads required. There are five drills for this purpose, whilst six more are arranged upon a vertical column upon the opposite side of the boiler shell for operating upon the butt seams. One of the chief difficulties in drilling holes in a built-up shell is the flexibility of the work, which causes it to give way and buckle when the pressure of the drills is brought upon it. So great has been this drawback that it has been found more advisable in many cases to use only one drill at a time, although there may have been four spindles on the machine. Mr. Dixon has overcome this objection in an ingenious manner by an internal support which gives great rigidity to the shell, and enables the larger number of drills to be brought into play at once without their accumulated pressure causing deflection. During the discussion an interesting point arose in connection with this feature. It was said that twist drills which, when properly ground, gave very clean holes and great accuracy of work, could not be used on boiler shells, as they so frequently broke in work. The author said this was perfectly true in ordinary cases, but it was due to the springing of the shell referred to. The statement is corroborated by the fact that twist drills can be advantageously employed on work firmly held on the drilling machine-table, whereas the older form of flat drill would have to be used where rigidity could not be obtained.

A NEW METHOD OF PREPARING PHOSPHORETTED HYDROGEN.

A NEW and extremely simple mode of preparing phosphoretted hydrogen is described by Prof. Retgers in the current *Zeitschrift für Anorganische Chemie*. After reviewing the usual mode of preparing the gas for demonstration purposes, by heating yellow phosphorus in an aqueous solution of potassium hydrate, and the other more rarely employed methods of preparation—such as by the interaction of calcium phosphide and hydrochloric acid, copper phosphide and potassium cyanide, and phosphonium iodide and water—the question of the direct combination of hydrogen and phosphorus is discussed. It appears that the currently accepted idea that ordinary molecular hydrogen does not combine with phosphorus is founded upon some old experiments of the French chemists Fourcroy and Vauquelin, who state that when phosphorus is melted in hydrogen gas, vapour of phosphorus becomes diffused in the hydrogen, and confers upon it the power of ignition in contact with oxygen without any combination between the phosphorus and hydrogen occurring. In view of the great readiness which, as Prof. Retgers has recently shown, warm hydrogen exhibits to unite with free arsenic, it was considered possible that the reason for the non-combination of hydrogen and melted phosphorus might be found in the low melting-point (44°) of the latter. Experiments were therefore made with red phosphorus, which, of course, is capable of being raised to a much higher temperature. When dry hydrogen is led through a glass tube containing red phosphorus, and afterwards through a wash-bottle containing water, practically pure hydrogen is found to escape. Immediately, however, a gas flame is brought under the part of the tube containing the phosphorus, combination occurs, and the gas issuing from the wash-bottle at once inflames in the air. The non-spontaneously inflammable gaseous hydride of phosphorus is also therefore accompanied by a smaller quantity of the spontaneously inflammable liquid hydride, and a sufficient quantity of the latter for demonstration may be isolated by leading the vapours through a U-tube immersed in a freezing mixture. Moreover, the solid hydride is likewise produced as a yellow deposit near the heated portion of the tube. Upon removing the flame from beneath the tube, the bubbles of escaping gas cease to take fire as they emerge into the air, and are found to consist of almost pure hydrogen. The production of phosphoretted hydrogen is consequently entirely dependent upon the elevation of the temperature considerably above the melting point of ordinary yellow phosphorus. The new mode of preparation is recommended by Prof. Retgers as being more convenient and elegant than the old-established method of boiling phosphorus in caustic potash, as forming an excellent example of the direct combination of two elements, and as furnishing ample demonstration of all three hydrides of phosphorus, the gaseous, liquid, and solid.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The Rolleston Memorial Prize has been awarded to M. S. Pembrey, of Christ Church, and E. S. Goodrich, of Merton College, the papers sent in by these two candidates having been judged to be equal. Mr. Pembrey was placed in the first class in the Honour School of Natural Science in 1889, and is demonstrator in the Physiological Department. Mr. Goodrich is still an undergraduate, and is assistant to the Linacre Professor. At a meeting of the Junior Scientific Club, held on Friday, October 26, Mr. W. J. Waterhouse, of Christ Church, exhibited some telephone cables, and Mr. W. P. Pycraft exhibited some Natterjack toads. Papers were read by Mr. W. Garstang, of Lincoln College, on some modifications of the Tunicate pharynx induced by the violent ejection of water, and by Mr. C. T. Blanshard, of Queen's College, on the genesis of the elements.

Sir Henry W. Acland, K.C.B., has announced his resignation of the Regius Professor of Medicine, the resignation to take effect at the end of the present year. Sir Henry is now in his eightieth year, and has long been a leading figure in scientific and medical matters in the University. His resignation will sever the link of many old associations. He has consistently and bravely supported the cause of science in Oxford, and that, too, at a time when scientific studies were regarded in anything but a favourable light by the rest of the University. It was largely due to his influence and energy that the University Museum was built, and he has never failed to support any movements for its further extension and for the improvement of the teaching which is carried on there. One of his latest efforts secured the building of the new Department of Human Anatomy, and he has had the satisfaction of seeing the medical school for which he worked so hard rise from almost nothingness into considerable dimensions, with every prospect of steady and healthy increase. He will carry with him on his retirement the affection and good wishes of all sections of the University.

SCIENTIFIC SERIALS

IN the *Nuovo Giornale Botanico Italiano* for October, Sigg. G. Del Guercio and E. Baroni describe the disease of Italian vines caused by a Schizomycete, and known as *gommosi bacillare* or *gelivure*.—Sig. C. Massalonga describes a large number of abnormal growths in different plants.—All the other papers concern the local Italian flora.

IN the *Journal of Botany* for August, September, and October, Mr. F. J. Hanbury adds seven more to the interminable list of new species of *Hieracium*.—Rev. E. S. Marshall describes and figures an apparently new species of *Cochlearia*, *C. micacea*, from Ben Lawers.—Messrs. J. G. and E. G. Baker discuss the botany of an interesting corner of Westmoreland, High-cup Nick.—The Ericaceæ and the Asclepiadeæ of South Africa are treated of, respectively, by Mr. H. Bolus and Mr. R. Schlechter.—Students of the local distribution of plants in Great Britain will find other papers to interest them.

Symons's Monthly Meteorological Magazine, October.—Protection from lightning, by A. McAdie. This is a summary of one of the Circulars of Information issued by the Weather Bureau, Washington. In addition to a number of rules for erecting lightning rods, the pamphlet contains statistical tables of injury to life and property by lightning in the United States. Full recognition is given by the author of the Report of the Lightning Rod Conference published in 1882, and of the experiments made by Prof. Oliver Lodge.—The recent drought in the Midlands, by the Rev. G. T. Ryves. During 26 days ending September 21, only 0·06 inch of rain fell at Tean Vicarage. Mr. Symons shows that at Barkby, Leicestershire, 1·10 inch of rain fell. The same record shows that the first nine months of

1894 have been dry, but not nearly so dry as in some previous years.—Enormous hailstones, by G. J. Symons. This contains some cuttings from various papers of a severe thunderstorm which occurred over a large part of the continent on August 26 and 27 last. At Beaucourt hailstones are said to have been picked up weighing nearly two pounds; at many places they weighed seven ounces and upwards, and many birds and some sheep were killed.—Climatological table for the British Empire for the year 1893, by G. J. Symons. The table contains data referring to temperature, rainfall, &c., at eighteen places. The highest temperature in the shade was 108° at Adelaide, on February 2, and the lowest − 48° at Winnipeg, on February 1. The highest temperature in the sun was 171° at Trinidad, which also had the greatest rainfall, viz. 92·5 inches; the least fall was in London, 19·8 inches.

SOCIETIES AND ACADEMIES.

PARIS.

Academy of Sciences, October 22.—M. Lœwy in the chair.—Experimental verifications of the theory of weirs, with liquid sheets submerged below or adherent, relative to the delivery and the contraction in the lower part of the liquid sheet, by M. J. Boussinesq.—M. A. Trillat claims priority in regard to processes of disinfection by formaldehyde.—On the rotation poles of Venus, by M. C. Flammarion (see p. 21). Variations of the level of water in a basin communicating with a tidal port, by M. A. de Saint-Germain. A mathematical paper.—Force acting at the surface of separation of two dielectrics, by M. H. Pellat. In the general case, the force is normal to the surface of separation and in the sense that the specific inductive capacity diminishes. Its value per unit of surface is given by the formula

$$f = \frac{K_1\phi_1^2 \cos 2\alpha_1}{8\pi} - \frac{K_2\phi_2^2 \cos 2\alpha_2}{8\pi},$$

α_1 and α_2 being the angles between the normal and the direction of the field, ϕ_1 and ϕ_2 the intensities of the field, on either side of the surface of separation.—Experimental researches on the freezing-point with different mixtures of alcohol and water, by M. Raoul Pictet. A table of the temperatures of crystallisation of definite mixtures is given, and the results are plotted in curves discussed in the paper.—A study of the combinations of hydrogen fluoride with water, by M. R. Metzner. The author has succeeded in obtaining only one hydrate possessing definite properties. It has the composition $HF.H_2O$ and contains 52·3 per cent of HF. The crystals of this composition melt at − 35° C.; they fume in the air, and have a specific gravity greater than 1·15. They are very soluble in the cold concentrated acid.—Researches on the mercuric sulphates, by M. Raoul Varet. The thermal data for the normal sulphate and for the basic salt $HgSO_4 . 2HgO$ are given in detail. Whereas sulphuric acid completely displaces HCN from its combination with potassium liberating + 25·4 Cal., hydrocyanic acid, even in dilute solution, replaces sulphuric acid in $HgSO_4$ with disengagement of + 23·5 Cal. Similarly hydrochloric acid displaces sulphuric acid in $HgSO_4$.—Antimony vermilion is not an oxysulphide, by M. H. Baubigny. Analysis of the colouring matter of antimony vermilion, precipitated by sodium thiosulphate, shows that it is simply a form of Sb_2S_3.—Bismuth nitrosalicylates, by M. H. Causse.—Salivary glands of the Apinæ (*Apis mellifica* ♂ and ♀), by M. Bordas. On an undescribed caterpillar ravaging the leaves and fruits of the fig-tree, in the arrondissement of Puget-Théniers, by M. Decaux.—On the mechanism of vegetable respiration, by M. L. Maquenne. The author shows that the ratio of CO_2 produced to O absorbed is sensibly altered by momentarily subjecting leaves to a vacuum, and the respiration is at the same time rendered more active. The conclusion is given: The respiration of plants appears to be the result of the slow combustion of a very oxidisable principle, which the living cell constantly secretes, shaded from the light, and which may accumulate when there is insufficient oxygen in the surrounding atmosphere.—The station of Schweizersbild, by M. Nüesch.—Three geological sections in French Congo, by M. Maurice Barrat.—Late geological researches in the Altai, by M. Vénukoff.—Rotation movements observed in an aerostatic ascension, by M. Vénukoff.

DIARY OF SOCIETIES.

LONDON.

THURSDAY, NOVEMBER 1.

LINNEAN SOCIETY, at 8.—Contributions to the Knowledge of Monocotyledonous Saprophytes: Percy Groom.—On an Error in the Descriptions of the Effect of a Centrifugal Force upon Growth: Rev. G. Henslow.—On Mediterranean and New Zealand Retepora, and a Fenestrate Bryozoan: A. W. Waters.

CHEMICAL SOCIETY, at 8.—The Electromotive Force of Alloys in a Voltaic Cell: A. P. Laurie.—The Action of Nitric Oxide on Sodium Ethylate: G. W. Macdonald and Orme Masson.—On Ethylic Butanetetracarboxylate: Dr. B. Lean.

MONDAY, NOVEMBER 5.

SOCIETY OF CHEMICAL INDUSTRY (Burlington House), at 8.—The Composition and Constitution of certain Alloys, by the late Dr. C. R. Alder Wright, F.R.S.: Mr. Watson Smith.—Note on Oxidised Linseed Oil: Mr. W. F. Reid.

ARISTOTELIAN SOCIETY (22 Albemarle Street), at 8.—An Essential Distinction in Theories of Experience: Mr. Bernard Bosanquet.

TUESDAY, NOVEMBER 6.

ZOOLOGICAL SOCIETY, at 8.30.—Descriptions of New Species of Œdionychis and Allied Genera of Coleoptera: Mr. Martin Jacoby.—On the Hyoid Arch of Ceratodus: Mr. W. G. Ridewood.—Third Report on Additions to the Batrachian Collection in the Natural History Museum: Mr. G. A. Boulenger, F.R.S.

ROYAL VICTORIA HALL, at 8.—The Electric Spark: Prof. A. W. Rücker, F.R.S.

WEDNESDAY, NOVEMBER 7.

GEOLOGICAL SOCIETY, at 8.—Notes on some Recent Sections in the Malvern Hills: Prof. A. H. Green, F.R.S.—The Denbighshire Series of South Denbighshire: Mr. Philip Lake.—On some Points in the Geology of the Harlech Area: Rev. J. F. Blake.

ENTOMOLOGICAL SOCIETY (11 Chandos Street, Cavendish Square), at 8.

THURSDAY, NOVEMBER 8.

MATHEMATICAL SOCIETY, at 8.—Mathematics, President's Address: A Generalised Form of the Hypergeometric Series, and the Differential Equation which is satisfied by the Series: F. H. Jackson.—Third (and concluding) Memoir on certain Infinite Products: Prof. L. J. Rogers.—On the Kinematics of Non-Euclidean Space: Prof. W. Burnside, F.R.S.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—Notes on Electric Tramways [in the United States and Canada (Supplementary Paper): H. D. Wilkinson.—Electric Traction, with Special Reference to the Installation of Elevated Conductors: R. W. Blackwell and Philip Dawson.

FRIDAY, NOVEMBER 9.

PHYSICAL SOCIETY, at 5.—The Photographic Action of Stationary Light Waves: J. Larmor, F.R.S.—On Vapour Pressure: Prof. S. Young, F.R.S.—On the Luminescence of Glass: John Burke.

ROYAL ASTRONOMICAL SOCIETY, at 8.

SATURDAY, NOVEMBER 10.

ROYAL BOTANIC SOCIETY, at 3.45.

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