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EDITORIAL

Industrial Textiles

DR. PICKARD in his Presidential Address skims lightly and pleasantly over the whole field of textiles, including the visible and the invisible clothes, and gives a brief account of the special characteristics that belong to cotton, wool, silk, rayon, rubber, and asbestos. We wish that he had given us far more of this sort of information, for though it is very familiar to him and to many others engaged in the study of textiles, recent information on the chemical structure and physical properties of textiles in general is scattered in many papers and many journals. We must be thankful to Dr. Pickard for what he has given us and at some time we must modestly and delicately hint to him that if he will give us much more our gratitude will also be increased. It seems that two quite new physical methods of investigating the properties and structure of textiles are coming into use, the one the use of electron diffraction, the other the use of molecular rays. These are both in an early stage of development and the interpretation of the records obtained is difficult; it is quite possible that the task is so difficult that it ought not to be attempted in a Presidential Address intended for an audience whose intensity of chemical study ranges from the extremely diffuse to the most highly concentrated. Moreover at an Annual Meeting there are sometimes distractions that tend to interfere with the highly philosophic thought and much rarefied atmosphere necessary for the comprehension of detailed mathematical analysis. Dr. Pickard no doubt thought it better to mention the possibilities of these new techniques and to whet the appetites with such a stimulant rather than to invite his hearers to a meal which would not be quickly nor very easily assimilated by some of the youngest and some of the fairest to whom he spoke. He pleaded in the latter part of his remarks for co-operation between the practical and theoretical students of the different varieties of textiles so as to produce materials of mixed origin adapted to the special needs of industry and there would seem to be interesting possibilities in such co-operation. He is obviously the very one to organize it and give it the blessing of his experience and inspiration.

Newcastle-on-Tyne

The Mohammedan who has made the trip to Mecca rejoices for ever afterwards in having the prefix *Hajî* to his name. So might the chemist who has so many letters after his name wish for a few in front to mark the fact that he has taken a Pullman to Newcastle, for the history of the organization of chemical industry in this country might well start off with "In the beginning there was Newcastle." There is no need for us to dilate here upon the important part played by Tyneside chemists in the history of the Society. Now, after more than half a century, the Society is once again holding its annual meeting in Newcastle, the city that might be called the directing nucleus of all the vast productive cytoplasm of the north of England. What shall we say of Newcastle? That it has eight bridges, a Lord Mayor, four M.P.s, and a bishop, and that the city covers more than eight thousand acres and houses nearly three hundred thousand inhabitants? Enough of this. Rather let us say that in a city where one hears many reverberating r's and broad vowels, there seems to be little of that spirit which tradition has with so little justification ascribed to our friends north of the Tweed, and indeed a hearty welcome is being given to the members of the Society who are so fortunate as to be able to attend the annual meeting. In the city itself there is enough and to spare to interest chemists and industrialists. Hard by is Billingham, the centre of the nitrogen industry; at Elswick is the famous works of Vickers-Armstrong Ltd., and round about are the factories of many industries. Yet if you would forget briefly that you were a chemist, it would not be hard to do so. The "sights" are worth seeing, which is more than Mr. Cook can always say. There are the castle,

St. Nicholas' Cathedral, the Tyne Bridge, the South African Memorial, and not least of all, Armstrong College, where the Society is holding most of its meetings, and if you have had enough of the town there is the Roman Wall to be seen at Chollerford, and you can find quiet in the charm of Jesmond Dene. Four days is all too little to do more than glance casually round the city. Perhaps when Lord Melchett's suggested three months' holiday for all materialises we shall be able to spend the time in Newcastle that the city demands. In the meantime, the annual meeting is being held in a notable centre of industry, where chemists can talk of chemistry and feel at home, and between times get together for some true symposia.

Combustion Research

Professor Bone's Medal Address on Combustion Research gives a clear and readable account of the essential principles of a great mass of work done during the last fifty years: work that is vaguely known to us all, but the details of which are readily forgotten by those who have had many other subjects to consider in their working and leisure moments. Many famous names are associated with this work, Vernon Harcourt, Le Chatelier, Berthelot, Dixon, Baker, Smithells, and Bone himself, together with other names referred to in this address. The research on combustion has dealt with a variety of problems only two of which Professor Bone has referred to at any length. The first is concerned with the propagation of flames and explosions and the determination of the speed of propagation: also with the photographic recording of the flame, a feat of some difficulty for the front of the flame is rotating some thousands of times a second. The second problem is concerned with the preferential treatment displayed by oxygen when exploded with hydrocarbons: this piece of research seems to have originated with Dixon, who in 1891 exploded equimolecular mixtures of ethylene and oxygen and obtained a mixture of carbon monoxide and hydrogen. The process is not in fact so simple as this statement might imply because, as prophesied by H. E. Armstrong in 1874, the oxidation of ethylene is a gradual business, and the first products are sundry alcohols, aldehydes, and acids that undergo further oxidation and become less stable as the temperature increases. It seems that the laws of natural selection operate in the chemical world just as they do in the vegetable world, the world of the animals in general, and that highly civilized world constituted and adorned by man and woman. Professor Bone, so far as we recollect, gives no reason why oxygen should prefer a hydrocarbon to hydrogen or carbon monoxide; he merely tells us that it does and he suggests that the hydrocarbon molecule is better looking and possibly better fed. His remarks remind us of the mathematician in love, whose fame is preserved by Rankine: said he, if the wandering course of the moon by algebra can be predicted, the female affections must yield to it soon, but the lady ran off with a dashing dragoon and left him amazed and afflicted. The affection of oxygen, like some of the manifestations of affection in the civilized world we have mentioned, seems to go by favour.

THE FIFTY-SECOND ANNUAL MEETING OF THE SOCIETY

The meeting this year has been a little longer than that at Nottingham was last year, and members who have endeavoured to make the most of everything offered have been having a busy time. Three separate Group sessions make a new departure for an annual meeting, but if this is an innovation there has been nothing tentative or immature about the programmes arranged by the Groups. In addition to these sessions there have been the annual general meetiug, the Presidential Address of Dr. Pickard, and the Medal Address from Prof. Bone. Altogether these have made up a very useful programme, and on the social side there have been the annual dinner, three receptions, and a dozen or more excursions and works visits, some of which are still in progress.

The meeting opened on Monday evening, July 1(, with an informal gathering of members in the King's Hall of Armstrong College, and members took full advantage of the opportunity to renew old acquaintances and to meet Dr. Dunn, Prof. Clemo, Mr. Craggs, and others of the Tyneside branch of the Society. Chemists it seems are punctual to a fine degree. Half-an-hour before the gathering in the King's Hall was due to begin you might have thought the whole meeting was doomed to failure for lack of support. But an hour later the hall was full of those little groups of old friends newly met amœba-like ingesting new arrivals every now and again. From eight until midnight dancing went on, with several intervals for some fine singing by Madame Wiggins and Mr. William Hendry. The whole evening was thoroughly enjoyed by two or three hundred members and their guests.

This informal gathering provided members with their first opportunity of getting to know Armstrong College in which most of the meetings have since been held. Armstrong College, of the University of Durham, was given its present name in 1904 in memory of the late Lord Armstrong, but its history goes back some thirty years before that time. The block of buildings in which the King's Hall is situated was opened in 1906 by King Edward VII. The hall itself is a fine spacious building and its unusual squareness and tall leaded windows give it a noble appearance; the Society could hardly wish for a better one in which to meet. For some years now the College has been renowned for its work in mining, chemistry, agriculture, and other subjects; it has been a real link between science and industry, and those members who had not previously been to Newcastle must have been much interested to see for the first time this famous place; since Monday evening they have had opportunities of seeing all that a fine building holds.

Chemists are busy men, and not all the visitors to the Newcastle meeting were present on Monday evening but amongst a distinguished company there were present Dr. R. H. Pickard (retiring president) and Mrs. Pickard, Dr. J. T. Dunn (president-elect) and Mrs. Dunn, Dr. R. T. Colgate, Prof. W. A. Bone, Dr. L. H. Lampitt, Mr. W. A. S. Calder, Mr. F. A. Greene, Mr. George King, Prof. F. J. Wilson, Dr. J. A. Cranston, Mr. H. J. Hodsman, Dr. L. A. Jordan, Dr. R. Lessing, Mr. A. Lowe, Mr. H. Talbot, and Dr. J. B. Firth.

THE PREVENTION OF INDUSTRIAL DISEASES OF THE SKIN*

By H. HALDIN-DAVIS, M.D., F.R.C.P.

The chief industrial diseases of the skin are firstly anthrax, the most dramatic and perhaps the least common: secondly, cancer of the skin which may be due to several different causes: and thirdly, trade dermatitis which is always with us. Not less than 15,000 cases of dermatitis are certified by factory surgeons every year. There is hardly any trade in which the workers escape it altogether, while some occupations yield a very large number of cases. Among the workers most frequently attacked are engineers, bakers, flour and sugar confectioners, french polishers, workers in the fur trade, and those concerned in the many different forms of the chemical and dyeing industries. Those whose occupations expose them to frequent contact with oils exhibit a peculiar variety, a folliculitis rather than a "dermatitis." The humble domestic worker is by no means exempt, the use of soda and other alkalis (which are far more injurious to the skin than acids) make ordinary household cleansing duties fraught with danger to the housewife and mother, and not only does she frequently exhibit dermatitis of varying degrees of severity but, as I pointed out in a communication to the Dermatological Section of the B.M.A. in 1931, the macerating effects of soap, soda, and water on the thin skin round the nails renders her peculiarly liable to a very chronic and resistant type of onychia. But I do not propose to-day to discuss the industrial diseases of the skin from a dermatological aspect: I thought it would be more interesting if I gave you a short résumé of the measures recommended by public authorities and adopted and developed by manufacturers for their prevention.

The importance of this subject has long been recognized by the Government and made one of the duties of the Home Office. It is one of those curious anomalies so characteristic of British organization that all matters concerning the health of the factory worker are dealt with not by the Ministry of Health as one might expect, but by the Home Office. This is no doubt due to the fact that long before the Ministry of Health came into being a highly efficient department had grown up under the Home Office which naturally refused to surrender it. The late Sir Thomas Legge, who was Senior Medical Inspector of Factories for about thirty years, was much interested in industrial skin diseases—and so is his successor Dr. Bridge, and since 1907 a constant stream of memoranda, regulations, placards, leaflets, etc. dealing with them has emanated from that department to guide, exhort, and warn the employers and the personnel concerned. The original order of 1907 awarded compensation for "eczematous ulceration of the skin produced by dust or caustic or corrosive liquids, or ulceration of the mucous membrane of the nose or mouth produced by dust." I will not detail all the other regulations since promulgated, but some of them mark distinct steps forward, e.g., in 1916 the term "dermatitis" was introduced first, and made a subject for compensation when caused by "dust or liquids." At that time the sufferer was only entitled to payment if he or she were disabled not only as regards the particular occupation in which the dermatitis was contracted but also as regards any other form of employment, while in 1923 an order was made entitling the worker to compensation if disabled only as regards the occupation in which the dermatitis was contracted. This right to compensation is conditional on the Judge before whom the case is heard being of opinion that the disability is due to *long continued exposure* to dust or liquids in the dermatitis-producing occupation. Dermatitis is a compensatable disease but not a notifiable disease. The Home Office has not considered it necessary to make dermatitis notifiable because it is of opinion that it would not learn any more about it by doing so and it would add considerably to the expense of administration for this reason—the notification certificate would have to be paid for by the State, whereas now the work person, him or herself, pays for the certificate entitling to compensation. The only cutaneous diseases which are notifiable are the following: anthrax, epitheliomatous ulceration due to tar, pitch, bitumen, mineral oil, paraffin, etc., and chrome ulceration. The reason why such diseases are made notifiable appears to be that otherwise they would escape notice and there would be no way of estimating the success or otherwise of the measures adopted for their control.

With this introduction I can now briefly indicate the measures employed for the prevention and control both of the notifiable skin diseases and of industrial dermatitis.

Firstly, as regards anthrax: for the prevention of this very serious complaint reliance is placed primarily on preliminary disinfection of the raw material and on proper conditions of employment, but seeing that if diagnosed early anthrax is quite amenable to treatment, a precautionary card has been devised by the Home Office for use in such industries as are liable to anthrax, and it is given to any workman who may happen to develop a pimple or sore for bim to take to his doctor when presenting himself for treatment. On the card are figures of early anthrax lesions and the possibility of the development of that disease is indicated, and I think that you will agree that this card is a very tactful method of suggesting to the doctor the possibility of anthrax infection and hence securing the all-important early treatment.

As regards skin cancer, it has been thoroughly established that those most likely to be affected are mule spinners and those concerned in the distillation of coal tar, the manufacture of patent fuel, and the refining of paraffin oils. For full information reference should be made to the report on epitheliomatous ulceration among mule spinners published by the Home Office in 1926. The committee came to the conclusion that the best methods of prevention consisted in: (1) the provision of an innocuous oil, but in the present state of our knowledge they were unable to recommend any particular brand; they expressed the hope that research would throw more light on this point; (2) adequate protection of the workers against contaminati

* Read before a joint meeting of the Food Group of the Society and the Metropolitan Branch of the Society of Medical Officers of Health on May 26, 1933.

The most practical device they considered to be the provision of an anti-splash screen, while they also recommended that manufacturers of spinning machinery should provide non-splash bearings, which however are unfortunately more expensive than others. They thought it impracticable to insist on the use of garments impervious to oil as these would add greatly to the discomfort of the worker; (3) they emphasized the importance of scrupulous cleanliness and the early removal of the oil by washing; (4) regular medical inspection of the workers with a view to the earliest possible diagnosis of the cases. After all it must be remembered that pre-cancerous conditions of the skin and the early stages of cancer itself affecting the skin are very amenable to surgical treatment. In order that medical inspection should be efficient they recommended that it should take place at the factory itself every four months and include every worker over 30 years of age, and should be performed by specially appointed medical men interested in the subject. These recommendations, although specially adapted for mule spinners who number not less than 70,000 in the whole country, are also applicable when appropriately modified to other individuals who work under conditions liable to produce epithelioma of the skin. A special warning placard has been prepared setting forth the precautions to be taken for the prevention of oil dermatitis, which is one of the most important precursors of epithelioma.

The only other notifiable disease of the skin is chrome ulceration. Chromium compounds have long been known as substances extremely dangerous to the skin and mucous membranes. Formerly they were chiefly employed in certain forms of printing and leather dressing, but in recent years chromium has come into prominence owing to the development of chromium plating, which is rapidly approaching nickel plating in industrial importance. As is well recognized it produces definite ulcers on the skin of those who use it, known as "holes," and a very characteristic lesion is perforation of the nasal septum. The production of these "holes" processes encouraged by any slight abrasion or scratch imply because, as it is wonderful how quickly they can 1874, the oxidation of ethane occurred after a single day's and the first products are sundry. When chromium and acids that undergo further oxidation they fumes are less stable as the temperature increases. It seems to the the laws of natural selection operate in the chemical world just as they do in the vegetable world, the worst of the animals in general, and that highly civilized world constituted and adorned by man and woman. Professor Bone, so far as we recollect, gives no reason why oxygen should prefer a hydrocarbon to hydrogen or carbon monoxide; he merely tells us that it does and he suggests that the hydrocarbon molecule is better looking and possibly better fed. His remarks remind us of the mathematician in love, whose fame is preserved by Rankine: said he, if the wandering course of the moon by algebra can be predicted, the female affections must yield to it soon, but the lady ran off with a dashing dragoon and left him amazed and afflicted. The affection of oxygen, like some of the manifestations of affection in the civilized world we have mentioned, seems to go by favour.

extremely common and is always giving rise to trouble in a great number of trades, but it is probably most common and most troublesome in the enormous food industry, *i.e.*, among bakers, confectioners, jam and preserve makers, etc.

Dermatitis due to food substances is no new discovery. The first text-book of dermatology published by Robert Willan in 1808 contains plates and descriptions of bakers' itch due to dough, and grocers' itch due to sugar, and we are still, more than a hundred years after, struggling against the same troubles. But we have this advantage: we do not concentrate so much on treatment as on prevention. Those who have to deal with industrial dermatitis are all agreed on the most important points to bear in mind in keeping it down. The first is selection of the personnel to be employed. In all the best factories in which food is handled, the skin of the candidates for employment is carefully examined before being taken on, and all those who have any active skin disease or whose skin shows any marked departure from the normal, are excluded. In particular it has been found that any degree, however slight, of *ichthyosis predisposes the skin very markedly* to dermatitis. In one factory in this examination not only is the skin of the hands and forearms carefully inspected, but also that of the feet and toes. Any tendency to scaliness and exfoliation of the epidermis in these regions causes the possessor to be rejected. No doubt in theory it would be advisable to test all candidates for employment for the possession of any idiosyncrasy towards the substances with which they are to come into contact, but this seems to be impossible. The next step is to see that the conditions of employment are as favourable as possible. This is where the State comes in. In certain trades employers are compelled to provide workers with proper facilities for washing, including an adequate supply of hot water. In good factories the lavatory accommodation is above reproach, and it is to be hoped that provision of washing accommodation will become universal. Moreover, in certain trades in which dermatitis is common the employer is compelled to exhibit a cautionary notice which is written in very plain and easily understood language, and the advice given is extremely sound. It recognizes moreover that the worker with a tender skin is to some extent situated between the devil and the deep blue sea, for while scrupulous cleanliness is essential, the too frequent use of soap and water is in itself a source of irritation.

The next point which I desire to emphasize is the importance of constant supervision. This is recognized by the requirements of one or two of the more recent Factories Welfare Orders and was practised in the better factories long before that time. This inspection is extremely important because it enables skin troubles to be detected at a very early stage when they are still amenable to treatment. Dermatitis usually starts as a dry erythematous patch either in the interdigital folds or on the extensor aspect of the fingers or hands, and as a counsel of perfection any worker exhibiting it in the slightest degree should be immediately removed from the work which may have excited it.

Dr. Howard Mummery, who has for many years been

in charge of one of the largest food-producing firms in the country and sees these cases in a far earlier stage than the mere dermatologist, emphasizes two points in the successful treatment of these cases. Firstly, the removal from the influence of the irritant, and secondly the prohibition of washing while any sign of dermatitis is present. The best application for treatment he finds to be an ointment containing zinc oxide, 2 drachms; starch, 2 drachms; vaseline, ½ oz. with the addition of 10 mm. liquor picis carbonis. This he orders the patient to rub thoroughly into the lesion. Personally, in treating dermatitis cases I find it better to omit the liquor picis carbonis, but like other dermatologists I only see the worst cases in which much damage has already been done and in which a stimulating preparation such as liquor picis carbonis is prone to increase the inflammation. Dr. Mummery's patients have every inducement to carry out his orders thoroughly because his firm finds it advisable to make up the legal compensation allowance paid to sufferers from industrial disease (of which dermatitis is only one form) to their usual wages as long as his orders are carried out. If he reports that the patient is not doing his or her best to get well the firm's contribution is stopped.

In addition to the weekly inspection, manicure is provided free for employees where special cleanliness is desirable and especially among fruit pickers who seemed to be particularly liable to peri-ungual sepsis before manicure was provided. It has been suggested by some inspectors that bowls of weak antiseptic should be placed on the benches for the workers to dip their hands into from time to time, but this suggestion has never found favour because in the first place the antiseptic tends to get into the food material which is being worked upon, which is obviously undesirable, and in the second place the dermatitis to which these workers are liable is due to chemical action and not to sepsis. In some factories arrangements are made to have lavatory basins with hot and cold water laid on actually within a few yards of the machinery, so that adhesive substances such as dough or sugar can be washed off without delay and without the use of special solvents, before they harden on to the skin.

Some time ago attention was directed by correspondents to *The Times* to the use of gloves for the prevention of dermatitis. The use of these is hardly practicable at all in the food trades such as we have been discussing above, but there is no doubt that they are of use in certain occupations. In general it may be said that wearing gloves at work is much more popular in America, both in the U.S.A. and Canada, than it is in this country. Engineers, those employed in the building trades, railwaymen, and timber workers appear to make much more use of gloves than the British workman, who might with advantage follow the transatlantic example more than he does. The layman is often tempted to recommend rubber gloves, but these are only suitable under certain conditions. The outstanding characteristic of rubber gloves is their impermeability to water and thus they protect the skin from its action, but they also prevent the evaporation of sweat and consequently if worn for more than a few minutes tend to cause the hands to become moist and sticky from the accumulation of perspiration which is itself a potent irritant and a frequent cause of dermatitis. Their chief use appears to be among those who have to deal with electrical apparatus where their non-conductivity is very valuable, and also for those who work among corrosive and irritating liquids.

In some trades the hands become soiled with very adherent material and special solvents are sometimes recommended for its removal; for example, for the removal of oil the following wash is recommended by the Home Office:

> chlorinated lime (powdered) 175 g.:
> sodium bicarbonate (crystals) 359 g.:
> boracic acid (powdered) 35 g.:
> water—up to 30 oz.

For use dilute with 10 volumes of water, to be followed by a thorough rinsing with soap and water.

Better however than the use of special solvents is the preventive treatment of the hands with a film of some material to protect the skin against contact with injurious substances. Considerable success has been achieved in this direction by the firm Rosalex, of Manchester, who, working in harmony with the Home Office have produced at least two very useful preparations for the prevention of dermatitis. One is non-greasy and is made up with glycerin and starch and other substances, while the other, Rosalex B, is greasy and consists largely of lanoline. Both are put up very conveniently in containers to be hung on the wall by means of a bracket and fitted with a knob, one turn of which releases sufficient of the mixture to coat the hands with a thin protective film. This serves a double purpose. It prevents to a great extent noxious substances from coming in contact with the skin and also enables them to be removed more easily without the employment of a too vigorous friction. The same firm has also put up a third preparation "C" which is waterproof.

Finally, a word or two as to the position of this country in regard to industrial diseases of the skin as compared with that of other countries. There is no doubt that the worker receives more consideration here than elsewhere. For example, in Germany only the following diseases are compensated:—Effects of *X*-rays, chronic and recurring skin diseases from galvanizing processes, from foreign woods and from soot, paraffin, tar, anthracene, pitch, and allied substances. Compensation is not payable until after 26 weeks' disablement, while in England it is payable after three days, hence the numbers in receipt of compensation are much diminished. In America I gather from the *American Journal of Public Health* that as recently as 1929 Ohio was the only State which up to that time had required the compensation of industrial cases. There it had been in force since 1921 while most of the other States did not even require that industrial skin affections should be reported nor does American public opinion seem to be very sensitive upon the subject. In a review of industrial dermatoses and their treatment by Downing and Welch, published in *The New England Journal of Medicine* in March, 1932, they do not even refer to the necessity of State action for the purpose of minimizing the incidence of these diseases. Certainly I am sure that in this country no one would willingly return to the old bad era of *laissez faire* in this matter,

and though it may be that ingenious and disingenuous members of the working classes may from time to time take unfair advantages of the regulations which are drawn up for their protection and under which they always receive the benefit of the doubt in borderland cases, the necessity for and the advantages of State action have been amply proved and justified.

I cannot conclude without acknowledging the help I have had in the preparation of this paper from Dr. Bridge, the Senior Medical Inspector of Factories, from Dr. Sybil Horner, his lieutenant, from Dr. Trumper, and from Dr. N. H. Mummery.

FRACTIONAL DISTILLATION

A Contribution to the Technique of Laboratory Fractionation

By R. McINTYRE, B.Sc., A.I.C.

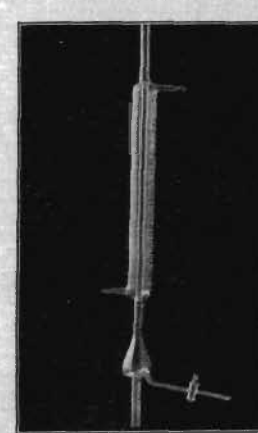
A fairly comprehensive idea of what constitutes modern practice in laboratory fractionation can readily be obtained by a perusal of the catalogues of the chemical apparatus dealers. It will be seen that the requirements of those interested are met by such columns as the Young's 12 pear, the rod and disc, the Ramsay, the Dufton, and a few other more complicated types that seem to exist only in text-books and catalogues. For the advanced worker who wishes for something more powerful, there is the Hemple or packed type of column, with glass beads or Lessing rings, and when fitted with a dephlegmator or fractionator this seems to constitute the most advanced laboratory fractionation equipment available in the ordinary way.

In studying the action of these columns, it is well to remember that the essence of fractional distillation is contact between the rising vapour and the washing reflux, whereby there is an exchange of the less volatile for the more volatile as the vapour rises through the column. This requires the establishment of equilibria which in turn will only take place or reach a maximum under certain conditions, and it is towards the promotion of these conditions that the designer directs his energies.

Considering the simple columns as represented by the Young's 12 pear, in light of the above, it is to be noted that they are used usually without any insulation to keep the heat in or to protect them from the disturbing effects of draughts, and it is apparent therefore that the reflux generated depends principally on the amount of liquid which happens to be condensed over the internal surface of the column. Thus the reflux is originated not at the top of the column but throughout all its length, so that the top sections do not perhaps receive enough reflux and the bottom sections too much. In other words, when used in this manner the operator has no control over the ratio of reflux to distillate and must work with whatever amount is provided by the atmospheric conditions and the boiling point of the liquid.

On the other hand, the wrapping of a duster, asbestos, or brown paper round some of the lower or all of the sections, gives the operator a certain crude control over the reflux in the case of the lower boiling liquids, but this advantage disappears when the temperature rises much above 150° C., for then the whole column has to be carefully lagged for the vapour to rise to the top of the column without the bottom sections becoming choked. Instead of using a duster for keeping the heat in, more elaborate insulation may be employed such as enclosing the whole apparatus in a casing embodying some form of louvre shutters to control the air flowing past the column. A good example of this was used by Heap, Jones, and Speakman (J.S.C.I., 1922, 50A) during researches on pyridine bases.

During the working of the 12 pear column, the rapid manner in which the drops of reflux drop out of the column suggests that these simple types depend for their action more on fractional condensation than



fractional distillation. However, the large drops dropping back do not constitute the whole of the liquid phase, for if a strong light be directed through the apparatus it will be observed that a mist of liquid droplets is constantly oscillating and circulating among the rising vapour.

The Hemple or packed type of column fitted with a dephlegmator has much greater possibilities than any of the simple types mentioned above, for it can be made as long or as wide as desired, and the dimensions can thus be chosen with the view of providing that the descending reflux and the rising vapour are long enough in contact to reach the equilibrium necessary.

An air-cooled column suffers from the disadvantage that condensate is always formed which has traversed only a portion of the column, and it is therefore inefficiently used. A well-lagged column without a dephlegmator or reflux condenser may be equally ineffective and a waste of good material. The column should therefore be well lagged and have a dephlegmator. The form which the latter usually takes is a condenser, the flow of water through which is so controlled that only a portion of the vapour passing through it is

condensed. In the case of liquids of boiling point higher than 100° C., the condenser is filled to a certain level and as the water boils off it is automatically kept at the same level. Altogether this type of dephlegmator is rather difficult to control except with elaborate supplementary apparatus, and when used in the last-mentioned manner, if the water be at all hard, the continual boiling soon deposits a white scale on the outer surface of the vapour tube, and there is continual danger of cracking. This method is of course modelled on large-scale practice. This is known as the "partial condensation" method and is used almost universally in this country. There is however another method of controlling the ratio of reflux to distillate which appears to be in fairly general use in large-scale practice in America, known as the "single condenser" method. It is not commonly met with in this country, and the text-books give no hint that such a method is possible.

In the "single condenser" method, the vapour from the head of the column, instead of going through a dephlegmator to undergo partial condensation, is led to a single condenser at a higher level than the top of the column, and is there completely condensed. The condensate is then divided into two streams by some variable device, one portion being returned down the column as reflux, while the other is retained as distillate and is run to the store tanks. In this method, the objection is frequently made that the composition of the reflux is the same as that of the distillate, and one may be inclined to ask why it is run back down the column instead of being also collected. The answer to this is, of course, that the fractionation is carried out in the column, not in the dephlegmator, and a moment's reflexion will show that in the "partial condensation" method it is also true that the reflux has the same composition as the distillate at any given moment, for exactly the same reason. It is also true that it would not have had this composition had it not been subjected to washing or scrubbing on its ascent through the column, and some of the higher boiling constituent thereby removed from it and replaced by some of lower boiling constituent.

As mentioned above, the "single condenser" method has been used on the large scale mostly in America, and the apparatus described below is an adaptation of this principle to laboratory practice. This dephlegmator offers a number of interesting advantages over the customary type, and is fitted into the top of the column in the same manner as the usual "analyser" or fractionator. It will be seen that by closing the tap, it acts only as a reflux condenser, while by fully opening it all the distillate collects in the channel and is run off and collected, and there is no reflux. By setting the tap in intermediate positions, the ratio of reflux to distillate can be instantly controlled and varied in any degree to suit the course of the fractionation. It does not matter whether the liquid being fractionated has a high boiling point or not. In fact, such liquids as tar acids, heavy naphtha, and even creosote can be drastically fractionated by its use. Another advantage that it provides is that if the operator has to leave the room for a short period, if the tap be closed it may be safely left refluxing without disturbing the gas adjustment; on return on resetting the tap, the operation can be continued at once without loss of time, as would be inevitable if the gas had been extinguished. The principal advantage is however the control which the apparatus affords by which the operator can guide the fractionation at various stages. As an example, in fractionating out say toluene from crude benzol, the thermometer may read 110° C. and the operator may imagine that he is getting pure toluene. On taking a boiling range however, he may find that his distillate has a range of 5° C. By simply adjusting the tap to increase the reflux, he will find that the reading on the thermometer will fall several degrees, and finally rise to 110° C., giving a pure product. This falling of the thermometer reading on increasing the reflux is sometimes most marked.

In one instance, during the fractionation of some naphtha, the thermometer read 125° C. A slight adjustment to increase the reflux was made, and the temperature thereupon began to fall slowly as the conditions in the column changed, until ten minutes later the thermometer remained steady at 110° C., indicating that more or less pure toluene was being collected. This behaviour can be used as a test of whether a pure product is being collected. For example, during the separation of α-methyl pyridine from pyridine bases, the thermometer may read 128° C. If the tap be set to give more reflux for a few minutes and the thermometer remains steady at 128° C., then it is fairly certain that the pure product is being collected. If on the other hand the temperature falls a few degrees, then the operator is on his pure fraction a little prematurely.

Apart from the practical uses of this dephlegmator, it should find a use on the lecture table in demonstrating the principles of fractional distillation, for a few minutes of manipulating the tap and observing the corresponding effect on the thermometer soon gives one a mental picture of what is happening in the column. The simplicity of the apparatus, together with the ready means of control put in the hands of the operator, and its applicability to liquids of high boiling point, make it altogether a much superior arrangement to the old "partial condensation" type, and should supersede the latter entirely.

This apparatus is manufactured by the National Glass Industry, of Lawrence Road, Tottenham, and sells retail at 8s. 6d.

THE RAPID AND ACCURATE ANALYSIS OF BITUMINOUS MATERIALS

By D. M. WILSON

A method was described in CHEMISTRY & INDUSTRY, 1931, **50**, 599—600, for analyzing bituminous materials, and when the recovery of the bitumen for examination is desired, this is the best method to employ. When however great speed is required, as in the case of a central laboratory controlling the daily output from a large number of manufacturing plants, a modified method is recommended. Hot perchlorethylene is used as the solvent and the bitumen solution is drawn through Kieselguhr filter cylinders of the Berkefeld type by means of a vacuum.

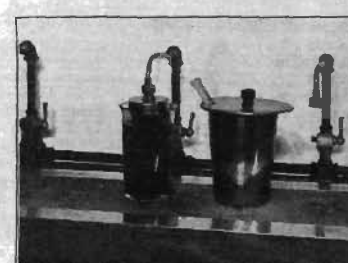
Apparatus.—Two sizes of filter cylinder are employed, 4½ in. long by 2 in. diameter, and 3½ in. long by 1 in. in diameter. The cylinders are cemented into chromium-plated brass caps which are fitted with ¼-in. gas brass union nipples. The apparatus is shown in the illustration. The filter cylinders are connected to the standards by short lengths of thin-walled soft-copper tubing which possesses a degree of flexibility. The standards are screwed into two-way brass taps and allow the cylinders to be connected at will, either to a tube connected to the vacuum pump or to another parallel tube connected to the compressed-air system. A heating panel, in which are fitted electric heating elements inserted in silica tubing, is provided for heating the beakers containing the sample and those containing the filter cylinders.

A vacuum of 25—28 in. of mercury is maintained by a Lacy–Hulbert N.Y.2 vacuum pump. A second machine is kept in reserve and is brought into use when a large number of samples has to be dealt with.

Compressed air is supplied by a Broome & Wade No. 9 air compressor which feeds a tank up to a pressure of 25 lb. per square inch. Air can be admitted from this high-pressure tank to a low-pressure one in which the pressure is maintained at 5 lb. per square inch.

Analysis.—The sample is heated in an oven to a temperature not exceeding 110° C. to drive off any moisture present and to soften the material. Whilst still hot the sample is divided into small portions and allowed to cool. A quantity of the sample, sufficient to be representative, is then weighed and transferred to a weighed aluminium or stainless-steel beaker. A filter cylinder of the requisite size is placed in a suitable glass beaker and the two weighed together after they have been heated in an oven and cooled in a desiccator. The filter is placed on the heating panel, connected to the vacuum apparatus, and hot solvent poured upon the material in the beaker. The bitumen is rapidly dissolved and the solution is poured over into the glass beaker containing the filter, the standard being connected to the vacuum line. After decanting the solvent a further quantity is added to the sample in the beaker and the whole thoroughly stirred. After standing for a few moments it is again poured off into the filter beaker. This procedure is continued until the solution poured over is no longer coloured. If at any time filtration becomes unduly slow, through the pores of the filter becoming clogged with filler, filtration is reversed by turning the two-way tap over to the compressed-air line, which causes the film of filler to drop off the filter and fall to the bottom of the filter beaker. Filtration is then resumed by reconnecting the cylinder to the vacuum line.

After the liquid in the filter beaker has fallen to a low level the filter is washed with hot perchlorethylene from a wash bottle, compressed air being blown through the cylinder at the same time, to assist in removing as much of the filler as possible from its surface. The filter is then allowed to drain all the liquid out of the beaker, the nipple on the stand pipe is loosened, and the filter and its copper tube are rotated through an angle of 180° so that any liquid in the cylinder is drained out. The cylinder is then transferred to an electric oven at 150° C. where it is connected to a tube which is also connected to the vacuum system, so that air is drawn through the cylinder until it is completely dried (about 1½ hours in the case of the large cylinders and 1 hour for the small). The filter and beaker are transferred to a desiccator, and the whole weighed after cooling. The suction tubes in the oven draw off any solvent remaining in the pores of the filter, and in order to recover as much of the solvent as possible for further use, this solvent is condensed in a separate vessel fitted to the vacuum line. In the meantime the aluminium beakers containing the mineral aggregate are dried, in this case also drying being assisted by a copper tube reaching nearly to the bottom of the beaker, and connected to the vacuum system, so that the hot solvent vapour is sucked out of the beakers and also collected at a suitable point in the vacuum line. The beaker with the mineral aggregate which has not passed over into the filter beaker is then weighed. From the loss in weight of



Vacuum analysis apparatus

the sample due to the loss of bitumen, the percentage content of the latter can be determined.

The filter cylinders may be used over and over again, and if they should become clogged a fresh surface can be obtained by merely rubbing with tissue paper. The cylinders are found to retain completely the fine material often present in asphaltic mixtures, and no trace of ash has been found on evaporating the filtrate and burning off the bitumen. The solvent used in the process is drawn into a container, from which it can be removed on restoring the pressure to normal. It is re-distilled and used again. Trichlorethylene may be used as the solvent, but perchlorethylene is preferable as it has a higher boiling point and the loss by evaporation due to the low pressure and in manipulation is not so great.

Solvent recovery.—In order to economize in solvent, and to avoid dilution of the crank-case oil in the pumps, which would cause excessive wear in the bearings, a solvent recovery plant employing activated carbon is interposed between the vacuum line and the vacuum pump. Additional absorbers are also connected to the exhaust pipes of the pumps in order to trap any solvent which may have escaped the absorbers on the vacuum side.

Slow filtering mixtures.—In the case of asphaltic materials containing Trinidad Epuré, solutions of which can only be filtered with difficulty, it is found that filtration can be hastened by adding a weighed quantity of dried "Filtercel" to the beaker containing the filter. The "Filtercel" is stirred vigorously with the solvent in the beaker so as to form a layer on the filter when suction is applied, thus preventing clogging of the pores with the fine mineral aggregate. When grading the recovered mineral aggregate a special allowance has to be made for the "Filtercel" present.

Grading of mineral aggregate.—After removal of the bitumen the aggregate can be graded in the usual manner, any filler still adhering to the filter after the washing process being removed by scraping with a blunt knife, care being taken to remove the layer of filler only, and not the material of which the cylinder is made.

Conclusion.—The method has been found to effect a remarkable saving in the time required to analyze asphaltic materials, and permits the analysis in a few hours of samples large enough to be truly representative. It is free from all risk of error through loss of fine material. It has been employed in the laboratories of Highways Construction, Ltd. for the last five years, and enables the examination of every routine sample to be completed on the day the sample is received.

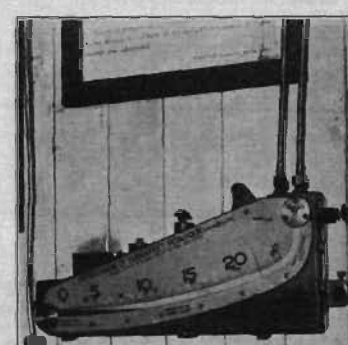
THE CURVED TUBE MANOMETER

SOME NOTABLE DESIGNS

It is well known that both Pitot tube and orifice modified Venturi tube devices are now extensively employed for the measuring of air, town's gas, producer gas, blast-furnace gas, and in fact almost any gaseous medium. The basic principle is that under correct conditions of design the differential pressure caused either by a Pitot tube or an orifice in a pipe line is proportional to the square of the rate of flow of the air or gas. Such meters have many advantages under conditions of low pressure for the chemical and allied industries, including convenience, small size, light weight, low capital cost, and easy construction in any desired material to resist the action of corrosive gases and vapours.

One method of measuring the differential pressure, with direct indication expressed as cubic feet or litres of air or gas per hour or any other desired figures, is to use the curved tube manometer or sensitive liquid pressure gauge. In this connexion great interest attaches to the latest designs of manometers of this type supplied by George Kent, Ltd., Luton (Beds), who make a wide range of orifice and Pitot tube meters with many different types of indicating, recording, and integrating mechanism both for low and high pressure conditions. In order to overcome the inherent difficulty that the flow of the gaseous medium varies as the square root of the differential pressure, giving therefore an extremely small vertical movement at low rates of flow, the manometer tube is of the long curved type. Consequently, the travel of the liquid in the tube at the lower end is so great for small pressure differences that an equally spaced scale instead of a square root scale can be used down to about 1/15th of the maximum flow. The standard "Kent" instrument, known as the CT/I type, also is supplied to work at one of three different maximum heads, that is 0·8 in., 2·0 in., and 4·5 in. water gauge, depending upon the conditions. Thus the 0·8 in. W.G. maximum instrument is particularly suited for very low pressures while the 4·5-in. size is suitable for higher pressures, such as in the measurement of the air blast to cupola furnaces or boosted gas.

As a rule the curved tube is made of celluloid, and is fixed in a case in front of a white background with an accurately graduated scale, while the liquid, oil, or other product, is dark coloured, giving a very definite meniscus so that readings to plus or minus 1/100 in. can be read without difficulty. The manometer is designed on ingenious lines so that no appreciable variation of the zero takes place with change of temperature, a troublesome matter with a number of makes for sensitive manometer. Essentially this is achieved by an automatic compensation, because the relative expansion or contraction of the liquid and of the reservoir containing it



"Kent" curved tube manometer operating on a producer gas plant

balances the alteration of the meniscus in the gauge due to surface tension changes.

Included in the arrangement is a zero adjuster consisting of a displacer operated by a knob through a gland, and equalizing valve so as to check the zero at any time, and a spirit level with levelling screws. When the manometer is to be used for gases containing substances which act upon celluloid, such as acetone or ammonia, the gauge tube is made of glass. In this case however should the glass be broken the instrument has to be sent back to the works for re-calibration.

Various modifications also of the standard CT/I curved tube instrument are available. For example the CTH/I design is intended for high air or gas pressures over 1 lb. per sq. in. pressure and up to 20 lb. per sq. in., having a special safeguarding device so that the liquid cannot be blown out accidentally. The CTM/I type also is a portable form of the instrument for heads up to 0·25 in. water, suitable for use in connexion with double-tipped Pitot tubes under conditions of air velocities of 3—30 ft. per second.

THOMPSON BROS. (BILSTON), LTD.

In the office of the engineering firm of Thompson Bros. at Bilston, South Staffs., there hangs a photograph of a large galvanizing tank, and the visitor is at first tempted to wonder why such an apparently commonplace object should have been photographed. The explanation is that the tank is the largest solid-welded galvanizing tank in the world, weighs 23 tons, and has a capacity of 125 tons of molten metal, and although somewhat prossic in appearance it chances to be one of the crowning achievements of many years of progress in this sort of work, so that the firm is naturally rather proud of it.

Thompson Bros., Ltd. was one of the first firms to manufacture solid welded galvanizing tanks, and it is now many years since the first tank, weighing less than a hundredweight, was produced. The work has developed, and the development received an impetus during the war years, when larger and still larger tanks were needed to deal with torpedoes, until the solid welding of a tank 36 ft. long, 3 ft. 3 in. wide, and 5 ft. 6 in. deep, of metal 2 in. thick, w s accomplished. During a visit we paid recently to the works of the company, we were able to watch the welding of similar tanks. From the production of such tanks the firm has gone on to make a speciality of all galvanizing equipment, and the complete "T.B." galvanizing plant is now in use in many parts of the world. The plant consists of a solid-welded bath containing a roller mechanism arranged to deposit on the metal sheets the required amount of spelter. From this bath the sheets are taken by a cooling conveyor into a swilling tank, which efficiently washes the sheets, and by a further conveyor through rubber-covered rollers which remove excess moisture, and finally into a drying stove fitted with inlet and outlet rolls for automatic working.

This however is only one section of the firm's work. During the last ten years it has developed considerably the production of tank road vehicles for conveying milk, petrol, and other fluids, as well as tar-spraying equipment. Many other productions are of interest to the chemist, particularly the chemist concerned with foodstuffs. In studying such requirements, Thompson Bros., Ltd. has taken well into account the advantages afforded by chromium-steel alloys, and is also taking full advantage of advanced welding technique. A typical example of the work we saw in progress was the manufacture in "Staybrite"—the "stainless steel" produced by Thos. Firth & Sons, Ltd.—of fermenting tanks for the brewing industry. These tanks are of 55-barrel capacity, each being turned out wholly in one piece. The sheets of metal are first shaped, then electrically butt-welded, the inside of the vessel being ultimately ground and polished free from all protuberances and hollows, and the welds are reinforced by welded strips on the outside of the tank. This attention to strength is notable in all the firms' work; we were, for instance, given an account of the tests to which some welded barrels had been put. Not only had the welds been tested with the normal internal pressure doubled, but they had also been dropped on concrete from a height of 20 ft., and afterwards an inflammable liquid was ignited inside them, but even after such savage treatment the welds were unaffected, and appeared to be even stronger than the sheet metal.

FIG. 1
Interior of one of the tank welding shops

FIG. 2
A large hydraulic press at work

Such attention to the reliability of welds has no doubt contributed to the trust which is placed in Thompson Bros. by aircraft manufacturers, for many aircraft components, such as welded exhaust manifolds, aluminium deflectors, tail-skids, etc., are manufactured by that firm.

Pressed metal work enters largely into the firm's manufactures, and in addition to its use in plant for the heavy chemical, oil refining, and electrical industries, it is used for many purposes as an economical substitute for the older methods of casting and riveting. A typical example we saw was the construction of a multiple pressure hat-dyeing machine, made of pressed and welded stainless steel. This machine had receptacles for a number of felt hats, which were to be kept in place by perforated metal cones, so arranged that a constant flow of the dyeing liquid could be maintained through the perforations. Chemical plant is also constructed at the works in aluminium and its alloys, and attention is also given to lining with rubber, ebonite, and glass enamel. This is alone an indication that the firm has in mind all the manufacturers' requirements, and the firm's products are to be found in food processing factories, paper mills, breweries, tanneries, bleaching and dyeing works, and chemical works in many parts of the world.

BIOCHEMICAL SOCIETY

The 156th meeting of the Biochemical Society was held at the Rothamsted Experimental Station, Harpenden, Herts, on Saturday, July 8, when the following papers were read:

"The Action of Vitamin-*C* on Tissues *in vitro*," by Douglas C. Harrison. The surviving respiration of tissues taken from normal and scorbutic guinea-pigs was measured manometrically in oxygen, both with and without the addition of vitamin-*C*. With scorbutic animals, using thin slices of liver suspended in M/20 phosphate buffer (p_H 7·4) the oxygen uptake over a period of 2 hours was increased by 8% to 57% (average 25%) by the addition of $\frac{1}{4}$ mg. ascorbic acid in 3 c.c. The number of scorbutic animals used was 12, the number of determinations being 21. With normal guinea-pigs the oxygen uptake of the liver was unaffected, or even slightly decreased by the addition of $\frac{1}{4}$ mg. of ascorbic acid. (The relatively small oxygen uptake due to the autoxidation of ascorbic acid was allowed for in all cases.) Using chopped muscle, the oxygen uptake with normal animals was slightly increased in presence of $\frac{1}{8}$ to $\frac{1}{4}$ mg. ascorbic acid, while with muscle from guinea-pigs suffering from scurvy a relatively large increase in oxygen uptake was obtained.

"Studies in the Pasteurization of Milk," by E. B. Anderson and L. J. Meanwell. Three main types of organism are associated with pasteurized milk: (*a*) those added as a result of contamination after heating; (*b*) thermophilic bacteria that reproduce rapidly at pasteurization temperature; (*c*) thermoduric species that resist a temperature of 63° C. for 30 minutes but will not multiply at that temperature.

Scrupulous cleanliness of all the equipment in the pasteurizing depôt will reduce organisms of class (*a*) to a minimum.

Thermophilic organisms occur only in small numbers in raw milk supplies, but under suitable conditions they multiply at a great rate during the pasteurization process. Old cells usually show a characteristic lag phase of growth of from three to five hours. Any practice that allows the survival of young actively growing cells will result in very heavy thermophilic contamination. Such practices are long plant runs, re-pasteurization of any returns and any stagnation of milk during its course through the heating apparatus.

Thermoduric organisms are found in large numbers in certain raw milk supplies. The chief cause of a high thermoduric content is failure properly to sterilize the farm dairy utensils. The trouble is increased when farm cooling of milk is omitted.

Satisfactory pasteurization depends on the provision of a clean raw milk supply.

"A New Triol from the Neutral Fraction of Pregnant Mares' Urine Extract," by E. Smith, D. Hughes, G. F. Marrian, and G. A. D. Haslewood. A pregnant mares' urine extract, from which the ketohydroxyœstrin had previously been removed, was saponified with alcoholic KOH. The ether extract of this solution was washed with NaOH and HCl. When the neutral fraction obtained by evaporation of the ether was frozen with benzene, a crystalline product was deposited in a yield of about 5 g. from 700 g. of crude neutral residue. After purification the substance crystallized from methyl alcohol/benzene mixture in small white needles m.p. 303—304·5° C.

The new substance was almost insoluble in benzene and petroleum ether but showed greater solubility in ethyl and still greater in methyl alcohols. The xanthoproteic reaction was negative. A red-orange colour was given on warming with concentrated H_2SO_4; this colour was discharged on dilution. No iodine value was indicated by the Rosenmund–Kuhnhenn method.

Rotations carried out on a thrice recrystallized sample in pyridine solution gave values for $[\alpha]_{5461}^{19-25}$ of −43·8, −44·3, and −44·1. Analysis of the compound gave figures corresponding to $C_{20}H_{34}O_3$ or $C_{21}H_{36}O_3$.

An acetate, m.p. 168—169·5°, was obtained in theoretical yield for acetylation of three hydroxyl groups, on boiling with acetic anhydride. Analytical figures indicated a formula

$$C_{20}H_{31}(O{\cdot}CO{\cdot}CH_3)_3 \text{ or } C_{21}H_{33}(O{\cdot}CO{\cdot}CH_3)_3.$$

In view of the properties and source of this new triol, its possible relation to pregnandiol and the sterols cannot be overlooked.

"The Proteins of Barley Grain," by L. R. Bishop. During development of the grain the quantities of the individual proteins increase regularly with the inflow of total protein, along a definite course, which is characteristic of the variety. There is a small change to final equilibrium and sets of mature samples show the corresponding varietal pattern. Exactly analogous relations have also been demonstrated in the relations of the individual to the total carbohydrates.

Corresponding regularities appear after malting (controlled germination). As a result of these regularities it is possible to form objective estimates of the "quality" of barley samples.

When varieties are compared in the field, regularities appear in yield, nitrogen percentage, and corn weight. The results suggest a mass action type of equilibrium and a possible biochemical classification of barleys and related genera.

"Observations on the Cellulosans of Straws," by A. G. Norman. Those polysaccharides very closely associated with true cellulose in the natural celluloses from plants and woods, and isolated together in the ordinary method of cellulose determination have been termed cellulosans. This fraction differs from true cellulose as typified by pure cotton cellulose in that it is readily susceptible to dilute acids and alkalis. The removal of this fraction from straw celluloses by treatment with dilute mineral acids has been investigated in detail. With strengths of acid from 0·1% to 5% the amount removed is very heavy in the first half-hour or so after which it falls steadily off. The reducing value of the acid extract however shows that the loss is not solely due to hydrolysis to the monosaccharide state. Further the figures for furfural yield of the residue indicate that the loss is not confined to the xylan present, but that the cellulose itself is more or less attacked. The drying of a cellulose preparation renders a portion water-soluble, a phenomenon which can be repeated several times, the amount removed gradually diminishing. Again the loss is not solely due to removal of

xylan. These observations have a bearing on the nature of the association between the xylan and the true cellulose.

"The Preferential Utilization of Different Forms of *Inorganic Nitrogen in the Decomposition of Plant* Materials," by E. H. Richards. Chaffed wheat straw, moistened to hold 75% of water, was incubated at 35° C. in bottles plugged with cotton wool for periods of from 1 to 160 days. Nitrogen was added as ammonium nitrate in the proportion of 1% to the dry straw—half as ammonia and half as nitrate. At intervals analyses of the partly rotted straw were made for ammonia, nitrate, total nitrogen, and dry matter. Ammonia was estimated by the method of Nicholas and Foote, and nitrate according to Bengtsson. Two separate series of experiments with different straws agreed in showing that up to the 14th day the organisms have a decided preference for ammoniacal rather than for nitrate nitrogen. Thus on the 8th day 62% of NH_3 but only 33% of NO_3 had been immobilized as protein. In the later stages there is an approximately equal *disappearance of both forms of nitrogen but it is important* to note that nitric nitrogen is then always lost, presumably as elementary nitrogen, while the ammonia is all immobilized if not originally added in excess. This loss may be as high as 25% when nitrogen is supplied as sodium nitrate only, against no appreciable loss when ammonium carbonate is the only source of inorganic nitrogen. The rapid growth of fungi in the early stages of rotting no doubt accounts for the preference for ammonia at this time. The results have some bearing on agricultural practice, *e.g.*, when unrotted farmyard manure or raw straw is ploughed into soil containing a reserve of nitrate.

"Chemical Simulation of Virus Effects," by F. M. L. Sheffield. Virus diseases in plants, as in animals, often induce the formation of large protein inclusions within the cells of the host. Various suggestions have been made as to their nature. Recent work on solanaceous plants infected with yellow mosaic disease has shown that the inclusions in them consist essentially of aggregations of minute particles of protein which appear in the cytoplasm soon after infection. These inclusions were regarded as peculiar to plants infected with virus diseases, never being found in healthy plants or in association with any other type of disease. Their mode of formation lent support to the view that they are essentially products of reaction of the host cell to the virus and suggested a method by which their formation might be induced in healthy plants.

Plants were treated with substances known to coagulate protoplasm, varying degrees of success being obtained with different reagents. With salts of molybdic acid it was found possible to parallel all the stages in the formation of a virus inclusion body, the mature body being indistinguishable from one produced by a virus disease. After some months the plants develop a mottle closely resembling those produced by infection with virus diseases. It was not possible to transmit this mottle to healthy plants.

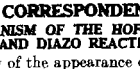
"The Influence of Nitrogen and Potassium on Respiration in Leaves of Barley," by F. G. Gregory.

CORRESPONDENCE

THE MECHANISM OF THE HOFMANN, CURTIUS, AND DIAZO REACTIONS

SIR,—In view of the appearance of a paper by Wal and Moyer (J. Amer. Chem. Soc., 1933, **55**, 2598) on t Hofmann reaction in which use is made of optica active 3 : 5-dinitro-6-α-naphthylbenzoic acid, it appe desirable to give a preliminary accounr of experimer which have been in progress some time.

When optically active 6-nitro-2-methyldiphenyl- carboxylic acid (I) is submitted to the Hofmann Curtius reactions an amine of the same sign of rotation



I

obtained. This can only mean that the time of existen of a free radical is short compared with the time f rotation of the nuclei about one another. Alternative expressed, the nuclear carbon atom is already under t influence of the entering nitrogen atom before t -C-C- linkage is severed.

Experiments are being made on the replacement of similarly situated amino group by OH etc. in t diazo reaction (this JOURNAL, 1931, 269).

I am, Sir, etc.,

F. BELL

Battersea Polytechnic, S.W.11
Jnly 7, 1933

EBONITE IN FACTORY EQUIPMENT

SIR,—Your note on ebonite covering for centrifuga and the correspondence which it has brought forth your issue for July 7, has not quite exhausted the histo of the subject, since a patent was taken out in Germar as long ago as 1883 by Schunke and Iwand (No. 2573 for an ebonite basket for the separation of sulphur acid and aluminium or magnesium chloride solutio from wool.

The Rubber Growers' Association is shortly issuir a booklet on "Rubber in Chemical Engineering" ar we should be glad to receive any further informatic readers may have on this subject.

We are, Sir, etc.,

HENRY P. STEVENS
M. B. DONALD*

15, Borough High Street,
London Bridge, S.E.1
July 10, 1933

* University College.

PERSONAL AND OTHER ITEMS

The Gunning Victoria Jubilee Prize for 1928—32 w recently presented by the Royal Society of Edinburg to Emeritus Professor Sir James Walker, F.R.S., f numerous contributions to physical and gener chemistry.

The Brotherton Research Scholarship has be awarded this year to Mr. H. C. Millet, a student of t University of Leeds, who has recently completed tl B.Sc. degree course and has been awarded first-cla honours in gas engineering. This is the second awa

... scholarship. It will enable Mr. Millet to continue ... investigating research on the influence of sulphur compounds ... furnace gases on the scaling of metals.

The degree of *Ph.D.* has been awarded by the University of London to the following: (chemistry), ... F. Goodway; (agricultural chemistry), A. Walkley; (chemical technology), A. M. Bloch; (biochemistry), ... White.

The University of Dublin has conferred the honorary degree of *Sc.D.* on Dr. J. S. Haldane, F.R.S., director of mining research at Birmingham University, and Dr. W. L. Bragg, Professor of Physics in the Victoria University of Manchester.

The University of Bristol has expressed its regret at the retirement, after nearly forty years' service in the University, of Prof. S. H. Reynolds, Professor of Geology, and also at the resignation of Prof. A. J. Pippard.

The honorary degree of *D.Sc.* has been conferred on Prof. Samuel Smiles, Daniell Professor of Chemistry at King's College, London, by the University of Belfast.

Dr. Watson Smith, jun., who was a pupil of Meldola at Finsbury Technical College and of Lunge and Berl at the Eidgenössisches Polytechnikum, Zürich, has recently arrived in England on leave from South Africa. He has been intimately associated with the explosives industry in that country for the past twenty-five years, originally at Somerset West and latterly at N'dola, Northern Rhodesia.

A well-known American consulting chemist and chemical engineer, Dr. V. R. Kokatnur, is spending a short time in this country on his way to America from India, where he has been for the last two and a-half years. Dr. Kokatnur is examining the possibilities of developing various industries in India.

St. Andrews University

At the graduation ceremony on June 30 the degree of *Ph.D.* (chemistry) was conferred on the following: Miss E. R. L. Gow ("A Study of the Optically Active2-Naphthylglycollic Acids"); W. J. Grubb Contributions to the Chemistry of the Menthols"); and D. W. F. Hardie ("A Research on the Benzoylation of Naphthols etc."). The degree of *B.Sc.* with first-class honours in chemistry was awarded to E. B. Abbot, A. R. Drury, Miss J. T. Fernie, C. F. Griffith, J. B. Kitchin, and A. Ritchie. The Forrester Prize in Chemistry was awarded to A. R. Drury.

Institution of Chemical Engineers

The autumn public lecture of the Institution of Chemical Engineers is to be given by Prof. G. T. Morgan, F.R.S., on October 27, on the subject "Engineering in the Service of Chemical Research." On December 6 a paper on "The Protection of Light Magnesium Alloys by Selenium and Other Coatings" is to be given by Dr. G. D. Bengough and Mr. L. Whitby, M.Sc.

Awards for Agricultural Improvement

The Imperial Council of Agricultural Research in India has decided to institute gold and silver medals to be awarded annually for scientific instruments and appliances, dairying, field implements, machinery, and water lifts contributing to the improvement of agriculture in

Industrial Development in 1932

A survey of industrial development in 1932 published in *The Board of Trade Journal* states that there were 646 new factories established during the year, together with 166 factory extensions, whilst 355 factories were closed down. The new factories provided employment for 44,750 persons. The survey shows that 27 of the new factories were concerned with chemicals, and in this group there were five extensions and 8 factories closed down, the new factories being for the most part in London and the South of England. Expansion of trade was shown in non-metalliferous mining and quarrying, bricks, pottery, and glass, leather, clothing, and foodstuffs. In the latter class the expansion was due largely to the development of the canning industry. There are 14 new factories in this industry and three factories have been extended, the districts concerned being mainly in the Eastern counties and Kent, and there is no record of a canning factory having been closed down.

British Standard Specification for Insulating Materials

A B.S. Specification of particular interest to the plastics industry has recently been issued by the British Standard Institution as B.S.S. No. 488—1933, for insulating materials used in general electrical installations. The appearance of this specification at the present time is particularly appropriate for there is now a tendency to break away from the belief that electrical accessories should be constructed wherever possible of earthed metal, and to substitute all-insulated exteriors.

The materials covered by the specification are classified on the basis of deformation temperature, this being the method recommended by the Electrical Research Association, and having, in the opinion of the drafting Committee, the smallest number of objectionable features. Four grades of materials are covered, these corresponding to good quality synthetic resin (deforming temperature above 140° C.), medium quality synthetic resin (100° C.), loaded hard rubber (70° C.), and non-loaded hard rubber (55° C.) respectively. The limitations of mechanical and electrical properties are defined, and ample appendices deal with the details of the tests for these properties and for the conditioning of the specimens before test.

Whilst it will be possible for certain of the more advanced specialists in electrical mouldings to claim that their technique is in advance of that imposed by the B.S. Specification, the fact remains that the general adoption of the standard aimed at in this specification will rule out many of the inferior components that have a tendency to maintain prices at an uneconomic level. Copies of the specification may be obtained from the Publications Department, British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 2d. post free.

British Oil-Refining Industry

During 1932 the amount of imported petroleum and home-produced oil and naphtha passing through refineries in Great Britain totalled 555,500,000 gal., a decrease of more than 75,000,000 from the figure for the previous year. The output of the refineries was 439,700,000 gal., as compared with 509,100,000 gal. in

for

spirit and fuel oil, of which about 160,000,000 gal. were produced in each case.

Canadian Mining

Despite the low price of copper the exports from Canada in bars, rods, sheets, etc. increased from $9,278,441 in 1931 to $12,654,140 in 1932, Great Britain's purchases accounting largely for the increase. The value of the exports to the United Kingdom in 1932 was $4,854,831 as against $1,056,741 in 1931. The exports to the United States on the other hand fell from $7,016,826 in 1931 to $5,658,075 in 1932. Exports to France, Germany, Italy, Belgium, and Sweden all increa ed.

Chemicals for Refrigeration

The British Association of Refrigeration held its annual summer meeting recently in the offices of Imperial Chemical Industries, Ltd., and an exhibition of chemicals and appliances used in the modern practice of refrigeration, including samples of solid CO_2 or Drikold, was organized by the company. Short lectures were given by *Dr. F. A. Freeth, F.R.S., chief research chemist of* Imperial Chemical Industries, Ltd., and Dr. E. Griffiths, F.R.S., of the National Physical Laboratory.

American Chemical Society Meeting

The annual meeting of the American Chemical Society is to be held in Chicago from September 10 to 15. Distinguished chemists who will be the guests of the Society during the meeting include Prof. George Barger of the University of Edinburgh, Prof. J. N. Bronsted of Copenhagen, Dr. Paul Karrer of Zurich, and Dr. Richard Willstätter of Munich.

Société de Chimie Physique

On the occasion of the 25th anniversary of its foundation, the Société de Chimie Physique has organized a Réunion Internationale which is to take place in Paris on October 16—22 next under the presidency of M. Jean Perrin. Papers will be presented by Prof. E. K. Rideal, Prof. P. Debye, Prof. O. Scarpa, Pr.-Doz. F. Bloch, and a number of other distinguished European scientists.

I.G. Farbenindustrie Works Fire

Considerable damage is reported to have been done in a fire at the works of I.G. Farbenindustrie at Hochst-on-Main, near Frankfort, the two upper floors of the building being completely gutted.

Disbandment of a Chemical Society

Following a conference with the local branch of the Australian Institute of Chemistry it was decided at the annual meeting recently to disband the Chemical Society of Western Australia. The Society was formed in 1915, its first president being Prof. N. T. M. Wilsmore.

Sesamum Crop of British India, 1932—33

From provinces which comprise about 88% of the total area under sesamum in India, it is reported that the present total area sown is 5,697,000 acres, compared with 5,335,000 acres last year, or an increase of 7%. The total yield is estimated at 488,000 tons (excluding Hyderabad for which no quantitative estimate of outturn is made at this stage), as against 426,000 tons, the corresponding estimate of last year, showing an increase

Winter Oilseeds Crop of British India, 1932—33

From information received from reports of provin and states which contain about 95% of the total ar in India under rape and mustard and 92% of the to area under linseed, the total area under rape and musta amounts to 3,169,000 acres, which is 3% below t *corresponding estimate (revised) of last year.* T total area under linseed is reported to be 2,649,000 acr which is 3% above the area reported at this time l year. The present condition of the crops is, on t whole, fair.

Universal Exhibition of Glass in Prague

In the Prague Arts and Crafts Museum, which belo to the Chamber of Commerce, there has recently be installed what is claimed to be the largest exhibition glassware, antique and modern, that has ever be shown in Europe. This exhibition represents the labo of many Central European collectors over a period seventy years. One of the earliest of these v Mr. Vojtěch Lanna, a prominent South Bohemian may who in about 1870 began to make a systematic collect of artistic glassware. He was followed by M. Leon Bon then President of the Prague Chamber of Commer Similar activities were carried on at Liberec (Reich berg) from 1892 by Dr. E. G. Pazaurek, who later beca Curator of the Provincial Museum of Arts and Crafts Stuttgart.

In 1907 Lanna presented his already valuable col tion of glassware to the Prague Museum of Arts Crafts and it has been exhibited there since 1905. example encouraged a number of other patrons, inc ing the late Thomas Bat'a and Mr. Henry Waldes put their collections at the disposal of the museum, recently the Czechoslovak Ministry of Education posited Bondy's collection there too. Thus, throug train of fortunate circumstances a unique collection at last been brought together which now comprises c six thousand items, not only of antique glassware, also of Venetian, German, Spanish, Dutch, Fre English, and local Bohemian work. The exhibit which was recently opened for the general public, incl the finest specimens obtainable and illustrates development of the industry and of the technical artistic processes applied to glassware in all its aspe It may be roughly classified into three sets of exhib

(1) Those representing the earliest types, leadin the mediæval and later products of Venice, Germa Spain, and Holland;

(2) The Bohemian and Silesian group, which prov the leading models for glassware from the seventee century onwards and still maintains its prestige, ar

(3) The examples of English technique whicl characterized by its high standards of grinding polishing.

The installation and arrangements were carried ou Drs. Jirik, Herain, and Poch. The exhibition is c daily, including Sundays, and regular lectures are g to visitors. Specially conducted parties of visi especially those from abroad, are welcomed and wi shown round by an expert.

Technical Applications of Lithium

special application of lithium. Small additions of the metal improve the quality of certain alloys. It is used in lead-bearing metals, a lead-calcium lithium being used on the German railways. It has also been alloyed with aluminium. It is used as a deoxidizing agent for copper, since it does not cause appreciable loss of conductivity. Added to nickel containing sulphur, it forms lithium sulphide, and results in an improvement in the mechanical properties. The additions in this case are made in the form of a Mg-Li alloy. Lithium has been found to lessen the resistance of soft lead to corrosion by strong acids.

Production of Ammonium Sulphate in Japan

The production of ammonium sulphate by Japan has undergone a striking development in recent years. In 1929 it was 250,000 tons, and in 1932 had risen to 700,000 t., with a maximum capacity of 1,000,000 t. With developments now in progress this figure will have risen to 1,500,000 t. by the end of 1934. (Die Chemische Fabrik.)

Export of Casein from the Argentine

The export of casein from the Argentine in the first two months of this year is given by *Die Chemische Industrie* as 4424 tons compared with 1930 t. for the same period last year. Of this quantity 2208 t. were exported to Germany, compared with 643 t. for the two months in 1932. An increase in the production of drugs is also reported, and developments are stated to be in progress for the increased utilization of native timber for paper.

The Nitrogen Industry

According to a statement by Herr von Harben, director of the Stickstoffsyndicat, reported in "L'Industrie Chimique," the fixation of atmospheric nitrogen accounted for 77·1% of the world's total nitrogen production during the last year, Chilean nitrate of soda providing 11% and by-product ammonia 11·9%. The various plants now operating for the fixation of atmospheric nitrogen are stated to be: Haber-Bosch 8, Casale 26, Fauser 16, Claude 19, National Engineering 15, Mont-Cenis 7, Frank and Caro 59.

Japanese Lacquer

It is pointed out in "L'Industrie Chimique" that it is a remarkable fact that Japanese lacquer, which had previously occupied a very important place throughout the world, has almost disappeared since the discovery of cellulose lacquers. This is notable not only in the exports from Japan, but in the internal markets of the country, where cellulose lacquers have replaced almost completely the original national product. Production of lacquer of the old type is now exceedingly rare.

Export of Soda

Figures for the world export of soda (Die Chemische Industrie) show a decline from 600,000 tons in 1930 to 480,000 t. in 1932. The British exports for the two years were 219,522 t. and 186,431 t. Germany exported 94,554 t. in 1932, compared with 74,878 t. in 1930, and is the only country to show a substantial increase. The export from Russia in 1932 was 22,463 t. and that from

REVIEWS

VITAMINS AND OTHER DIETARY ESSENTIALS. By W. R. Aykroyd, M.D. Pp. 218. London: Wm. Heinemann (Medical Books, Ltd.), 1933. 7s. 6d.

Should you imagine, as I do, that you are a bit of an expert about dietary matters, that the elements of food chemistry, the normal processes and physiology of digestion, *are quite well known to you, that you have the* properties, distribution, and behaviour of the 10 (about) vitamins at the tips of your 10 fingers, that you know what are the "trace" metals essential to health and where they occur in natural foods, that the general history of deficiency diseases is to you somewhat commonplace, still I counsel you to do as I have done, put your self-esteem in your pocket and read Dr. Aykroyd's book through from cover to cover.

It was not written for you or me, and perhaps that is why we can learn all the more from it. There is nothing in this book to frighten the lowest-browed of inquirers; *much more remarkable, there is no statement in it to* irritate the most pedantic of biochemists. To have achieved this expository dualism is in itself a remarkable feat. When it is accompanied by a real ability to write English, by a pervading but not too obtrusive sense of humour, and by a genuine enthusiasm for the author's subject as rare as it is frequently simulated, one can only take off one's hat to Dr. Aykroyd in a combination of surprise and gratitude.

On a few points one might feel disposed to disagree with Dr. Aykroyd, but they are either matters of opinion or matters about which he is admittedly only *putting forward tentative* views. At worst, they constitute minor defects, and weigh as nothing in the balance against the outstanding virtues of this book. After a preliminary page, there are chapters on calories, protein requirements, carbohydrates and fats, and the reader is then taken through the discovery of the vitamins, vitamin-*A*, beri-beri, pellagra, scurvy vitamin-*D*, osteomalacia, diet and teeth, and minerals in nutrition. There follow five further chapters, which together comprise something in the nature of an epilogue. After discussing the dietary value of foodstuffs, and the factors governing dietary habits, the author proceeds to a short account of nutrition, physique and health, and concludes with a two-chaptered peroration, "Towards the Light," and "The Perfect Diet." An adequate index follows.

If ever a book was worth the price asked for it, this one is. Had I not received a copy to review, I should quite certainly, even on a first glance, have bought one for my *bookshelf. Can I say fairer than that?*

A. L. BACHARACH

TRANSACTIONS OF THE AMERICAN INSTITUTE OF CHEMICAL ENGINEERS. Vol. XXVII, 1931. Pp. iv + 425. New York: D. Van Nostrand Co., Inc., 1932. $6·00.

The occupations and earnings of chemical engineering graduates, the relative merits of platinum *versus* vanadium pentoxide as a catalyst for sulphuric acid ion,

this volume. Other papers deal with the theoretical considerations governing heat technology and the corrosion-resisting properties of zirconium alloys.

A survey of the occupations and earnings of 1000 recent chemical engineering graduates from five recognized institutions of learning reveals the existence of a potential demand from industry for about 2000 of these men a year. To-day, it is shown that about one-eighth of all engineering graduates took chemical engineering and that the saturation point is far from being reached. Five industries—chemicals, petroleum, rubber, iron and steel, and pulp and paper—seem to absorb more than half of these graduates, while the food, textile, and leather industries absorb only 2%.

The highly controversial question of the relative merits of platinum and vanadium catalysts for sulphuric acid manufacture is set forth in detail and is enriched by a large amount of discussion submitted by engineers having actual experience with both types. Both sides of the question are presented, accompanied by a great deal of performance data, such as SO_2 concentration in burner gas, consumption of catalyst per cent. conversion, and rate of arsenic poisoning.

One-third of the volume is devoted to the subject of stream pollution and the treatment of industrial wastes. The contributors include, in addition to chemical, civil, and sanitary engineers, a number of Governmental officials, with the result that the problem is attacked from the legal, economic, and social viewpoints as well as the technical. The source of the problem is traced to the congested industrial centres, the natural self-purification of streams explained, and the experiences of three states in regulating waste disposal outlined. Reference is made to the broad federal and specific state powers bearing on the situation and the effective methods of treatment actually worked out in a dozen different industries.

A symposium of heat technology, comprising four papers, covers such theoretical questions as the effect of tube length on the transfer of heat to oil flowing in pipes, the application of theoretical equations to the drying of solids, and the rate of heat transfer in streamline flow. Another paper, the seventh of a series, reports on studies made to determine the resistance to corrosion of zirconium alloys and on comparative tests with other types of alloys. A formula is given for zirconium alloy for service in hydrochloric and sulphuric acids, composed of Zn, Fe, Ni, Al, Si, and C.

ÉLÉMENTS DE PHARMACODYNAMIE SPÉCIALE. Étude de l'Action des Divers Medicaments. By E. Zunz. Vol. I. Pp. vii + 496. Vol. II. Pp. 497—1271. Paris: Masson et Cie, 1932. 190 fr.

Though the various national pharmacopeias tend to become more and more alike, and a new remedy such as insulin or calciferol is applied internationally almost as soon as it appears, there are still considerable differences to be traced in the practical therapeutics of different countries. These diversities add to the interest naturally evoked by the issue of this comprehensive text-book of pharmacology by a distinguished representative of the Brussels school of medicine.

It is evident from the preface that the author has given much thought to the arrangement of his material and the plan adopted is based mainly on pharmacologic action. The sections on such drugs as narcotics (general anæsthetics and hypnotics) and analgesics (limited to central narcotics) are written on more or less conventional lines, but most of the book is divided into chapters written on a much broader basis. That on "Modificateurs de la Nutrition," for example, brings together derivatives of arsenic, vanadium and phosphorus, lecithin, vitamins, iodine and iodides, colchicine and piperazine. There is a similar catholicity of content in "Modificateurs de l'activité du tube digestif."

The pharmacology of each drug and its therapeutic applications are discussed adequately, and the author has evidently taken a considerable amount of trouble to refer in each case to little known substances having similar action. Drugs such as the natural bitters, about which little is known chemically and which in the days of more dramatic chemotherapeutical and biologic remedies are apt to be neglected in text-books, receive generous treatment. The chemical composition of natural drugs is recorded briefly but adequately and in the case of pure chemicals graphic formulæ are liberally provided.

It is not to be expected that a book dealing with such a mass of diverse material should be wholly without blemish. The remark that Schueffner has *suggested* the use of chenopodium oil in hookworm disease seems a little belated when, in the last fifteen years, millions of doses of this drug have been administered to victims of this disease. Ethyl esters of the acids of chaulmoogra oil, being insoluble in water, cannot be given by intramuscular injection in solution in this medium. The section on antimonial drugs is accurate as far as it goes but it does not mention the development of the newer type of "emetic" used in the treatment of bilharziasis and the account of the newer derivatives of *p*-aminophenylstibinic acid now in use with marked success against kala-azar is not quite complete. These are other similar points are matters for specialists and such minute lapses do not detract from the value of the book as a general treatise on pharmacology.

This book can be cordially recommended to the attention of chemists interested in pharmacologic problems, or whose professional duties involve a knowledge of drugs and their mode of action. T. A. H.

GESAMMELTE ABHANDLUNGEN ZUR KENNTNIS DER KOHLE. Edited by Prof. Dr. F. Fischer. Vol. 3 1930. Arbeiten des Kaiser-Wilhelm Instituts für Kohlenforschung in Mülheim-Ruhr. Pp. vii + 61 Berlin: G. Borntraeger, 1932. Paper, 56 rm. bound, 58.50 rm.

The director of the Kaiser-Wilhelm Institute for Coal Research has edited this 10th volume of transactions on the knowledge of coal, which covers the year 193 and is divided into six parts containing a total of 3 papers by various workers, amongst whom Fischer, Fuchs, and Peters predominate. Seventeen of the papers were published originally in *Brennstoff-Chemie* whilst 10 were previously unpublished and the remainde distributed amongst various journals, including one i

Fuel. Part I contains two papers on bacteriological work, the first which deals with the formation of methane from carbon monoxide and hydrogen being of particular interest as a possible means of reducing the carbon monoxide content of gas. In part II are eight papers on wood, lignin, and humic acids, while part III contains papers on the origin and constitution of coal. Three papers on the chemistry of fuels constitute the fourth part, while the fifth, which is the most important and occupies about two-thirds of the book, contains nineteen papers dealing with work on gases. This part is subdivided into three sections, on chemical and physico-chemical work, electrical treatment of gases, and benzine synthesis.

The final part contains three: "New Views concerning the Origin of Petroleum" by Fischer, "Progress of Coal Utilization" by Pichler, and lastly a contribution by Peters on "The Benzol Synthesis of Fischer and Pichler." The book concludes with a short appendix by Fuchs on the organization and objects of the research institute in Mülheim. There is no index, but the book is well printed and contains 47 illustrations, 42 graphs, and 193 tables of data. References to the literature are numerous, and the collection should form a handy volume of value to fuel technologists. A. M.

COMPANY NEWS

THE DISTILLERS CO. LTD.

The company's preliminary statement of results for the year ended May 15, 1933, shows a profit of £1,722,478, which is about £36,000 less than in the previous year. A final dividend of 10% has been declared on the ordinary shares, making the total for the year 17½%, the same as last year.

ZINC CORPORATION

The report of the Corporation for 1932 states that operations at Broken Hill were maintained on a full-time basis, but development work was restricted. The improvements at Port Pirie had resulted in appreciable reduction of smelting and refining charges. With £36,363 brought in from last year, the total available is £188,088, as compared with £177,972 last year, when £26,585 was brought in. Preferential dividends have been paid, and a participating dividend of 6d. per share is declared, which is the same as last year, and £46,479 remains to be carried forward.

CELLULOSE ACETATE SILK CO. LTD.

The company reports a trading profit for the year ended April 1, 1933, of £90,044, with a net profit of £38,041, as compared with a net profit last year of £90,615, which included however £45,000 in respect of a claim on a cancelled contract. The debit balance is now reduced to £31,165. The company's plant has been in full operation at increased capacity during the first quarter of the current year, and there is evidence of a continued demand for the company's yarn.

MIDLAND BANK LTD.

The directors of the Midland Bank Ltd. announce an interim dividend for the half-year ended June 30 last of 16% per annum less tax, payable on July 15.

MARKET REPORT

This Market Report is compiled from special information received from the manufacturers concerned.

Unless otherwise stated, the prices quoted below cover fair quantities net and naked at sellers' works.

The following alterations in prices are reported since the publication of the last *Market Report* (*cf.* CHEM. & IND., July 7, 1933, p. 569).

INTERMEDIATES

Dinitrotoluene 48/50° C.—8d. per lb. 66/68° C.—9d. per lb.

PATENT LIST

The following is a list of complete specifications of chemical interest which are open for inspection under Section 91 (4) (a) of the Patent Acts. Printed copies are not available, but photographic copies may be obtained at a charge of 8d. per page (*minimum* 1s.) from the Patent Office, Chancery Lane, W.C.2.

I. 30,785—7 (1932). Enzinger-Union-Werke. *See* XXIII.

35,866 (1932). Carbo-Norit-Union Verwaltungs-Ges. Effecting adsorptions.

36,593 (1932). Sharples Specialty Co. Centrifugal separation.

II. 36,433 (1932). Fischer and Pichler. Production of unsaturated hydrocarbons from hydrocarbons richer in hydrogen.

III. 32,654 (1932). Soc. Chem. Ind. in Basle. Manufacture of nitrogenous derivatives of the anthraquinone series.

34,725 (1932). Henkel & Co. Manufacture of mixed anhydrides of boric acid and organic acids.

36,102 (1932). Chem. Fabr. vorm. Sandoz. *See* XX.

36,103 (1932). Boehringer & Soehne. Manufacture of anhydrides of fatty acids.

36,532 (1932). I. G. Farbenind. Manufacture of condensation products of the anthraquinone series.

IV. 36,594 (1932). I. G. Farbenind. Manufacture of disazo dyestuffs insoluble in water.

V. 20,629 (1932). Wacker Ges. f. Elektrochem. Ind. Cleaning fibrous materials.

VII. 16,241 (1932). Norsk Hydro-Elektrisk Kvaelstofakt. Manufacture of sodium nitrate.

VIII. 35,103 (1932). Goldschmidt A.-G. Manufacturing glazes or enamels.

IX. 36,437 (1932). Seed. Cement.

X. 35,224 (1932). Heraeus-Vacuumschmelze A.-G., and Rohn. Production of alloys.

XIII. 22,976 (1932). Kopp. Production of moulded articles.

35,479 (1932). Internat. Gen. Electric Co. Making objects or coatings of artificial resin.

XIX. 31,159 (1932). Sardik. Food products.

34,253 (1932). Sardik. Pectin and its manufacture.

XX. 36,102 (1932). Chem. Fabr. vorm. Sandoz. Manufacture of strongly basic porphins.

XXIII. 30,785—7 (1932). Enzinger-Union-Werke. Cleansing and sterilizing filter mass.

GENERAL NOTES

Dyestuffs (Import Regulation) Act, 1920

The following statement relating to applications for licences under the Dyestuffs (Import Regulation) Act, 1920, made during June has been furnished to the Board of Trade by the Dyestuffs Advisory Licensing Committee. The total number of applications received during the month was 575, of which 464 were from merchants or importers. To these should be added the three cases outstanding on May 31 making a total for the month of 578. These were dealt with as follows :—granted, 552 (of which 548 were dealt with within seven days of receipt); referred to British makers of similar products, 19 (of which 15 were dealt with within seven days of receipt); outstanding on June 30, seven. Of the total of 578 applications received, 563 or 97% were dealt with within seven days of receipt.

Import Duties Advisory Committee

The Import Duties Advisory Committee gives notice of application for drawback under Section 9 of the Finance Act, 1932, in the case of refined fish and marine animal oils in respect of the crude fish and marine animal oils used in their manufacture.

Any representations in regard to this application should be addressed to the Secretary, Import Duties Advisory Committee, Caxton House, Tothill Street, Westminster, London, S.W.1, not later than July 27, 1933.

Sulphate of Ammonia

It is announced by Imperial Chemical Industries, Ltd., that the price of neutral sulphate of ammonia for delivery July/August is £6 15s. per ton for six-ton lots, carriage paid to buyers' nearest station.

Change of Address

Messrs. J. Harrison Carter, Ltd., the well-known manufacturers of disintegrating plant, have moved their London office from 59, Mark Lane, E.C.3, to Sardinia House, Kingsway, London, W.C.2. The telephone number is Holborn 7724. The head office and works still remain at Dunstable.

PUBLICATIONS RECEIVED

COTTON EFFECT: AND RELATED PHENOMENA. By S. Mitchell, D.Sc. MONOGRAPHS ON MODERN CHEMISTRY. Edited by Prof. J. Kendall, M.A., D.Sc., F.R.S., and Prof. J. Read, M.A., B.Sc., Ph.D. Pp. vii + 92. London: G. Bell & Sons, Ltd., 1933. 7s. 6d.

BEST BOOKS OF THE YEAR 1931. Edited by A. J. Philip, M.B.E. New Series. Vol. III. Pp. 131. Gravesend: A. J. Philip.

OPTISCHE MESSUNGEN: DES CHEMIKERS UND DES MEDIZINERS. By Dr. F. Löwe. 2nd enlarged and revised ed. TECHNISCHE FORTSCHRITTSBERICHTE: FORTSCHRITTE DER CHEM. TECHNOLOGIE IN EINZELDARSTELLUNGEN. Edited by Prof. Dr. B. Rassow. Vol. VI. Pp. xii + 205. Dresden and Leipzig: T. Steinkopff, 1933. Paper, 9 rm.; bound, 10 rm.

ORGANISCHE FARBSTOFFE: ANLEITUNG ZUM SCHRITTWEISEN EINDRINGEN IN DIE FARBENCHEMIE AUF KOORDINATIONSTHEORETISCHER GRUNDLAGE. By Dr. R. Wizinger. Pp. x + 86—LXVII. Berlin and Bonn: Ferd. Dümmlers Verlag., 1933. Paper, 9.80 m.; bound, 11.80 m

DER CHEMIE-INGENIEUR. Edited by A. Eucken and *Jakob.* Vol. I. Part 3. PHYSIKALISCHE ARBEITSPROZESSE DES BETRIEBES. THERMISCH-MECHANISCHE MATERIALTRENNUNG. Edited by A. Eucken. Revised by S. Erk and others. Pp. x + 327. Leipzig: Akademische Verlagsges., 1933. Paper, 30 m.; bound 31.50 m.

NORTHUMBERLAND AND DURHAM COALFIELD. DURHAM AREA. THE HUTTON SEAM. Department of Scientific and Industrial Research. Fuel Research. Physical and Chemical Survey of the National Coal Resources. No. 27. Pp. vi + 126. London: H.M. Stationery Office, 1933. 2s. 6d.

ESSAI SUR LA CHIMIE COMPARÉE: LES CORPS SIMPLES. By Dr. I. N Longinescu. Pp. vi + 98. Paris: Les Presses Universitaires de France, 1932.

ANNUAL REPORT OF THE IMPERIAL INSTITUTE, 1932. the Director, Lt.-Gen. Sir William Furse, K.C.B., D.S.O., to the Board of Governors. Pp. 54. London: Imperial Institute, 1933. 2s.

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