

## Calendar of Patent Records.

December 14, 1688.—On Dec. 14, 1688, Abraham Thevart was granted a privilege for 30 years by Louis XIV "de faire seul, à l'exclusion de tous autres, de fabriquer où bon leur semblera, des glaces de soixante pouces de haut, sur quarante pouces de large, et de toutes autres hauteurs et largeurs au-dessus, . . . et pour cet effet se servir seulement des machines que ledit Thevart a inventées", on condition that a description of the process be presented within three months. Thevart set up his factory first in the Faubourg St. Antoine and later at St. Gobain, where large sheets of glass were cast in 1693, the first four pieces being presented to the king. In England the first large glass sheets were manufactured by the Company of British Cast Plate Manufacturers, formed in 1773, in a factory at St. Helens, Lancashire.

December 15, 1883.—It was Gottlieb Daimler who first realised the importance of high piston speeds for the internal combustion engine, and the motor-car industry really dates from his patent, which was applied for in Germany on Dec. 15, 1883. His first engine—a four-stroke engine running on benzene—was built into a bicycle, which was driven for the first time in November 1886 in the streets of Cannstatt.

December 16, 1835.—Henry Booth, one of the chief promoters of the Liverpool and Manchester Railway, and the first secretary of the Company, invented the common screw-coupling for railways. It was adopted by his company and has continued in use to the present day. His patent, dated Dec. 16, 1835, for "an improved method of attaching railway carriages together for the purpose of obtaining steadiness and smoothness of motion", probably was for this invention, but no specification was enrolled and the patent became void within two months of the grant.

December 20, 1822.—The first 'eversharp' pencil was patented in England by John Isaac Hawkins and Sampson Mordan on Dec. 20, 1822, with the title "Improvements on pencil holders for the purpose of facilitating writing and drawing by rendering the frequent cutting of the points unnecessary." The projection of the lead was governed by screw mechanism within the pencil holder.

December 21, 1612.—The patent granted to Joseph Usher, Warner Rich, and Godfrey Devette, on Dec. 21, 1612, for a new engine for supplying water to cities and towns and private houses, etc., contains a provision that a model of the invention is to be supplied within one month from the date of the grant, and furnishes an early example of the official requirement of a description of the invention as a condition of the grant. Sir Hugh Myddleton's patent for the supply of water to London was granted in the previous May, and this may have been the cause of the insertion of the proviso in the later grant.

December 21, 1736.—Jonathan Hull's patent for his "machine for carrying vessels or ships out of or into any harbour, port, or river, against wind or tide or in a calm", was granted on Dec. 21, 1736. Hull proposed to use a Newcomen engine to propel a tug-boat, by means of a stern paddle wheel operated through rope gear and pawl and ratchet mechanism. His experiments were presumably not successful, but he published in the following year a book describing the invention, which may have stimulated the later inventors.

December 21, 1802.—"Tatham's Clumps", which were interlocking bricks for building circular structures such as wells, columns, pipes, etc., were patented by William Tatham and others on Dec. 21, 1802. The bricks were made at the works of Scott and Clarkson, at Hackney.

## Societies and Academies.

LONDON.

Royal Society, Dec. 5.—F. A. B. Ward, C. E. Wynn-Williams, and H. M. Cave: The rate of emission of alpha-particles from radium. A new type of electrical counter was used in which the whole of the amplification is produced by triode valves. The amplification was linear, so that the counting of  $\alpha$ -rays was undisturbed by the presence of  $\beta$ -rays. About 500 particles per minute could be counted. The rate of emission from radium determined by counting about  $10^5$   $\alpha$ -particles was  $3.66 \times 10^{10}$   $\alpha$ -particles per sec. per gm. of radium.—E. J. Williams and F. R. Terroux: Investigation of the passage of fast beta-particles through gases. The primary ionisation for beta-particles of 0.5-0.9 of the velocity of light, determined in the Wilson cloud chamber, appears to approach limits of 22 ions per cm. in oxygen, and 5 ions per cm. in hydrogen. Variation with velocity differs appreciably from that predicted on classical theory. From the frequency of branch-tracks, the magnetic moment of an electron seems considerably less than a Bohr magneton. Momentum appears to be conserved in branch collisions.—R. J. C. Howland: On the stresses in the neighbourhood of a circular hole in a strip under tension. The problem is solved by successive approximation for the case in which the stress-system is symmetrical both about axis of strip and about perpendicular diameter of hole. General formulæ are given expressing each approximation in terms of the preceding. The coefficients of the transformation depend upon transcendental integrals which are estimated numerically and coefficients are then tabulated. When the ratio of diameter of hole to diameter of strip does not exceed 0.5, greatest stress at boundary of hole is nearly  $4\frac{1}{2}$  times tension at infinity. On the edge, tension rises from a minimum of less than  $\frac{1}{2}$  of applied tension at point nearest to hole, to maxima, not much less than twice applied tension, at about one-third of width of strip on either side of central section. On the axis, disturbance due to hole becomes inappreciable at a distance from centre of hole equal to about  $1\frac{1}{2}$  times width of strip.

Geological Society, Nov. 20.—D. Williams: The geology of the country between Nant Peris and Nant Ffrancon (Snowdonia). The general stratigraphical succession is given. The topmost Cambrian beds, the Ffestiniog or *Lingula* Grits, are of shallow-water origin. They are faulted against blue-black slates, probably of Lower Llanvirn age. Upwards, the slates pass into the paler Llandeilo slates with *Glyptograptus teretiusculus*, at the top of which occur the Talgau lavas apparently belonging to the Glyder Fach-Capel Curig volcanic suite. These earliest flows are notably sodic. The Snowdon Volcanic Suite is essentially composed of potash-rhyolites and rhyolite-tuffs, succeeded, near the Devil's Kitchen, by pumice-tuffs and flows of andesitic or basaltic character. The Upper Rhyolitic Series of Snowdon itself is here absent. Two large acid plutonic masses, Moel Perfedd and Bwlch-y-Cywion, are believed to represent the denuded plugs of the vents from which the Lower Rhyolitic Series was extruded. Both the folding and the cleavage, which strike approximately north-east and south-west, are attributed to Caledonian earth-movements, the cleavage following closely upon the folding, but preceding the faulting. 'Cleavage-fans' are conspicuous, two 'synclines' being separated by an 'anticline'. There appears to be no evidence in this area of the post-cleavage thrusting observable on Snowdon.—Beeby Thompson: The Upper Estuarine series of Northamptonshire and

northern Oxfordshire. J. W. Judd, in 1867, gave the name 'Upper Estuarine Series' to a series of variable beds, largely variegated clays containing abundance of vegetable matter of probably freshwater origin, interspersed with brackish-water beds and with distinctly marine beds. The author in 1909 recognised an 'Upper Estuarine Limestone', commonly a water-bearing bed in the midst of the series. This bed divides the series into three parts, on which additional information is given. In northern Oxfordshire, between certain inferior oolite limestones or white sands (the time-equivalents of the Lincolnshire limestone?), or ferruginous sands (the equivalents of the variable beds of the Northampton sand or even of the ironstone series) below, and the great oolite limestone above, occurs a series of beds which in various parts physically, and in others palæontologically, agree, as does the complete set in sequential position, with the Upper Estuarine Series of Northamptonshire. The Northamptonshire and Oxfordshire sections on this geological horizon are thus more definitely correlated. In Part 2 of the paper it is shown how the extended classification of beds can be used for identifying unconformities due to earth-movements developed at different times.

Linnean Society, Nov. 21.—M. J. Godfrey: The pollination of *Cephalanthera*. The three British species can be cross-pollinated by insects, though there are no viscid glands to attach the pollinia. An insect retreating from the flower becomes smeared with the viscid secretion of the stigma, which then picks up the pollinia projecting from the anther.—E. B. Poulton: Recent observations on snake-like caterpillars which throw light on a statement in H. W. Bates's classical paper on mimicry. Bates was probably referring to a Spingid larva which deceived him by the reduction of the caudal horn to a mere hump in the final stage. The two larvæ, *Leucorhampha triptolemus* Cram. and *L. ornatus* Rothsch., behave exactly as Bates described, and bear their terrifying eye-like marks on the ventral surface.—S. K. Montgomery: Report on the Crustacea Brachyura of the Percy Sladen Trust Expedition to the Abrolhos Islands under the leadership of Prof. W. J. Dakin, D.Sc., F.L.S., in 1913; along with other crabs from Western Australia. Of 57 species and varieties in the collection, there are 8 species and 4 varieties described as new; and a new genus is suggested to contain one of these, along with *Grapsus inornatus* (Hess) and *Brachynotus octodentatus* (Milne-Edwards). The Brachyuran fauna of the Abrolhos Islands is more nearly related to that of the north of Australia than to that of the south and south-west. The Ninety Mile Beach, north of Broome, has divided the Brachyura into a northern and a north-western group. The relative absence of the Oxystomes both from the north-western and the southern groups is noted. The Brachyuran fauna of Australia as a whole, and of the south of Australia in particular, varies considerably from the general homogeneity of the Indo-Pacific.

Physical Society, Nov. 22.—D. P. Dalzell: Heaviside's operational method. The method of treatment incorporates the views of the late T. J. I.A. Bromwich with those of J. R. Carson, and is identical with that advocated by Van der Pol. It involves unrestricted use of complex integration as employed by Bromwich, and thus avoids such uncertainties as arise from the use of operators denoted by incomplete symbols. The theory of integration provides a complete explanation of all the aspects of Heaviside's method of solving differential equations.—E. T. Hanson: The dynamical theory of resonators. The theory of the

small resonator with neck communicating with the open air depends upon the assumption that the air within the neck may be treated as an incompressible fluid. The theory is extended to include generally necks of variable cross section.—E. C. Atkinson: Escapement errors of pendulum clock. Prof. Sampson's theory of maintenance is applied to find equations for the errors of rate caused by changes in intensity and limits of the impulse and in friction of moving parts of the impulse mechanism. For the Cottingham clock, rigidity of the stops limiting the impulse is the most important point in design. The equations are also given for the dead beat escapement and show that working conditions which are good so far as friction is concerned are bad for barometric changes. The method used for computing 'remote' error in these cases must be modified when the inertia of the impulse mechanism is appreciable as in the Shortt clock.

## DUBLIN.

Royal Irish Academy, Nov. 11.—J. J. Nolan and J. G. O'Keeffe: The ions produced by discharge at liquid surfaces. Chattock's method is used to determine the mobilities of ions produced in discharges at water and alcohol surfaces. The ions are of the same character as those produced by discharge at metal points or by the ionising radiations. The observation of Tyndall and Phillips, that in air saturated with *n*-butyl and *n*-amyl alcohols the mobility of the positive ion is greater than that of the negative, is confirmed.—Miss A. L. Massy: The Mollusca of the Irish Atlantic Slope. The Mollusca (other than the Cephalopoda, Amphineura, Pteropoda, and Heteropoda and Nudibranchia) taken by the Fisheries Branch of the Department of Agriculture, Dublin, on the west of Ireland since the year 1900: the area covered is between lat. 49° N. and lat. 56° N. Records east of the Fastnet Light, Co. Cork, have been excluded and the western boundary is the 1500 fathom line. Many rare deep-water species have been captured. 313 species are enumerated, and under the fossil distribution will be found many records from Irish and Scandinavian sources not very accessible to students of the group.

## PARIS.

Academy of Sciences, Nov. 4.—Eugène Slutsky: The extension of the theory of periodograms to series of dependent quantities.—B. Demtchenko: An inverse problem to the problem of Dirichlet.—Henri Cartan: The zeros of the linear combinations of  $p$  given integral functions.—Georges Valiron: Mero-morph algebroid functions.—A. Markoff, jun.: Nearly periodic movements.—E. G. Barrillon: Concerning discs rotating in a fluid.—R. de Malleman: The calculation of the atomic frequencies in solids. The formula of Lindemann rests on the hypothesis that at the melting-point the amplitude of the atomic vibrations should be equal to the mean distance of the atoms. From the author's calculations this is inexact, and the ratio is smaller than unity, 0.06 for aluminium, silver, gold, platinum, copper, iron, nickel, cobalt; 0.08 for the alkaline metals; and 0.04 for liquid mercury. This ratio is practically equal to the product of the coefficient of expansion and the absolute temperature of fusion.—Albert Turpain and Michel Durepaire: The electric charges developed in certain amorphous dielectrics under the action of pressure. This phenomenon is exhibited by ebonite, paraffin, glass, and especially by crêpe rubber. A diagram is given showing the electrical charges produced in rubber as a function of the pressure.—E. Pierret: A new mode of receiving ultra-short [electric] waves, 10 cm.—18 cm. wave-length.—L.

Jolland: The conductivity of solid salts at high temperatures.—G. Bruhat and R. Legris: The absorption of aqueous solutions of tartaric acid and of alkaline tartrates.—P. Vaillant: The absorption spectrum of cobalt chloride and its variations. Six solutions of cobalt chloride were studied, the first pair in water varying in concentration, the other four at the same concentration but in varying solvents. Analysis of the results showed that the ion  $\text{Co}^{++}$  acted throughout as the only absorbing agent, its activity varying with the concentration and with that of the other ions in the solution.—R. Gindre: A phenomenon of atmospheric optics.—Jean Thibaud and Jean J. Trillat: The diffraction of the X-rays in various substances, principally in liquids.—A. Grumbach and S. Schlivitch: The rôle of the atmospheric oxygen in photoelectric batteries with coloured liquids.—A. Boutaric and Mlle. M. Dupin: The slow evolution of mixtures of colloidal solutions resembling anaphylactic effects.—M. Bourguet and Mlle. V. Gredy: The selective action of a hydrogen catalyst. A study of the addition of hydrogen to phenyl-acetylene with colloidal palladium as the catalyst. The determination of the velocities of hydrogenation shows that the reaction takes place in two distinct stages, first the production of phenylethylene and then the formation of the saturated hydrocarbon. The reaction velocities of these two stages differ considerably, and if, after the complete conversion into phenylethylene, the reaction velocity for the second stage is reached, the fresh addition of phenylacetylene to the mixture re-establishes the velocity of the first stage.—Albert Portevin and Pierre Chévenard: The influence of the fineness of structure at the time of annealing grey cast irons.—Dumanois and Mondain-Monval: The direct oxidation of hydrocarbons by the air. A closed bomb containing pentane and air under pressure was maintained at various temperatures between  $80^\circ\text{C}$ . and  $230^\circ\text{C}$ ., portions being withdrawn from time to time and tested for carbon dioxide and for aldehydes. It was shown that some degrees below the temperature of spontaneous inflammation, chemical reactions were taking place in the mixture, heat being disengaged and carbon dioxide and aldehydes being formed. Similar results were obtained when the pentane was replaced by other hydrocarbons (hexane, heptane, octane).—G. Dupont and J. Lévy: The auto-oxidation of abietic acid.—Georges Darzens: The condensation of the chloride of dimethylacrylic acid with benzene: dimethylvinylphenyl ketone as a product of the reaction. This reaction does not give the hydrindone which might be expected, the reaction stopping at the first stage, dimethylvinylphenyl ketone,  $\text{C}_6\text{H}_5 \cdot \text{CO} \cdot \text{CH} = \text{C}(\text{CH}_3)_2$ .—Maurice Nicloux: The micro-estimation of carbon and the estimation of this element in arable soil. A modification of the method described in earlier communications avoiding the use of a microbalance.—C. P. Nicolesco: The discovery of the Cenomanian in the valley of Ganzeville (Seine Inferieure).—Pierre Lesage: Continuation of researches on precocity and its heredity in *Lepidium sativum*.—M. Bridel and J. Rabat: Variations in the composition of new branches of *Amelanchier vulgaris*. Determinations of the amelarioside in the fresh branches showed large variations from month to month: no reasons for this variation can be assigned at present.—Et. Fœx and Et. Rosella: Contributions to our knowledge of the *Piétin* of wheat.—J. Magrou, Mme. M. Magrou, and P. Reiss: Action at a distance of various factors on the development of the egg of the sea-urchin.—Mlle. Choucroun: The hypothesis of mitogenetic radiation.—A. Blanchetière: The pepsin and trypsin hydrolyses of the gliadin of wheat in their relation with the formation of the diacipiperazines.

## BRUSSELS.

Royal Academy of Belgium, April 13.—Th. De Donder: The invariantive theory of the calculus of variations (4).—Oct. Dony: (1) An experimental contribution to the study of heating and of electric furnaces. The author replaces platinum, or refractory alloys such as nichrome, with soft iron of large cross section, up to 5 mm. diameter for cylindrical wires. The currents employed were of the order of 200 amperes, and with suitable heat insulation, temperatures of  $1150^\circ$ - $1200^\circ\text{C}$ . could be maintained for long periods. Examples of laboratory applications of these furnaces are given.—(2) The reduction of zinc oxide by gaseous carbon monoxide at atmospheric pressure and at high pressures. The electric furnace described above has been applied to the reduction of zinc oxide in carbon monoxide at  $1100^\circ$ - $1300^\circ\text{C}$ .—D. Pompeiu: An integral property of functions of two real variables.—Jean P. Bosquet: Some fundamental formulæ of the invariantive theory of the calculus of variations.—Louis van den Berghe: Observations on the sense of smell and on the mechanism of the olfactory currents in some Teleostians. The detailed study of five species, with ten illustrations, is given. The sense of smell varies greatly in different forms; *Blennius pholis* finds its prey both by sight and by smell, whereas *Cottus bubalis* does not use the sense of smell.—Maury: Report of the geodesic section of the Institut Cartographique Militaire.—Lucien Godeaux: The fundamental curves of birational transformations of space.—André Grosjean: The discovery of a horizon with marine fauna at the Limbourg-Meuse coal mine at Eysden (Belgian Campine).

May 7.—G. Cesàro: The directions of extinction of an ensemble of two parallel crystalline plates, placed, in monochromatic light, between a fixed polariser and a movable analyser. The conditions necessary for the existence of extinction positions. The fictitious spherical triangle from which these relations can be deduced.—Cl. Servais: The geometry of the tetrahedron.—L. Godeaux: Point correspondences between surfaces.—J. Pasteels: Analysis of the physiology of the egg of the pholas (*Barnea candida*).—A. De Waele: The influence of carbon dioxide on the vernal awakening of the snail. There is an optimum temperature (about  $18^\circ\text{C}$ .) for ending the snail's winter sleep: for the same temperatures moisture favours the awakening, and moist carbon dioxide has the same effect. Dry carbon dioxide prolongs the hibernation.—F. Dacos: A crucial experiment for the diffusion of electrons.—E. Leloup: The maturation and fecundation of the egg of *Salpa fusiformis*.—M. Cosyns and R. Moens: Note on piezo-electric quartz. Researches on the limits of the accuracy obtainable with a quartz crystal utilised as a frequency standard. The different factors capable of modifying the frequency are studied singly. The method utilised has the advantage of being a zero method, and at present has an accuracy of the order of one in 10,000.—G. van Lerberghe: The characteristic equation of perfect solutions and of regular solutions.

June 1.—Th. De Donder: The invariantive theory of the calculus of variations (5).—Cl. Servais: The geometry of the tetrahedron (2).—Lucien Godeaux: The connected points of cyclic involutions of order three belonging to an algebraic surface.—Marcel Winants: A generalisation of Fredholm's equation.—P. Swings and Fl. Bureau: The integration of the equation of the quasi-Keplerian orbits by the method of successive approximations.—G. van Lerberghe and Mlle. G. Schouls: A characteristic equation for binary gaseous mixtures.