

Research Items.

THE CAUSAL ORGANISM OF BRAXY IN SHEEP.—There has been much dispute regarding the essential symptoms and the causal organism of braxy. What may be called the old school considered the disease to be due to an anaerobic, motile, spore-bearing bacillus, giving rise to an inflammatory condition of the fourth stomach. But the latest revision of our present state of knowledge, by Dr. J. P. McGowan (*Centralbl. f. Bakteriol., Parasit., und Infektionskr., Jena, Bd. 91, 1923*), shows that, in face of the criticism of continental workers and of the author himself, this view must be abandoned, for feeding or inoculation with the alleged causal organism fails to produce braxy. It would also appear that the symptoms usually considered to be those of braxy are in reality very rapid post-mortem putrefactive changes. Examination of very fresh carcasses shows the abundant presence in pure culture of *Bacillus bipolaris septicus ovium*, inoculation with which reproduced the disease; and this would indicate that braxy is a hyperacute form of hæmorrhagic septicæmia. Sheep are pre-disposed to attack under conditions of lowered resistance, often dependent upon climatic factors, such as the presence of a large quantity of frosted grass in the food, or exposure to severe day and night fluctuations of temperature. Sheep which are feeding poorly seldom suffer from the disease, and to this fact the author attributes the success of the well-known pig-dung drench and of the "vaccines" prepared from non-causal bacilli, since both treatments throw the sheep seriously out of condition.

INSULIN.—The chemistry of insulin is described in an article by Mr. Norman Evers in the *Chemical Age* for November 3. So far back as 1885 Mering and Minkowski noticed that complete extirpation of pancreas from dogs was followed within a few days by diabetic symptoms similar to those observed in human beings. Lepine suggested that the pancreas gave some secretion which controlled carbohydrate metabolism, and this view gained ground. Schafer suggested the name "insuline" for the secretion produced by certain groups of small cells in the pancreas. Many attempts were made to prepare an extract of the pancreas which on injection would reduce the blood sugar of a diabetic patient, but it was left for Drs. Banting and Best, working under Prof. J. J. R. Macleod at Toronto University, to crown these efforts with success. Mr. Evers describes the original method of extraction in some detail, and considers the subsequent improvements; he also treats of the purification, chemical properties, and of the other sources of the substance. Apparently, for the present, ox and pig pancreas are the only available economic sources. It will be recalled that an article by Prof. J. J. R. Macleod describing the action of insulin appeared in *NATURE* of October 27, p. 625.

TROPICAL AMERICAN ASCOMYCETES.—Among the Ascomycetes of Tropical America are several puzzling forms of Discomycetes, which in habit recall rather the Basidiomycetous genus, *Auricularia*. Just before his death the late Prof. Durand had revised a number of these forms, and his findings have been published by Dr. Roland Thaxter, with some notes and two plates of figures added. The long-established genus, *Midotis* Fr., is now clearly characterised for the first time, whilst some other curious species, including some previously grouped under *Cordierites* Mont, are now placed in a newly formed genus, *Ionomidotis* Durand. Seven species of this new genus are described, and a key supplied for their identification.

CONTROL OF DISEASE IN THE PALMYRA PALM.—Something of the problem involved in carrying out remedial methods in phytopathology is to be seen in the report by W. McRae, appearing in the *Memoirs of the Department of Agriculture in India*, volume 12, No. 11, July 1923. In 1905 Dr. E. J. Butler identified *Phytophthora palmivora*, Butl., as the cause of the serious disease of the Palmyra palm, *Borassus flabellifer* Linn., occurring in the Madras Presidency. This palm is of great importance to the native community both for its fruit and for its use as the source of a fermentable liquid used in the preparation of toddy. For the latter purpose the leaves at the apex of the shoot are cut. Older leaves are sometimes cut also for use either as fuel or as a source of fibre. Control of the disease has involved the cutting, removal, and burning of the green tips of diseased trees and then, as experience showed it possible, the removal of outer diseased leaves from less severely affected trees, which then frequently recovered from the disease. The author concludes that, during the fifteen years in which the control operations which he reviews have been in progress, some three-quarters of a million palms have been saved, and he affirms definitely that the disease has been reduced from a grave menace in 1908 to a controlled problem at the present time. The operations, carried out by native workers under the supervision of a special staff recruited from the Revenue Branch of the District Administration, are estimated to have cost 20,000*l.* for the period 1916–1921. Until the application of the Pest Act, everything had to be done with the acquiescence and co-operation of the villagers, the result being so careful an attention to propaganda and education in the reasons for remedial measures that during the first two years' operation of the compulsory clauses contained in the Pest Act only one prosecution has proved necessary.

THE THEORY OF ISOSTASY.—At the meeting of the Royal Geographical Society on November 12, two papers discussing the theory of isostasy from very divergent angles were presented. The briefer one, "Doubts and Suggestions on Terrestrial Isostasy," by Captain Alberto Alessio, is critical of Hayford's method of treating Pratt's hypothesis: his assertion that the field of force of gravity, being observed only at a limited number of points, can be produced in an infinite variety of ways by appropriate distributions of density may be assented to; but he brings forward no arguments of sufficient weight to explain away the value of Hayford's simple general hypothesis as to the distribution of density under mountain or oceanic regions, as a means of accounting for variations in the gravitational field. The second paper, on "Abnormal Densities in the Earth's Crust disclosed by Analysis of Geodetic Data," is by Prof. W. Bowie, of the United States Coast and Geodetic Survey, who has continued Hayford's isostatic researches. It is a valuable and interesting résumé of the present state of the theory, indicating both its many successes and the extent to which it is to be regarded as a simplification—for purposes of preliminary analysis and computation—of the probable real facts. The anomalies or differences of the observed gravity data from the values calculated by Hayford's method are shown to be much less than those from the values calculated by Bouguer's method, in which no account is taken of the isostatic compensation. It is also shown that the Bouguer anomalies increase rapidly for elevated stations, while the "isostatic" anomalies show a purely normal accidental distribution. Even so, a considerable class

of cases in which the isostatic anomalies suggest decided departures from isostatic equilibrium can be reasonably accounted for by what may be regarded as a second approximation to the facts; the simple Hayfordian theory is that the compensating excess or defect of density is distributed uniformly throughout a column of a certain depth, independent of locality. Prof. Bowie has shown that in many cases there is geological evidence for the existence of heavier or lighter rocks (as the case may be) nearer the surface, and that these are capable of accounting for many of the anomalies referred to, without supposing the isostatic compensation to be incomplete.

CARBONISATION OF COAL.—The Fuel Research Board has issued a report (Technical Paper No. 8) on "The Steaming of Wigan Arley Coal in Vertical Gas Retorts" (H.M.S.O., 9d. net). It sets out the results which were obtained when this particular coal was carbonised with gradually increasing quantities of steam in the Glover-West vertical retorts of the Fuel Research Board's experimental station at Greenwich. The coal is one largely used for gas-making in Lancashire, and the tests on it were carried out "at the request of the Preston Gas Company, the Wigan Coal and Iron Company, Ltd., and Messrs. West's Gas Improvement Company, Ltd., these firms combining to bear the cost of 300 tons of coal for the purpose." A large amount of detail as to the results obtained finds its place in the text of the report, and particularly in tables given at the end, from which it is plain that an attempt has been made to secure as much information as possible during the tests for the guidance of gas engineers who may be thinking of using this coal. It is interesting to note that some data have been acquired for the fuel consumption, as reported thus: "The amount of heat required per ton for the carbonisation of this coal, including the sensible heat in the products, varied from 13.0 therms with 5 per cent. steam to 18.25 therms with 20 per cent. steam. The intermediate points were not obtainable owing to the amount of heat which was taken up by the setting when only three retorts were in use being unknown."

TEMPERATURE-MEASURING INSTRUMENTS.—A useful booklet of 71 pages has been issued by the Cambridge and Paul Instrument Company, in which a concise account is given of the various temperature-measuring instruments made by this firm. A perusal of its contents shows that the number of useful devices applicable to the measurement of temperature is continually increasing, so that the user has now a much wider choice than heretofore. Descriptions are given of dial and index thermometers, the latter being provided with an electric alarm attachment for ringing a bell when the temperature differs from that at which it is desired to work. With both these types continuous records may be taken on charts by means of a moving pen. In connexion with platinum resistance thermometers, direct-reading indicators for any assigned range are provided, in which the movements of the pointer depend upon the extent to which a Wheatstone bridge is thrown out of balance by the varying resistance of the platinum at different temperatures. Thermo-electric pyrometers, with base-metal and rare-metal couples and suitable indicators and recorders, are described; a form used for measuring surface temperatures, and methods of cold-junction control, being of special interest. Amongst radiation and optical pyrometers, a description is given of a recent pattern of the disappearing filament type, capable of reading to 2100° C. A new feature is the introduction of devices for the automatic control of temperatures, either of gas or electric furnaces or tanks of liquids.

Control is effected from the indicator by means of a relay, which comes into action when the required temperature is reached, and operates a mechanism which regulates the supply from the source of heat. The instruments described under this head represent a distinct advance in temperature-measuring appliances.

"FISHING" IN OIL-WELL DRILLING.—Fishing is a term employed by the driller to cover a multitude of different operations connected with the drilling of oil-wells, but it is invariably synonymous with trouble of some kind or other, and always calls for the greatest skill and ingenuity on the part of the operators concerned. Technically speaking, the processes of side-tracking of tools, casing, or similar obstruction, frequently necessary in emergency, also come within the purview of "fishing jobs." The recovery of lost or "stuck" tools, runaway tools, broken ropes or rods, lost or broken casing, the removal of "frozen" pipe or other obstacle impeding the drilling of the well—these are some of the many kinds of trouble experienced by the driller. Fishing methods differ with the type of drilling system in vogue, with the efficiency of the drilling crew, and to a large extent according to the country in which the oil-field is situated. It should be borne in mind that operations of this character are usually lengthy, tedious, and expensive, since while they are being carried out the well certainly cannot be earning any money; consequently producers are becoming more and more alive to the necessity for reducing fishing operations to the absolute minimum, by the employment of the most skilful drillers, equipped with the most up-to-date tools and devices for achieving the desired results. Drilling is becoming more and more of a science, less of routine manual labour; it is therefore valuable to have the advantage of a paper such as Mr. Albert Millar's, read on November 13 before the Institute of Petroleum Technologists, dealing with the Galician-Canadian pole tool fishing methods, which provided a natural sequel to his previous paper on the same system of drilling for petroleum.

MERCURY AS A WORKING SUBSTANCE FOR BINARY FLUID TURBINES.—The possibilities of the use of mercury in this connexion were discussed in a paper read by Mr. William J. Kearton before the Institution of Mechanical Engineers on November 16. No fluid exists which possesses the ideal conditions for a single fluid turbine; hence the use of two fluids—one having a high boiling-point to be used in a high-temperature turbine, and the other with a low boiling-point to be used in a low-temperature turbine. Mercury may be used for the first fluid and steam for the second. It is stated that an experimental mercury-vapour turbine has been built in the United States by the General Electric Company to the designs of Mr. Emmett, and that a second turbine has recently been put into operation. There does not appear to be any published information on the subject in Great Britain. A considerable amount of experimental work has been done by chemists and physicists on the properties of mercury, but all the data required for a complete study of the problem are not at hand. A large amount of research work, particularly in connexion with the determination of latent heats at high temperatures, remains to be done. A considerable part of Mr. Kearton's paper is taken up with a discussion of the properties of mercury, and the results obtained by many workers are reviewed. The author has calculated tables giving the relation of temperature, vapour pressure, sensible heat, latent heat, total heat, entropies of the liquid, of evaporation, and of the mercury vapour; these tables appear in the paper, and are supplemented by diagrams showing the properties graphically.