

urgent attention. Foods that are too soft or too finely prepared are frequently causes of dental decay, and many serious illnesses, as well as cases of chronic debility, are due to poisons absorbed from the roots of decayed teeth.

The sour-milk cure, which is now in great vogue, was fully discussed from all points of view, and its benefit in suitable cases was placed beyond doubt. More practical evidence is needed, however, and the discussion will have done much to point out the directions in which this evidence should be sought.

An address on surgery was delivered by Prof. Gilbert Barling, in which he discussed the treatment of cancer. He referred in terms of praise to the work of the Imperial Cancer Research. There was evidence that the tissues resisted the inroad of cancerous growths, though little was as yet known of the nature of the resistance. We had not yet discovered the factors which heighten or lower this power of resistance. In considering the means available for the cure or relief of malignant growths, he discussed the application of X-ray and radium treatment. His conclusions were, on the whole, in agreement with those of Drs. Dominici and Wickham. He emphasised the fact that a genuine cure is not to be expected from these agents in cases of advanced cancer, and he further emphasised the great importance of early detection. Only one real opportunity for cure existed, and this was at the first operation, which should be undertaken at the earliest possible stage of the disease, and advantage of this opportunity should be pressed to its fullest extent.

Dr. J. Mitchell Bruce, in his address in medicine, gave a brief record of the most important additions to medical knowledge during the period since the association last met in London.

First came the discovery of the spirochæte of syphilis; of the part played by the mosquito in malaria and in yellow fever, and by the goat in the diffusion of Malta fever; of the connection of a trypanosome with sleeping sickness; of the Leishman-Donovan body with kala-azar; and of the *Diplococcus intracellularis meningitidis* with cerebro-spinal fever. The existence of typhoid carriers had been fully demonstrated, as well as the dangers of other typhoid products than the stools. The effects of oral sepsis had been worked out, and proved to be so widespread, so multiple, and frequently so grave, as to make us ashamed of our previous blindness to a common source of blood infection staring us in the face all those years. Auto-intoxication proper had attracted professional—and only too much public—attention, and led to the introduction of a great variety of dietetic and medicinal "cures." Of improved methods of observation and diagnosis, blood examination deserved first mention; and special interest and importance attached to the Widal reaction in typhoid and to the Wassermann reaction in syphilis. Radioscopy, which was coming into clinical use in 1895, had been greatly improved and extended, more particularly in its applications to the investigation of gastric and intestinal disorders and diseases; and the orthodiagraph must be mentioned in this connection. A great impetus had been given to the study of cardiac irregularity, and the sphygmomanometer was now generally employed. A real advance had been made in the introduction of lumbar puncture as a means of diagnosis in cerebro-spinal diseases.

"During these fifteen years several new methods of treatment of the first rank have been either introduced or perfected. Chief of all comes serum-therapy and vaccine-therapy. Of great importance is the employment of spinal analgesia as a substitute for general anæsthesia, the dangers of which have been closely investigated in relation to the status lymphaticus, as well as to post-anæsthetic acid intoxication. Other powerful means of treatment have been discovered in radium, in the Röntgen rays, and in the Finsen light."

A very complete medical museum formed an important part of the meeting. It included a very valuable series of microscopical preparations showing the blood parasites of malaria, sleeping sickness, and other tropical diseases. The Imperial Cancer Research showed a beautiful collection of specimens, lantern-slides, and diagrams giving a very good idea of the valuable methodical work which is being carried out by this institution under the directorship of Dr. E. F. Bashford. In the museum, the value of

Röntgen-ray diagnosis was again to the fore, for many of the sections showed negatives, prints, lantern-slides, or diagrams to illustrate the Röntgen-ray appearances in various diseases. There was also a large exhibition in which numerous firms of publishers, instrument makers, chemists and druggists, and manufacturers of special foods and dietetic preparations showed their most recent work. In the electrical apparatus section, the great power of the modern generating apparatus was very obvious, each firm being able to show apparatus capable of giving so powerful a spark that a Röntgen-ray photograph could be taken by a single flash. Different contrivances were shown to accomplish this, including various forms of mercury jet interrupter, of electrolytic interrupter, and the well-known Snook apparatus, in which an alternating current is generated and transformed by means of a step-up transformer placed in a bath of oil, the secondary current being rendered unidirectional by a simple contrivance. A new apparatus was shown by Messrs. Schall for raising the internal temperature of the body by employing the thermal effect from a high-frequency apparatus. In a spark-gap where the electrodes are separated only by the thickness of a sheet of paper, undamped oscillations are generated at the rate of more than a million a second. Similar oscillations are used in wireless telegraphy for the production of continuous oscillations. The voltage of this new type of generator is less than 3000, but currents of 500 to 3000 milliamperes are used, and the patient feels nothing except the rise of temperature. The method is said to be useful in chronic cases of rheumatic and gouty origin.

The social functions included a reception by the Corporation of the City of London at the Guildhall, a garden-party at Ranelagh, receptions at the Natural History Museum and at a large number of hospitals. Special services were held in Westminster Abbey and Westminster Cathedral.

There was a large and distinguished assemblage for the annual dinner, at which Dr. Butlin presided. The Earl of Aberdeen, Lord-Lieutenant of Ireland, emphasised the good work of the British Medical Association, and expressed his opinion that those responsible for measures of social and hygienic reform should come to the association for direction as to the best means by which such reform can be carried out. As an example of a much needed reform, he dwelt on the unnecessary and noxious fumes from motor-cars. In referring to the valuable scientific papers delivered at the various sectional meetings, he selected for special note the paper by Sir J. J. Thomson, the eminent Cambridge physicist, in which he pointed out that certain substances could be made to give out a radiation which had much the same physical properties as some of the radiation given out by radium, and suggested that these radiations might be found to have the same effect upon the tissues as those at present obtained by the application of radium.

The Bishop of Kensington, speaking at a breakfast given by the National Temperance League, said that temperance owed no small debt to the British Medical Association for the new light it was constantly throwing on scientific investigation. It was to the professional men rather than the politicians that we must look for the solutions of the social problems of the day, foremost among which was that of temperance.

Thus medical progress was discussed in all its aspects at this—the greatest annual meeting by far ever held by the British Medical Association—and the discussions added new vigour to the work of observation and investigation.

THE INSTITUTION OF MECHANICAL ENGINEERS.

THE summer meeting of the Institution of Mechanical Engineers took the form of a joint meeting with the American Society of Mechanical Engineers. More than one hundred and fifty members of the latter society took part in the meeting, which opened in Birmingham on Tuesday, July 26. The reading and discussion of papers occupied the mornings of Tuesday and Wednesday, and on Thursday the party proceeded to London, where a *conversazione* was held at the Institution House in Westminster. On Friday morning further papers were read and discussed in the lecture hall of the Institution of Civil Engineers, kindly lent for the occasion. The institution dinner took place

on Friday evening. The many excursions and visits to works were attended by large numbers of members of both societies and their lady friends.

At Birmingham, four papers on the handling of locomotives at terminals and running-shed practice were contributed by Messrs. F. H. Clark, F. M. Whyte, H. H. Vaughan, and W. Forsyth, all members of the American Society, and one on the same subject by Mr. Cecil W. Paget, member of the British Institution and general superintendent of the Midland Railway.

In the latter paper, Mr. Paget gives plans and description of two of the most recent sheds built in this country, viz. the Great Western sheds at Old Oak Common, of the centre turntable or round-house type, and the London and South-Western shed at Eastleigh, of the through straight type. Straight sheds are economical in first cost and maintenance, but unless they are of the type known as "through sheds" they are awkward to work; the latter class are necessarily draughty. The centre turntable type, though more expensive to build, possesses considerable advantages of working, because engines can be easily got in and out without moving others, and, in addition, better lighting and convenience in getting about and in bench accommodation are possible. There is, however, the disadvantage that when the turntable requires lifting for repairs it throws the whole of the pits served by it out of use whilst the repairs are going on. So far as possible, engines are allotted to and kept for the same drivers, and this is almost universally the rule in the case of passenger engines on most English railways. By this plan casualties are lessened owing to the greater care taken by the driver in working the engine and in properly reporting defects; as a result, the coal consumption is generally less.

Mr. F. M. Whyte, of New York, describes American methods of handling locomotives at terminals. To insure uninterrupted turntable service, two turntables may be supplied in a circular engine-house, the house being divided into parts, each having a turntable. Mr. Whyte deals very fully with the question of pooling locomotives, i.e. the system of increasing the service of the locomotive by placing any crew on any locomotive for service instead of holding it until its assigned crew could obtain the necessary rest. Extensive experiments have been made to determine the relative costs of the assigning and the pooling systems, and in some of these experiments no material difference in cost has been found. There probably is some loss in trustworthiness of service in pooling.

Some very good drawings and photographs of American engine-houses and their appliances are given by Mr. F. H. Clark, of Chicago. A common length of turntable for new installations is 80 feet. For boiler-washing, recent installations are the National, in which the steam and water blown off from the engines are used for washing out and for heating fresh water, and the Raymer system, which is of the enclosed-heater type, and performs similar functions. Mr. W. Forsyth, of Chicago, describes the arrangements of the Pennsylvania Railroad at East Altoona, Pa. The engine-house is in diameter and cross-section the largest structure ever erected for this purpose, having an exterior diameter of 395 feet and a turntable of 100 feet. There are fifty-two stalls, each 90 feet deep. Mr. Forsyth states that the reduction in boiler pressure from 225 lb. to 160 and 180 lb. has also reduced the number of boiler failures, and has permitted the more continuous use of locomotives which results from the pooling system. Mr. H. H. Vaughan, of Montreal, considers that in passenger service pooling is objectionable under any conditions, and should be avoided if possible. In freight service he considers that pooling is advisable if conditions are such that engines cannot be run with assigned crews. His experience is that where assigned crews can be used on engines, the cost of repairs, the amount of fuel consumed, and the class of service obtained will all be more satisfactory.

Other papers read at Birmingham were one on tooth gearing by Mr. J. D. Steven, of Birmingham, and another on interchangeable involute gearing by Mr. Wilfred Lewis, of Philadelphia, Pa. Mr. Steven considers the involute form of tooth only, as being that which is in most general use, and would welcome uniformity of opinion in the matters of cutting and using gearing. If a new form of tooth is desirable, it is his opinion that the stub form

with 20 degrees angle of pressure would be a change in the right direction for the following reasons:—it can be used right down to twelve teeth in its true form, and cut on either a single cutter or on a generating machine; it is a stronger form than that most commonly used at present; a very large proportion of its face does useful work; the possible objections on the score of less contact and greater bearing pressure are so slight as to be nearly negligible.

Mr. Wilfred Lewis is chairman of a committee of standards for involute gears appointed about a year ago by the president of the American Society of Mechanical Engineers. Twenty-five years ago, as a result of investigations made on behalf of the firm of Wm. Sellers and Co., he recommended the adoption of a pressure angle of 20 degrees in place of 15 degrees commonly used. This practice has been since followed by the firm, and has given satisfaction in a general way. Mr. Lewis has since advocated an obliquity of $22\frac{1}{2}$ degrees as giving less interference on twelve-toothed pinions. Experiments on behalf of the author's committee are being made at the Massachusetts Institute of Technology, and, although not conclusive, enough has been done to indicate that the friction loss in gear-teeth is influenced to a greater extent by the length of the addendum than by the obliquity of the system.

The papers read and discussed in London dealt entirely with problems connected with the electrification of railways. These were contributed by Messrs. F. W. Carter, of Rugby, H. M. Hobart, of London, W. B. Potter, of Schenectady, L. R. Pomeroy, of New York, and G. Westinghouse, of Pittsburgh, the latter being the president of the American Society of Mechanical Engineers.

Mr. Carter directs attention to electrification as a means of recovering traffic drawn away from the railway by trams and motor-omnibuses, an expedient which has invariably been found successful in regaining much of the lost traffic. Modern electric railway apparatus leaves little to be desired in the matter of freedom from breakdown. There are about 200 miles of electrified route in this country, for the most part worked by motor coaches, employing a multiple-unit system of control. There appears little prospect of general electrification of the railways of this country, as no advantage is apparent which would in any way justify the expense.

Mr. Hobart draws comparison between systems employing series wound, continuous-electricity train-equipments, and the single-phase system. Continuous equipment provides, per ton of equipment, 11 horse-power at the axles (averaged over the journey), as against 6 horse-power per ton in the case of single-phase equipment. Mr. Hobart gives figures showing that 10 per cent. less of the takings are available for dividend paying in the single-phase system than in the continuous-current system.

Mr. Westinghouse is convinced that the extended distribution of electricity for industrial purposes can be secured only by the generation of alternating currents of high voltage and their conversion by static transformers into currents of various voltages, and has developed his business along these lines. He earnestly recommends to the serious consideration of railway engineers and those in authority the pressing need of determining the system which admits of the largest extension of railway electrification, and of a prompt selection of three standards of electrification which will render possible a complete interchange of traffic in order to save expense in the future and to avoid difficulties and delays certain to arise unless some common understanding is arrived at very shortly.

Mr. Potter considers that the development of apparatus for higher voltage direct-current has so far increased its scope that direct current at 600 volts or higher may be considered the most economical for city and interurban service. Single-phase and three-phase stock equipments are applicable only to exceptional conditions.

Mr. Pomeroy deals with the electrification of trunk lines, and concludes with the following paragraph, which called forth the commendation of Mr. Aspinall, the president of the Institution of Mechanical Engineers. The idea is all too prevalent with the public, and even with some of the bodies that have been given legal power of supervision over railway companies, that any expenditure which can be

forced upon the railway companies is just so much gain for the public. Never was there a more absolute fallacy. In the long run, the cost of every bit of railway improvement must be paid for by those who buy tickets and ship freight. Economy in the administration of our railways is just as important in the interest of the general public as if the railways were actually under Government ownership.

THE BRITISH PHARMACEUTICAL CONFERENCE.

THE forty-seventh annual meeting of the British Pharmaceutical Conference was held at Cambridge on July 26, 27, and 28, under the presidency of Mr. F. Ransom. The presidential address dealt mainly with pharmaceutical research, and Mr. Ransom indicated certain directions in which progress may be anticipated. He deplored the fact that a better organisation did not exist to bring together the two classes of investigators—pharmacists and pharmacologists. If a joint committee consisting of medical men and pharmacists were appointed with the object of organising research work, investigations might be directed in the proper channels, and better results would be obtained. The president dealt at some length with the question of the cultivation of medicinal plants, and commented upon the attempts which had been made to obtain plants of more or less standard alkaloidal content. He suggested that a subject inviting investigation was whether the variations in the constituents of drugs were due solely to the seasons, or whether they depended upon other conditions. Referring to the subject of the standardisation of disinfectants, which has recently received much consideration, he said that neither the chemical nor bacteriological processes which had hitherto been devised seemed to be applicable in all cases, although for specific purposes comparisons of efficiency might be deduced.

In addition to the president's address, twenty-one papers were communicated, the larger number of which were of purely pharmaceutical interest. The papers which aroused the most considerable discussion were those dealing with the testing of disinfectants.

In a paper contributed by Prof. Sims Woodhead and Dr. C. Ponder, the authors made clear their position in regard to the question of standardisation of disinfectants. On analysing the Rideal-Walker drop method, they picked out and gave consideration to the following factors:—organisms to be acted upon; number of micro-organisms and amount of organic matter to be added; strength and number of dilutions; time during which the disinfectant is allowed to act; temperature. Prof. R. T. Hewlett in his paper criticised the Woodhead-Ponder method, but expressed the opinion that the use of *B. coli* instead of *B. typhosus* is perhaps a desirable change, although further investigation is necessary.

Mr. C. T. Kingzett and Mr. R. C. Woodcock contributed a paper, in the course of which it was pointed out that while the Rideal-Walker test may very well serve to determine the relative germicidal values of similarly prepared preparations of a coal-tar nature, it is not applicable for ascertaining the real or relative value of other disinfectants of a different chemical nature. Dr. D. Somerville also read a paper. There was a long discussion on these papers, in which Dr. Rideal, Dr. E. Feilmann, Mr. J. E. Purvis, and others took part, and in the course of reply Prof. Sims Woodhead said he did not wish to doubt the value of the Rideal-Walker method, because he thought it was of extreme value, but they must not be expected to accept it as a final standard.

Another paper to which reference may be made is that by Mr. J. F. Tocher, last year's president of the conference, in which the author describes a modification of Mendeleëff's classification of the elements; the suggested new arrangement, which the author thinks may ultimately prove to have a satisfactory theoretical basis, places elements of like properties in similar positions, while elements with unlike properties are separated by distances proportional to the intensity of their differences.

In a paper on the interpretation of water analysis reports, Mr. J. E. Purvis pointed out the impossibility of fixing any standard by which waters can be judged and

condemned; but, he said, there were certain rules which appeared to be necessary before a final judgment could be delivered upon any water. These were briefly as follows:—

- (1) the history of the water should be supplied to the analyst;
- (2) the rainfall before and after the analysis should be obtained, because a heavy rainfall before analysis means that the amounts of the constituents are not the same as compared with the analysis before the rainfall;
- (3) the method of storage and of distributing the water should also be considered;
- (4) the surface drainage may be a factor;
- (5) a bacterial analysis should go hand in hand with a chemical analysis;
- (6) the final judgment with regard to the quality of a water should rest with the chemist and bacteriologist in collaboration.

Mr. P. E. F. Perrédès described an insect pest in belladonna (*Épitrix atropæe*, Foudras, a small beetle belonging to the tribe Halticæ of the series Phytophaga), and suggested a method of eradication.

As a result of a chemical examination of the rhizome of *Cimicifuga racemosa*, Mr. H. Finnemore found distinct reactions for alkaloids, but the amount present is very small.

The meeting, as a whole, was one of the most successful which has been held for many years. The attendance was somewhat larger than usual, and the interest taken in the papers was evidenced by the excellent discussions thereon.

ASSOCIATION OF ECONOMIC BIOLOGISTS.

THE ninth annual meeting of the Association of Economic Biologists was held on July 6, 7, and 8 in the Beyer Buildings of Owens College, Manchester. The association was indebted in particular to Profs. Hickson and Weiss for kindly hospitality, and to Mr. J. Mangan for the arrangements he had made as local secretary. Prof. G. H. Carpenter, of the Royal College of Science, succeeded Mr. A. E. Shipley, F.R.S., as president, and in the course of his address dwelt on the close interdependence of research in so-called "pure" and "applied" science. The original discovery of minute protozoal parasites in the blood of various animals was apparently perfectly "useless," yet it prepared the way to modern methods of dealing with terrible diseases of the tropics, such as malaria and sleeping sickness. Similarly, the more recent researches of workers intent primarily on alleviating these diseases have resulted in many discoveries of great theoretical significance.

Turning to another topic, Prof. Carpenter reported that a new crop—tobacco—in Ireland had brought to notice fresh pests, amongst others, a spring-tail new to science. He suggested that this was not a new introduction, but more probably an animal hitherto present in small numbers, which had multiplied under the stimulus of an ample supply of a congenial food plant.

A very interesting discussion arose out of Prof. S. J. Hickson's paper on the place of economic zoology in the modern university. The author pointed out how at present the demand for trained men capable of dealing with agricultural and other pests is in excess of the supply, especially in the colonies. He outlined a scheme for securing to students an efficient grounding in general science combined, by cooperation with experiment stations, with proper practical experience. Stress was laid on the importance of the fourth year's work, and the advisability of securing, if possible, training at a central agricultural college or experiment station, e.g. in India or Ceylon, for those destined for a tropical career.

Another well-discussed and important topic was the problem of wild-bird protection, introduced by Mr. W. E. Collinge, who pointed out that under the restrictions imposed by the Wild Birds' Protection Acts some birds had apparently multiplied to an excessive degree. He advocated securing definite knowledge as to which birds were harmful, and taking steps to secure their diminution, e.g. by placing in schools specimens of the eggs of such birds, and offering rewards for their collection. The discussion brought out prominently the difficulty of determining exactly whether certain birds, e.g. the rook, were beneficial or harmful in all districts and at all seasons; and practical suggestions, some of which are already being utilised, for acquiring this necessary knowledge were made.