

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXII.

March 16, 1935

No. 820

Notes and Comments

Science and Economic Change

DR. J. T. CONROY'S recent Hurter Memorial Lecture contains a fascinating account of the changes that have occurred in the alkali industry within the past fifty years—changes so fundamental as to be a microcosm of the whole chemical industry, and yet so subtle and almost imperceptible at times as to create the illusion of stagnation. The Leblanc process, for example, was first undermined by the ammonia soda process but still appeared to have a big future for the production of caustic soda and chlorine compounds. Then came the Hargreaves and more particularly the Castner processes, and by 1914 the Leblanc process was doomed. Costs have thus been falling, and the Leblanc cycle having given way to better processes, many of the intermediate products incidental to the cycle have perforce to be made by separate processes.

Sulphuric acid manufacture is one of these that has been the subject of equally fundamental changes. Continental acid makers adopted the heroic method of scrapping plant to introduce the methods of intensive production; we obtained virtually the same results by more gradual change. Fans were introduced to assist the chimney draught; the hand-operated acid egg was replaced by the automatic type; exhaust steam replaced live steam; later water sprays replaced steam; nitre potting was replaced by oxides of nitrogen obtained by catalytic air oxidation of ammonia. Apart from chamber acid, an equally fundamental change has occurred in the B.O.V. technique where the old method of dearsenication and concentration of chamber acid has been replaced by the contact process. The sulphuric acid industry, while still of great magnitude, has lost several important outlets, one indication that was mentioned by Dr. Conroy being that at the Modderfontein dynamite factory, air, water and coke have replaced an annual importation of 18,000 tons of Chilean nitrate and 7,000 tons of sulphur.

Wear and Tear of Plant

BBRITISH manufacturers are making strong representations to the Chancellor of the Exchequer that the present income tax provisions relating to the wear and tear of industrial plant and machinery are inadequate for modern high speed production, and they further claim that allowance should be made for plant which has to be scrapped to make way for new processes. In a memorandum on the subject the National Union of Manufacturers points out that existing rates of wear and tear allowances on plant and machinery are completely out of harmony with the rates which prudent manufac-

turing concerns apply when arriving at their available annual profit. Not only are the average rates very low, about $7\frac{1}{2}$ per cent. per annum, but this rate is calculated on diminishing values and it may be taken as a rough calculation that $7\frac{1}{2}$ per cent. on diminishing values is about $2\frac{1}{2}$ per cent. on original cost. This point is better understood when it is pointed out that plant and machinery which is written down at $7\frac{1}{2}$ per cent. on diminishing values will only be reduced to a nominal figure at the end of 40 years. Machinery generally is now being driven at a much higher speed and, as a rule, is not built to last an indefinite period in view of the progress of invention. The Union therefore urges that the wear and tear allowances should be brought more in accord with the rates applied in the financial records of manufacturing concerns, and that as a preliminary to this, and pending an inquiry into the question, the rates now allowed should be calculated upon original cost.

Allied to this question is the obsolescence allowance which is obtainable when plant and machinery is replaced. It is appreciated that the Board of Inland Revenue has given a broader interpretation of the rules under which this allowance can be obtained in recent years, but even now the restrictions bear hardly on those industries which find it necessary to adopt new methods of manufacture at fairly frequent intervals. This allowance should, it is considered, be obtainable in the case of all plant and machinery which is scrapped except when this act is due to the discontinuance of business. It is thought that any loss of revenue which might be entailed if these suggestions were adopted would be only temporary, as obviously the total allowances by way of wear and tear and obsolescence could not exceed the cost of the plant and machinery concerned.

Income Tax and Personal Allowances

THE memorandum which the National Union of Manufacturers' has submitted to the Chancellor of the Exchequer states that there is no single measure which would do more to increase confidence, and trade and employment, than a further reduction in the standard rate of income tax, and it would be a mistake to disregard this view, which is shared by all industrialists throughout the country, merely because it cannot be from the nature of the case disinterested. It is true although, and because, manufacturers personally would gain by its acceptance. Another alleviation which would give great relief to producers as well as to all other taxpayers would be the restoration of the personal and other allowances to the level which prevailed in

1930-31. As a further point, the Union again urges that the tax on fuel oil presses very hardly on those industries which find it essential to adopt this fuel in order to keep abreast of modern methods of production.

Protective duties should, it is considered, only be imposed after full investigation has been made into the case by an impartial body set up for this purpose, such as the Import Duties Advisory Committee, and one of the most satisfactory features of the procedure of this Committee is that all trades likely to be affected by a variation in the rate of a duty have an opportunity of stating their case *before* a decision is arrived at. In the case of the duty on fuel oil no such opportunity was given to the users of this oil, and it is suggested that the duty should be reduced to a figure more in harmony with the general level of import duties now prevailing, and that if the industries which benefit by this tax desire its increase they should be required to make out their case before some impartial tribunal, which will hear the case on both sides.

The Duddell Medal

DR. W. EWART WILLIAMS, who is distinguished for his work in optical design, chiefly in the region of interferometry, was presented with the twelfth Duddell Medal at the annual meeting of the Physical Society on March 15. The Duddell Medal is awarded to "persons who have contributed to the advancement of knowledge by the invention or design of scientific instruments, or by the discovery of materials used in their construction." The principal invention of Dr. Williams is that of the reflection echelon spectroscope. The basic idea of such an instrument had been described by the late Professor Michelson, a former Duddell Medallist, nearly forty years ago and many of its advantages over the transmission instrument were readily obvious. The practical construction of such an instrument, however, seemed impossible until the discovery by Williams that two optically plane surfaces of quartz or fused silica could be placed in permanent "optical contact" without exerting the mechanical force needed with glass surfaces. He saw that a number of fused silica plates of exactly equal thickness could be built up in the necessary echelon formation without introducing any distortion that would ruin the optical performance of the instrument.

By adding two small mirrors to the echelon and mounting it in an evacuated chamber, Dr. Williams has adapted the instrument (which was originally meant for fine structure work only), for the accurate measurement of the wavelengths of the lines. In consequence of the far greater resolving power now available, the wavelengths of the lines can be measured with a corresponding greater degree of accuracy, and the method of calculation is far simpler and more rapid than with the Fabry-Perot interferometer. He has also devised a method of standardising the metre in terms of wavelengths by means of the reflection echelon. This permits the number of wavelengths contained in a gauge of approximately a metre length to be determined in two operations as distinct from the numerous stages involved in the present methods. The principle of the reflection grating has been also applied by him to directional aerial systems for short-wave wireless transmitters, which are being practically used in America. Dr. Williams's work is of outstanding importance, but the account just given by no means exhausts the story

of his contributions to optical science. He has improved a number of optical instruments, amongst which are the Rayleigh refractometer and (in conjunction with Mr. F. Twyman, F.R.S.), the Fabry-Perot interferometer. The latter instrument, which he has also used in combination with a spectroheliograph, enables small changes of wavelength over the surface of the sun to be detected.

Patent Litigation

THE costs incurred by Courtaulds, Ltd., excluding any charge for the time of their own employees, in the recent patent litigation between themselves and British Celanese, Ltd., and which concluded in favour of Courtaulds, Ltd., in the House of Lords, amounted to £59,000. Mr. Samuel Courtauld, chairman of the company, revealed this fact in addressing the shareholders at the annual meeting last week, adding that of the sum mentioned they would be entitled to recover a proportion from their opponents. Estimates which had been made of some £70,000 to £100,000 for the whole cost of the proceedings were, he suggested, probably far below the mark. The effects of legal proceedings of such magnitude, both from the technical and financial points of view are far reaching. Mr. Courtauld told the shareholders that there was nothing haphazard or light hearted about the company's proceedings from the moment it first began to manufacture acetate yarn, and he observed that the action had nothing whatever to do with the company's viscose yarn manufacture, which could not have been affected in any way by the result. The directors reconnoitred the ground from every point of view and consulted the best legal and expert opinion before taking the stand which led ultimately to the decision in the House of Lords.

Courtaulds, Ltd., were charged with infringing four patents. One charge was abandoned in the first court, for infringement was not proved. They claimed that the other three patents were invalid. One of these was abandoned by British Celanese, Ltd., in the court of appeal. In the House of Lords very little was heard of another, and the fight centred round the third. Courtaulds maintained that this remaining patent was invalid on three grounds, any one of which would have sufficed for its revocation, and the Law Lords upheld their contention on all three counts. Seven judges in all sat upon the case and their findings were unanimous in Courtaulds' favour in each court. The chairman told the shareholders that they might rest assured that, though the directors might deliberately incur certain risks from time to time, it was not their habit to walk into positions of danger light heartedly or without due care. Mr. Courtauld concluded his reference to the litigation by expressing thanks to the eminent counsel who conducted the company's case, to the solicitors and the consultants whose advice it sought and to its own technical and patent experts who devoted many days and nights of anxious thought to the long and intricate proceedings.

GERMAN cyanide exports recovered during 1934, total shipments having increased to 4,770 metric tons for the first 10 months, from 2,171 tons in the corresponding period of 1933. Such exports totalled 4,677 tons for the year 1932, and the previous peak of 5,010 tons was attained in 1931. Average unit values declined during the first 10 months of 1934 to 884 marks a metric ton from 1,236 marks for the year 1933, 1,156 marks for 1932, and 1,223 marks for 1931.

Chemical Problems of Tanning and Leather Dressing

A Conference at Leeds

A JOINT conference of the Federation of Curriers, Light Leather Tanners and Dressers, and the British Section of the International Society of Leather Trades Chemists was held at Leeds University, March 7-8. Mr. J. Bruce was in the Chair, supported by Colonel Angus.

In a paper on "Drying," Mr. F. E. Humphreys, Ph.D., A.R.C.S., said one of the most usual forms of drying used in the leather industry was by means of hot air, and the amount of drying which could be thus effected depended upon (a) the ease with which moisture could be given up and (b) the capability of the air to take up that moisture; (a) depended upon the temperature and structure of the goods, etc., and (b) upon temperature and humidity. The relative humidity and temperature of the air used for drying should be carefully controlled as it was quite possible to bring about a result opposite to that desired by the use of air with a high degree of relative humidity. Another factor was the volume of air passing over the goods. The air flow should not be too slow nor too rapid. These three factors were those calling for greatest consideration, and an alteration in any one would affect drying.

Ideal Conditions for Drying Leather

The ideal conditions for drying would depend upon the type of leather being handled, and whether it was the initial drying or drying after soaking back. The best conditions of temperature, relative humidity and air flow for leathers were at present little understood, but provided the two latter were satisfactory there seemed no reason why the temperature should not be as high as that of a hot pit (at least 100° F.). Drying troubles were due mainly to varying conditions during the operation. It seemed that for the time being a compromise had to be made by drying the leather in an atmosphere containing less water than one with which the leather would be in equilibrium at the desired water content, until the required percentage of water remained in the leather, and then allowing the goods to even off. Oils slowed up drying only so long as the oil film remained intact, but, once broken, the rate of water removal was unaffected. Under suitable conditions, even sole leather could be dried without the use of oils.

Discussing the "Water Solubles in Vegetable Tanned Leather," Dr. R. H. Marriott, A.I.C., pointed out that this matter was held in two distinct ways; one portion was distributed round the fibres and in the spaces between the fibrils, and the other portion was held firmly in the space lattice between the hide substance or collagen molecules. This latter type of water solubles aided in filling out the fibrils, and, if removed, the fibrils would collapse when dried, bringing about distinctly thin fibres. The quantity of this interfibrillary water soluble matter present was dependent upon the amount of interfibrillary or loosely-held water solubles present, and if a leather was low in total water solubles it was almost bound to have rather thin fibres.

Interfibrillary Water Solubles

The drying of the interfibrillary water soluble matter resulted in the fibrils and fibres being coated with it and so causing them to adhere, but if an excess was present a boardy leather would be obtained, and one in which the grain would easily crack on bending. Successful currying depended on freeing the fibres from this interfibrillary water soluble matter so that the greases employed would have direct contact with the fibres. At the same time, to ensure the desired firmness in the finished leather a certain amount of water soluble matter had to be retained. Of great importance also was to guard against any great loss of interfibrillary water solubles. It would be seen therefore that water soluble matter in leather imparted firmness, but, at the same time, such soluble matter acted as an antioxidant towards the oils, preventing that undesirable gummy spue and leather rotting. On the other hand, the water solubles provided a suitable media for mould growth, and, where this was likely to occur, as, for example, under poor storage conditions, it was advisable to incorporate into the leather some form of fungicide.

The subject of "Sulphonated Fatty Alcohols" was introduced by Mr. M. Briscoe, B.Sc. He said that sulphonated

fatty alcohols were, strictly speaking, the sodium alkyl sulphates; "sulphated" fatty alcohols would have been a better term for them. They were prepared by treating the higher fatty alcohols with sulphuric or chlor-sulphuric acids under certain well-defined conditions of temperature, etc., and then neutralising. As the quantity and range of naturally occurring fatty alcohols were limited, means had to be found for producing them synthetically, and this was now accomplished by hydrogenating the corresponding fatty acids (or fat). Thus, cononut oil or its lauric acid fraction gave a commercial lauryl alcohol (Lorol), while stearic acid gave commercial stearyl alcohol (Lanette wax). Ocenol was hydrogenated oleic acid. Cetyl alcohol was obtained from natural sources (sperm oil), and these four alcohols formed the basis of the sulphonated fatty alcohols of commerce.

Sulphonated Fatty Alcohols

In use, the sulphonated fatty alcohols had advantages over soaps in their excellent wetting, emulsifying and cleaning properties, and in being neutral in solution and stable to acids and alkalis, hard water and sea water. Coupled with these advantages they possessed to a marked degree the "fatty" property of a soap, although not related to it chemically. Hence their valuable effects on vegetable tanned leather. Properties of the sulphonated fatty alcohols altered with increase in the number of carbon atoms in the molecule. For instance, solubility, equalising power, resistance to hard water, were at a maximum with the product from the C₁₂ alcohol (Lorol) and these properties diminished as the number of carbon atoms increased. Again, at low temperatures (below 40-45° C.) maximum detergent powers were possessed by the C₁₂ product, but at higher temperatures detergency increased with the number of carbon atoms. Softening properties also increase in the same way. From these considerations, sulphonated lorol was most suitable for leather work, and this had been proved by actual experience. The right degree of softness was obtained, while the higher members of the series would give excessive softness, resulting in a "flannel" feel to the leather.

Lorol could be used on chrome tanned leather for over-coming troubles in dyeing due to greasy leather. Applied prior to dyeing, it ensured better penetration and more level dyeing. As with textiles, the shade was slightly altered, but this was easily corrected by adjusting the dyestuffs used. One per cent. of sulphonated lorol on the shaved weight of leather would be found sufficient, and this was added to 100 per cent. water and the goods drummed at 130° F. Due to the presence of lorol in the leather, the amount of fatliquor used could be reduced. Sulphonated lorol could also be used in fatliquoring instead of soap. With alum leather it was useful as a wetting agent, and with olive oil gave a satisfactory substitute for egg yolk in re-egging. Other applications were in the washing of aldehyde and chamois leathers, the dyeing of shorn lamb skins, while sulphonated cetyl or oleyl alcohols could be used in the dyeing of wool rugs to ensure an even shade of colour throughout.

Pigmented Finishes

The growth of the use of pigmented finishes in leather dressing had been such that, at the present time, there were very few leathers indeed which were not doped in some way or another, said Mr. H. Anderson, B.Sc., in the course of a paper on "Cellulose Lacquers as Leather Finishes." Either water or cellulose lacquers were used, the latter comparing very favourably with the former from the standpoints of appearance and fastness. The durability of a cellulose lacquer had, in the past, been a source of some anxiety, but the modern product had improved vastly, due mainly to the fact that the lacquer manufacturer had found reasons for the trouble caused by the sinking of the plasticiser into the leather, and had adopted means for its prevention.

The testing of lacquers was discussed at some length, including the measurement of covering power and the relation between this, tinctorial value and obliterating value. It was shown that a lacquer with a high tinctorial value and low obliterating or hiding power gave a more natural looking leather than one with a high hiding power and low tinctorial

value, although the covering powers of the two lacquers being the sum of the two properties might be identical. Discolouration of white lacquers on leather was also discussed, and it was shown that three forms of discolouration occurred: (a) that due to exposure to light, (b) that due to bleeding of the tannin during drying, and (c) that due to bleeding through storage. The function of the undercoat in the prevention of "bleeding" was illustrated.

Properties of Lecithin

A meeting of the British Section of the International Society of Leather Trades Chemists was also held on March 9 at Leeds University, the president of the Section, Mr. M. C. Lamb, being in the chair.

Dr. B. Rewald read a paper on "The Chemical, Physical and Colloidal Properties of Lecithin." Lecithin, he said, was one of the natural phosphatides—substances related to both fats and proteins. It was not an individual compound, but varied in nature according to the basic substance with which it was combined. When choline was present the material was termed a lecithin, and if cholamine was the basic substance it was termed a cephaline. The yolk of egg contained 60 per cent. of chlorine lecithin in addition to some of the cholamine compound. The soy bean lecithin was approximately 50 per cent. each of the two types. When oil seeds, etc., were extracted with a fat solvent, only about 25 per cent. of the phosphatides (in the free state) went into solution. The remainder could be extracted by adding some alcohol to the solvent. This part of the lecithin was weakly bound in some way to the protein present in the seed.

The method used to extract the phosphatides from the oil was to add a little water, which became immediately bound up to the phosphatide to give an emulsion which could be separated. This water-binding property was one of value in the preparation of emulsions, a very small proportion of alkali being added to the emulsions for stabilising purposes, the phosphatides having a slight acid reaction. The soy bean lecithin was that most widely used commercially and—contrary to the pure lecithin—would keep almost indefinitely owing to the presence of some oil. It had been used for some time as an emulsifier in the manufacture of margarine, chocolate and in baking, but its application to leather was very recent, and in this connection the replacement of egg yolk by lecithin emulsions had met with good results. Many details regarding the use of lecithin would be found in Eng. Pat. 306,672.

Many lecithin oil emulsions were now on the market and used successfully. Apart from the oil, the lecithin itself was not without lubricating properties. It became fixed in the leather and imparted a high degree of softness. A point of practical interest was that lecithin could prevent the formation of fatty acid spue in the same way that it prevented chocolate spue.

Alkali Products in Australia

Manufacture to be Started by Imperial Chemical Industries, Ltd.

THE manufacture of soda ash is to be started in Australia by Imperial Chemical Industries, Ltd. Up to the present practically all the alkali products used in Australia have been imported.

For many years British alkali manufacturers have studied the possibilities of an alkali industry in Australia, a problem presenting many points of special interest. It is only after a careful and detailed survey of the whole question that I.C.I. have come to the conclusion that the time is ripe to start such a manufacture, and this will be undertaken in the Port Adelaide district of South Australia. A commission is at present in Australia and is negotiating with the Federal and the State Governments in connection with the details relating to the establishment of the new industry. Since the salt which is the principal raw material will be obtained by the solar evaporation of sea water, some time must necessarily elapse before the required area of evaporating surfaces can be prepared and put into operation. On completion of the factory which will be erected in accordance with I.C.I.'s most up-to-date practice, Australia will be able to supply all her future requirements of soda ash, caustic soda and other by-products.

Raw Material for Varnishes

Biochemical Methods of Production

THE glyptals, or condensation products of polyvalent alcohols (such as glycerine) with polybasic acids, are among the more valuable of the synthetic resins. The necessary acids, however, such as phthalic, maleic, etc., are not available in large quantities at a low price, so that the glyptals are not so cheap as they ought to be. There are, it is true, two naturally occurring polybasic acids which are or could be made available in large quantities, namely, tartaric and citric acids. Of these the latter is fairly plentiful, not only from the natural citrus fruits, but also from biochemical or fermentation methods, using various species of moulds or organisms, such as *Cyrtomyces* or *C. glaber*. The yields of acid are good and of high purity. Several thousand tons of citric acid are now produced in this way by the fermentation of glucose.

Citrate resins have been prepared in the laboratory, but not yet on a commercial scale, so far as the present writer is aware, but it should be a feasible idea. Stefan Bakonyi, of Dessau, has recently stated in "Farbe u. Lack," 1935, pp. 87-8, that he has evolved a process for the manufacture of citrate resins on a large scale, and promises further details later.

The alcohol part of the resin could be obtained with glycerine or glycol which can also be produced synthetically if necessary. As soapmakers' glycerine, however, is plentiful and cheap, and has, in fact, been overproduced since the war, there is little need to resort to the synthetic methods which were highly developed in Germany and the United States. The best glycol to use for this purpose, whenever it may be necessary to use the fermentation process for glycerine production, is 2-3-butylene glycol, yielding a material very suitable for resin manufacture.

Drying oils or fatty acids are also necessary for incorporation in varnishes, and these can also be obtained by biochemical methods, as, for example, by Lindner's process, using the organism *Endomyces vernalis*. New cultural methods for growing the necessary organism have lately been introduced and a method worked out for obtaining the pure "bacterial" oil. Here again, further details are promised later. It is probable that a sugar obtained from wood or wood waste or other cheap cellulose will be employed, and in view of recent progress in the utilisation of wood for this and similar purposes a very abundant supply of raw material should be available. At the same time it must be remembered that there are many ways of utilising wood waste, and this new development will be in competition with others.

Alkali Works Regulations

New Order Issued

THE Minister of Health has issued "The Alkali, etc., Works Order, 1935," extending the list of noxious or offensive gases mentioned in Section 27 of the Alkali, etc., Works Regulation Act, 1906, and extending the list of works mentioned in the first schedule of the Act. The draft Order was the subject of a public inquiry held at the Ministry of Health on February 6 and reported in THE CHEMICAL AGE of February 9 (page 125).

The first schedule of the Order made in 1928 is amended by the deletion of the words "Fumes from paraffin oil works" and the list of noxious or offensive gases mentioned in Section 27 of the 1906 Act is extended to include "Fumes containing silicon, calcium or their compounds" and "Fumes from paraffin oil works containing any sulphur compound."

The first schedule of the 1906 Act is extended under the new Order by the addition of the words set out under the following items: Item 8 (Muriatic acid works)—"or as the result of the use of chlorides in a chemical process." Item 9 (Sulphide works)—"or any works in which sulphuretted hydrogen is evolved as part of a chemical process." Item 15 (Bisulphide of carbon works)—(after "manufacture") "use or recovery." Item 18 (Paraffin oil works)—"and works in which any product of the refining of crude shale oil or crude petroleum is treated so as to cause the evolution of gases containing any sulphur compound."

Part 2 of the new Order adds to the list of works mentioned under the first schedule "cement production works, that is to say, works in which argillaceous and calcareous materials are used in the production of cement clinker." The Order comes into operation on April 1.

The Manufacture of Sulphuric Acid

A Survey of Developments

THE history of reaction chamber design for sulphuric acid plant has been one of evolution, said Mr. W. A. Damon in a lecture on "Modern Trends in the Manufacture of Sulphuric Acid," which he delivered to the Bristol and South-Western Counties Section of the Institute of Chemistry, on February 18. In the early days of the industry, plant was designed to give ample chamber space with comparatively small denitrating and absorbing space. Gradually, chamber space has been reduced and this tendency has been associated necessarily with more powerful nitre recovery systems. The chambers have two essential functions; firstly to produce sulphuric acid mist, and, secondly, to effect the condensation of the mist. With a view to promoting the condensation of acid, Lunge Rohrmann towers were introduced in 1898 at Lewis' works and the Briton Ferry Chemical Works in South Wales. This device was followed by a plethora of inventions embodying many designs of towers and packed flues to be placed between the chambers.

In 1894 the first Delplace circular chamber in this country was built at Beckton. A set of Meyers' circular chambers was built at Cross' works in Glasgow 7 years later. The year 1911 saw the installation of the first Opl set at Chance and Hunt's works at Oldbury. In this plant, which was designed for very intensive work, there were six rectangular towers in series, all packed. The first tower acted as a Glover, Nos. 2, 3 and 4 as reaction chambers and Nos. 5 and 6 as Gay Lussacs; a fan placed after No. 6 discharged the waste gases to atmosphere through a coke filter. The time of passage of the gas through the plant was only 40 minutes, so they were extremely sensitive.

Novel Features in 1914

Moritz chambers were built at Dalton Main in 1914. These embodied a number of features novel at that time. In 1914, also, was built the first Mills-Packard plant at Bramford. These towers were in the shape of the frustum of a cone; they were 20 ft. diameter at the bottom, 10 ft. diameter at the top and 40 ft. in height. In the first place one such tower was operated in series with a rectangular chamber, but later the rectangular chamber was replaced by a second Mills-Packard tower; both were water-cooled externally and water-sprayed internally. In this form of plant the chamber space required was only 3.0 cu. ft., an astonishingly low figure in those days. Nitre consumption was 3 to 6 per cent. A set of six towers built by Chance and Hunt, in 1931, at Oldbury, are 35 ft. at the base, 32 ft. at the top and 48 ft. in height. Here each chamber is split down the centre by a verticle gap 2 ft. wide extending across the diameter. This set, with two Glovers and three Gay Lussacs, produces 800 tons of B.O.V. per week from spent oxide, the chamber space being 4 cu. ft. and nitre consumption 2 per cent.

The most recent example of the Mills-Packard plant is the one at Ipswich, owned by Fison, Packard and Prentice. This is practically a replica of Chance and Hunt's plant at Oldbury and it is exhibiting a very satisfactory performance. About three years ago a Gaillard Parrish set was built by Parrish for the South Metropolitan Gas Company. The plant comprises four cylindrical tower chambers 25 ft. diameter and 45 ft. high, which operate at a low chamber space, acid being sprayed into the tops of the chambers by turbo-dispersers.

There is no Petersen plant in England, but the process is doing well on the Continent and will probably make its appearance in England before long. This system comprises Glover and Gay Lussac towers, but the intermediate chambers are packed with graded quartz. Very large quantities of strong nitrosulphonic acid are pumped over the surface of this quartz packing and an enormous wetted surface is presented to the gas flow. The towers have been described as huge wetted sponges or sieves which comb out the SO₂. The percentage of nitre in the nitrosulphonic acid is as high as 4 per cent. (as HNO₃). The front end of the system acts as a Glover and the back as a Gay Lussac. The system is said to be capable of dealing with gases in which the SO₂ content varies widely. The Petersen system calls for a large pumping installation (rotary pumps of silicon iron being used) with an extensive cooling and settling system for the acid.

About 1870 the demand for fuming sulphuric acid (the production of which was practically a monopoly in the hands of a Continental firm) was suddenly increased by the development of the synthetic process for manufacture of indigo and other dyes. In 1899 the Badische Anilin and Soda Fabrik took out English patents to cover the process then being operated at their German works. Interest in the matter was much stimulated also in that year by Professor Lunge, who chose this subject for the first Hurter Memorial Lecture. The principal features of the Badische patents were that it was recognised that the heat of reaction must be dissipated in order to secure good conversion and that, in order to avoid poisoning of the catalyst, quite elaborate purification of the SO₂ stream was essential. A 98 per cent. conversion was claimed and it was stated that production of acids over 80 per cent. was cheaper than by the chamber process.

The Contact Process

Spencer Chapman and Messel were the first to operate the contact process in England. A great number of patents followed in the next three years. Among them should be mentioned: (1) The Mannheim process, which employed two separate converters, ferric oxide and platinum; in this process, which was first used in this country by Nobels, the air supply to the burners was carefully dried. (2) The Schröder Grillo process, in which a converter mass of magnesium sulphate was used; the converter itself was of improved design which resulted in heat economy. (3) The Tentelow process, the chief feature of which was the employment of an alkaline wash in the gas purification system.

Recent advances have been in connection with the use of materials, such as zinc blende and gypsum, better purification of the gases, improved heat balance, the use of vanadium catalyst and the reduction of losses from the final escapes. Prior to 1922 the SO₂ produced during the roasting of zinc blende was, for the most part, discharged to atmosphere. The Imperial Smelting Corporation then set out to find a practicable method of recovering this waste in the form of sulphuric acid. Many difficulties had to be overcome, but, whereas in 1922 only 20 per cent. of the sulphur contained in zinc blende was recovered, the figure is now 95 per cent.

The use of vanadium as a catalyst was originally patented in 1900, but the matter was not pursued further at the time and the patent was abandoned. In 1913 both the Badische and the Bayer Companies took out patents; the latter being in respect of the use of silver and vanadium oxides together. Later patents were held by the Selden Company and the Monsanto Company, both in America. In England, however, the use of this catalyst has been developed principally by the Imperial Smelting Corporation. Vanadium is advantageous in that a smaller quantity is required for the conversion of a given quantity of SO₂.

Acidity of Escape Gases

The acidities of final escapes from oleum plants are considerably higher than those from chamber plants, last year's average being 3.74 grains per cu. ft. (expressed as SO₃). At many works, however, the exit gases are scrubbed with soda ash solution, whereby marketable sodium bisulphite is produced. This method is not, however, universally economic. At Billingham, the escape gases are washed with a solution of ammonium sulphate and ammonia. The liquor is circulated until a definite strength of bisulphite is reached, when it is pumped over to a lead-lined tank and acidified with sulphuric acid. The SO₂ produced is returned to process and the ammonium sulphate solution sent to the sulphate plant.

The total quantity of acid (expressed as 100 per cent. H₂SO₄) produced annually in this country is about 850,000 tons, of which upwards of 200,000 tons is contact acid.

Mr. Damon believes that chamber plants will be designed to work more and more intensively. In this connection the recent experiments of Professor Ernst Berl should be mentioned. Berl estimates that by conducting the chamber process under pressure of 13 atmospheres 3,800 kg. of 78 per cent. acid per 24 hours per cubic metre can be produced. This corresponds to a chamber space of between 0.01 and 0.02 cu. ft. per lb. of sulphur burned per day.

Progress in Bleaching, Dyeing and Finishing

The Dyeing of Blue Overall Fabric

In the course of each year quite a large amount of coarse cotton fabric is dyed dark blue and used in the manufacture of workmen's overalls. The requirements of this fabric are that it should be durable and retain its colour through the drastic and repeated washings which it has to undergo. It is therefore useful to note the publication by K. A. Rinneberg and Wuterich ("Textilber.," 1935, 16, 54) of an article describing practical details for dyeing this type of fabric.

In the past, this blue overall fabric has been dyed with indigo and also sulphur colours. The necessary fastness, when dyeing with indigo, can only be secured by carrying out several immersions in the reduced dye vat followed by air oxidation, and this procedure involves much labour and time.

With sulphur dyes it is possible to dye much more simply and rapidly but the fastness of the dyeing is less satisfactory especially in view of the present increased use of washing agents containing chlorine or peroxide. The discovery of Hydron Blue enabled this overall fabric to be produced much more satisfactorily since the dye can be applied to cotton fabric from a combined sodium hydrosulphite and sodium sulphide vat by a continuous method, and the fastness of the resulting dyeing is quite good. Various types of Hydron Blue having green to red tones have been made available and with the further assistance of Indocarbon Black CL conc. it is possible to produce almost any shade of dark blue.

Advantages of Variamine Blue

More recently it has been found that the best method for dyeing the overall fabric involves the use of the naphthol colour, Variamine Blue. Rinneberg and Wuterich indicate the necessary plant and the manner in which the dye should be applied. Essentially, the process of dyeing consists of impregnating the fabric with Naphthol AS, drying, and then impregnating with diazotised Variamine Blue BA or RTA (these bases are usually bought by the dyer in the form of their stabilised diazotised salts so that the use of sodium nitrite and hydrochloric acid is unnecessary). Since these Variamine bases have but poor coupling energy, special conditions must be employed in the second part of the dyeing process in order that complete coupling between the Naphthol AS and the diazo compound takes place.

The fabric is first impregnated in open width with the naphthol solution by means of a mangle provided with several immersed rollers for the purpose of prolonging the time of immersion of the fabric in the liquor. It then passes on through a "hot flue," which is a large chamber provided with upper and lower rows of guiding rollers and a current of hot air, so that the fabric is uniformly dried. The naphtholated fabric is then led through a second impregnating mangle containing the diazotised Variamine solution, then through a small steaming chamber to promote coupling and development of the blue colour two "boxes" for washing the fabric with hot water, a box of hot water containing 10 c.c. of 57° Tw. caustic soda per litre, a box containing a hot solution of soda ash, and then another small steaming chamber (this is for the purpose of converting the blue colour on the fabric to its correct permanent tone), and finally the fabric is thoroughly washed by passing through three boxes of hot and finally cold water.

Reduced Vat Dyes in Cellulose Oxidation

Valuable information on a special property of vat dyes in their leuco form has been recorded by H. A. Turner, G. M. Nabar, and F. Scholefield ("J. Soc. Dyers and Col.," 1935, 51, 5). This paper contains the results of a full investigation of a phenomenon previously recorded (Scholefield and Patel: "J. Soc. Dyers and Col.," 1928, 44, 268) that orange and yellow vat dyes on cotton exposed to sunlight cause excessive tendering and also bring about the more rapid fading of any blue vat dye which may be present.

From a consideration of several facts the authors reached the conclusion that, even in the dark, the presence of a vat dye of any colour in its reduced state on cotton should activate a solution of sodium hypochlorite so that the cotton

would suffer excessive tendering during bleaching, and this conclusion is now supported by much experimental evidence. Cotton samples, dyed with various vat dyes, were immersed, with and without previous reduction with sodium hydrosulphite, in sodium hypochlorite solutions of various pH in the dark and the resulting tendering of the cottons afterwards determined by measurement of tensile strength and fluidity in cuproammonium solution. The results definitely showed that under such conditions the reduced form of the vat dye was a much more effective catalyst than the unreduced form.

Two other facts emerged. Firstly, the reduced vat dye exerts its catalytic effect immediately the dyed fabric is immersed in the hypochloric liquor, and that apparently as soon as the dye is oxidised to its normal state this catalytic effect almost ceases. As a result of this behaviour the cotton is tendered within a few seconds of treatment with the hypochlorite liquor. The second important fact is that the maximum tendering effect is shown with sodium hypochlorite liquors having pH about 7.5. Earlier work has also shown that a neutral bleaching liquor is most destructive towards the cellulose of undyed cotton materials. It would, therefore, seem that the reduced vat dye acts as a catalyst in much the same manner as does ammonia, hydrogen peroxide, and urea (Kauffmann, "Ber.," 1932, 65, 179).

Among the vat dyes which have been found to promote tendering of cotton are Caledon Yellow GS, Grelanone Red B, Cibanone Orange R, Hydron Yellow NF, Hydron Pink FB, Indanthrene Bordeaux B, and to a smaller extent Indanthrene Blue RC and Indanthrene Brilliant Orange GR. The more concentrated is the dye on the cotton the greater is the tendering effect up to a certain point; more than 2 per cent. of dye on the cotton increases the effect but little. This research has considerable bearing on technical processes in which fabrics containing vat dyed stripes are subjected to kiering and chemicking treatments and to laundering. It appears essential to avoid reducing the coloured portions of such materials immediately before their treatment with a bleaching liquor and particularly such a liquor which is about neutral; otherwise there is danger that the dyed portions may be seriously tendered.

Lubricating Power of Oils on Wool

Olive oil and mineral oils have been compared with each other as regards their lubricating power towards wool by H. H. Skinkle and R. C. Morrison ("Amcr. Dyestuff Rep.," 1935, 24, 27). Such lubricating values are important on account of the necessity of oiling wool in the early stages of its manufacture where the fibres are continuously drawn alongside each other in the preparation of yarn. The method of comparison consisted of ascertaining the angles of slope necessary to initiate the sliding of a pad of the oiled wool down an inclined glass sheet. The smaller the angle the better is the lubricating value of the oil within the wool. From the results obtained it is concluded that equal lubrication is obtained from both oils when present in the wool above 3 per cent., but below this concentration a mineral oil is superior to olive oil as a wool lubricant.

Durability of Rayon Plush Fabrics

In the manufacture of plush fabrics for use on furniture there has been in recent years an increasing tendency to use rayon yarns on account of their high lustre, and rayon plush fabrics can now be made having a much brighter and attractive appearance than those constructed with wool. Recently, however, J. Walther ("Kunstseide," 1935, 17, 47) has compared the wearing values of wool and rayon plush fabrics, and surprisingly finds the rayon fabric to be superior. In Walther's experiments both types of fabrics were subjected to rubbing treatments under identical conditions in a rotary machine by which the surface of the fabric was rubbed with emery paper of standard character. The wool plush fabric wore away much before the rayon fabric. It is believed that the superiority of the rayon fabric is due to the greater resiliency and smoothness of the rayon fibres. It is suggested that rayon yarns could find a considerably increased outlet for use in plush materials.

New Technical Books

TECHNICAL GAS ANALYSIS. By George Lunge, Ph.D., Dr. Ing. Revised and rewritten by H. R. Ambler, Ph.D., F.I.C. pp. 416. Gurney and Jackson. 21s. net.

During the twenty years that have passed since the appearance of the late Professor Lunge's "Technical Gas Analysis," no general text-book on the subject has appeared in England, despite the number of important advances in technique which have been made during that period. The first aim of the revision has been to make the book as comprehensive as possible of all processes and types of methods which have appeared up to the time of writing, even where space has allowed no more than a brief mention with reference to the original literature. The second aim has been to give detailed working descriptions of the more noteworthy general methods and of processes for the more important gases. Where a choice has had to be made in describing alternative types of apparatus, preference has been given to instruments which are likely to be available to analysts working in the British Empire. The great growth of physical methods of gas analysis has made it desirable to group such methods together in a new section. A special section has been given to flue gases.

* * *

A TEXT-BOOK OF ELEMENTARY QUALITATIVE ANALYSIS. By Carl J. Engelder. Second edition. pp. 243. Chapman and Hall, Ltd. 13s. 6d. net.

In preparing this text-book the author has endeavoured to present the theoretical principles of the subject in a manner which is easily understood. He has outlined groups of preliminary experiments which demonstrate the properties of the metallic and non-metallic ions that are of importance in analytical procedures, and has simplified the procedures for anion analysis and systematic analysis. In general, his aim has been to train the student in logical, independent thinking rather than to teach him specific details of routine analysis. Theory of qualitative analysis has been treated from the standpoint of ionisation and chemical equilibrium. In this second edition the section on cation analysis has been entirely rewritten and enlarged, and certain improvements have also been made in those cases where tests are apt to be inconclusive. Attention must be directed to the binding used for this book. Students in laboratories where text-books are needed for reference purposes have frequently soiled their books through no fault of their own, but the new binding eliminates such troubles, because the pyroxylin impregnation of the cloth makes the finished binding completely water-proof and vermin-proof.

* * *

JOLY'S TECHNICAL INFORMATION FOR 1935 (Technisches Auskunfts-buch für das Jahr 1935). 40th yearly edition. Joly Auskunfts-buch-Verlag, Kleineittenberg a.E., Germany.

In the style of numerous excellent English encyclopaedias for all fields of knowledge in daily life, historical events, cultural pursuits and their results, progress and politics, Joly's Technical Information now appears in the 40th edition as a handy encyclopaedia on all technical questions. This limitation to pure technique is the great point about the book which contains for the engineer naturally very much more than any other encyclopaedia without, however, reaching the extent of a specialist handbook. The chemist will not, of course, use this book when he wants to acquaint himself with some special chemical question, but if he wants to get the hang of some question of technique out of his line he will find himself quickly informed in "Joly" in the style of similar general English encyclopaedias. In conclusion one can say that the book is less for the specialist and his field than for purposes of a more general, technical gist of a subject. That it fulfils its purpose within these limits is proved by the successful appearance of the 40th edition. Over and above this, the book has another value in England; in the case of innumerable technical articles, machines, machine parts, raw materials and semi-products and technical materials of all kinds, the average normal prices are given. This enables one not only to get information quickly, but, what is often more important, for exports, etc., a comparison of German and English prices.

EXPERIMENTAL PHYSICAL CHEMISTRY. By F. Daniels, J. H. Mathews and J. W. Williams. Second Edition. pp. 499. McGraw-Hill Publishing Co., Ltd. 21s. net.

The purpose of this book is to illustrate the principles of physical chemistry, to give training in careful experimentation, to develop familiarity with apparatus, and to encourage ability in research. It is divided into three sections: Laboratory experiments, apparatus and technique, and miscellaneous operations, such as calibration, glass blowing, purification of materials, etc. Some of the experiments are classical, others are new and are based on researches which are described in the literature. They are based on the experience of several years at the University of Wisconsin, where 30 to 35 experiments are assigned to the student during the year, and an average of 8 hours of laboratory time is allowed for each experiment. It is pointed out that any experiment worth doing is worth a careful report. "Accurate reports should become a habit. They should include a discussion of the theory, the derivation of all formulas, and the original data. . . . A true scientist cannot let his data be influenced by a preconceived hypothesis, nor must a student be influenced in his calculations by a knowledge of the correct result." The range of subjects covered is very complete—gases, liquids, optico chemical measurements, solutions, thermo-chemistry, colloid chemistry, phase-rule, chemical equilibrium, reaction rates, electrical conductance, electromotive force, electrode phenomena, dielectric constant, radioactivity, isotopes and photochemistry.

* * *

CHEMICAL ENGINEERING PLANT DESIGN. By Frank C. Vilbrandt, Ph.D. pp. 341. McGraw-Hill Publishing Co., Ltd. 24s. net.

This book is presented as an analysis of the fundamental principles and factors that are involved in the development of a technically and economically efficient plant process from the laboratory stage, through the pilot plant, to the unit of commercial size. It deals only with "plant design," which is quite distinct from "equipment design." The subject matter has been selected and developed with particular reference to professional chemical engineers as well as advanced students of chemical engineering. To executives in the chemical engineering industries who have never been trained in chemical engineering, it will serve as a useful guide upon the application of chemical engineering principles to plant design. The design of plant, so we are told, is based upon the application of accurate fundamental principles and data on unit operations to the process in question, and also upon the economic phrases of that process, costs being an important factor. The correlation of data, which is obtained through laboratory experimentation into a workable basis for designing plant, also takes into consideration a study of equipment and flow of materials in the process, as well as storage and expansion. Dealing with the development of the design project the author gives a brief outline to show the important part that the designer plays in the creation of an industrial plant. He then passes on to consider the location of the plant in regard to supply of raw materials, the market for the finished product, transport facilities, labour, water, power, waste disposal and the possibility of nuisance to adjoining property. Subsequent chapters deal with foundations, drainage, the installation of pipework, pumps and pumping. Flow diagrams, to which Chapter VIII is devoted, are an important phase in the work of the chemical engineer, there being about 80 important unit operations which may be involved. These flow diagrams are developed to show the flow of materials or chemicals through the process, the sequence of unit operations, and the equipment to be used at each stage of the process, as well as the paths by which intermediate and finished products emerge from the plant. The selection of the process equipment is a matter which demands very serious consideration, and 56 pages are devoted to it, the outstanding features of different types of equipment being briefly explained. Typical data sheets are given to show the nature of the information which should be passed on to the plant maker when sending out an inquiry for the equipment which is needed as part of the complete plant. The remaining chapters deal with plant layout; buildings, their construction, lighting, ventilation and heating; power and power transmission; and pre-construction cost accounting.

Notes and Reports from the Societies

Institute of Chemistry

Aberdeen Section : Polarimetric Methods

THE use of polarimetric methods in determining constitutions and reaction mechanisms was discussed by Mr. Robert Roger in a paper read before the Aberdeen Section of the Institute of Chemistry on March 1.

Work on the determination of chemical constitution by polarimetric methods, said Mr. Roger, can be subdivided into two classes: (a) constructive, where systematic changes are made in the structure of a parent compound and the subsequent effect on the rotatory power noted, and (b) deductive, where results found in constructive methods are utilised to decide the constitution of compounds.

Examples of (a) are found in the work of Rupe, Hilditch and others on the effect of unsaturation on optical rotatory power; the work of Rule on optical activity and the polarity of groups attached to the asymmetric carbon atom; the peculiar variation of rotatory power in compounds containing long chains of carbon atoms (Pickard and Kenyon). Examples used for illustration were (i) the menthyl esters of phenylacetic-, diphenylacetic- and triphenylacetic-acids (Rupe); the effect of varying the group X in menthyl esters of substituted acetic acids, CH_2XCOOH (Rule); comparison of the rotatory powers *o*-, *m*- and *p*-(+)-tolylhydrobenzoins (β -forms) derived from (-)-benzoin (Roger and McKay). Examples of (b) are found in the work of Singh and his co-workers on the constitution of compounds, such as *p*-imino-camphordiphenylamine; the proving of the "bornylene" structure of certain camphor derivatives (Rupe); investigation of the keto-enol problem by Lowry and his co-workers; work on the problem of asymmetric induction by Roger and Ritchie, Lowry, etc.

An interesting method of investigating reaction mechanism by polarimetric methods is found in the work of Patterson. He showed that the intramolecular change of the syn-form of an oxime into the anti-form could be determined by carrying out the action in an optically active liquid medium, such as ethyl tartrate, the change in rotatory power of the solution being used as the measure. By this means the rate of change of benz-syn-aldoxime into the anti-form and the conversion of iso-nitromethane into the stable nitromethane was found. Lowry, MacConkey and Burgess have also found the interconversion of the keto and enol forms of benzoylcamphor to be a unimolecular reaction and have determined the dispersion of the two forms.

The question of the intermediate phase in the dehydration of optically active glycols has also been the subject of study. The obtaining of an optically active ketone and an optically inactive aldehyde in the dehydration of (+)-*o*-tolylhydrobenzoin (Roger and McKay) effectually counters the suggestion of Danilov that the aldehyde forms the intermediate phase in such reactions. The work of Jones, Wallis and others on transformations of the Beckman, Lossen and Curtius types tends to show that the formation of an intermediate "carbonium ion" must be accepted with reservation and that consideration of the Meisenheimer idea of residual or partial valencies is helpful.

Institute of Fuel

East Midland Section : Evaluation of Coal

THE evaluation of coal, with particular reference to small coal for steam raising, was discussed by Mr. E. S. Grumell, in a paper read at a joint meeting of the East Midland Section of the Institute of Fuel and the Institution of Mechanical Engineers, at Derby Technical College, on February 22. The purchase of coal on a heat basis, said Mr. Grumell, is not yet widespread, and it is rarely realised that 1 per cent. of water as an inert constituent has practically the same effect as 1 per cent. of ash on the calorific value and freight charges. In many collieries coal is now being cleaned to reduce the ash content to 4 to 5 per cent., and there is a tendency to reduce this still further, a figure of the order of 3 per cent. being contemplated. Having pointed out the unreliability of evaluation by a short boiler trial, a method based on the correct sampling and analysis of coal, together with a limited knowledge of the effect of certain properties on performance

was described. Briefly, the points to be considered are as follows: (1) The calorific value of the coal as received; (2) the thermal efficiency which can be obtained from the coal; (3) the capacity value as affecting the output of a given plant; and (4) incidental charges.

Two coals of equal calorific value may not give the same results, and it is necessary to ascertain the actual "available" heat units. These will depend on the moisture, ash, volatile and coking properties, the size of the coal, and possibly the melting-point of the ash. For any given plant in general—and only comparisons are being dealt with—the thermal efficiency of two coals can differ only by: (1) The percentage of carbon dioxide in the flue gases; (2) the moisture in the flue gases; (3) the carbon loss in the ashes; (4) the outlet temperature of the flue gases which may, to a minor extent, vary with the volatile contents. In conclusion, Mr. Grumell referred to the general applicability of the fundamentals of the method. It is at the present moment being used as a basis for comparing large coal for locomotives and steamers, small coal for coke ovens, and coal for gas producers. In the case of coal for coke ovens, in place of efficiency a factor based on coking properties, tar and benzol yield, is used. In the case of locomotive coal "efficiency" must include something for "rate of steam raising, smoke emission, storage properties or other considerations." The use of practical methods is in many cases absolutely essential, but, quantitatively, they are often liable to error, and for this reason the results should be checked by what may be called laboratory methods.

Society of Chemical Industry

Liverpool Section : Meat Chemistry

A JOINT meeting of the Liverpool Section of the Society of Chemical Industry and the Food Group was held at Liverpool University on March 8 in the form of a symposium on "Meat." Professor C. O. Bannister was in the Chair.

Dr. E. C. Smith, of the Low Temperature Research Station, Cambridge, gave the opening paper dealing with "The Proteins of Meat," and in the course of his remarks dealt with the structure of muscle, the muscle substance proper being the familiar red meat. He described the proteins present in the various portions together with the pigments which give the meat its characteristic colour. The connective tissues, *i.e.*, the tendons consist largely of two insoluble fibrous proteins, (a) collagen, which gives gelatine on heating with water and (b) elastin. The muscle substance proper contains myosin and mycogen, which are proteins of the globulin class. The solubility of these proteins is very sensitive to changes of temperature, salt concentration, *pH* and to whether denatured, coagulated or not. Phenomena of this type might be related to drip in stored meat and the tenderness of meat after storage. The lecturer outlined improved methods for the determination of these proteins and showed the results obtained before and after storage.

Mr. L. C. Baker, of the research laboratories of J. Lyons and Co., Ltd., read the second paper on "The Constituents of Meat Acting as Pointers of Change." Certain constituents of food, he said, might be utilised as indicators in the study of food products and called "pointers of change." In the case of meat, lactic acid increased rapidly immediately after slaughter with corresponding fall in the *pH*. The increase in the tenderness of meat on maturing under suitable conditions had been considered due to the presence of this acid. Incipient putrefaction had been detected by a rise in the *pH* and by an increase in the amount of ammoniacal nitrogen. Cooking lessened the percentage of moisture and of water soluble extractives and coagulated the proteins. In this connection, boiling was more drastic than roasting. The colour of meat, due to haemoglobin from the residual blood, was an excellent guide to the quality of meat, the colour changing from red to brown on oxidation. Taint in the fat had been correlated with increase in the amount of free fatty acid and of active oxygen.

In a further paper on "Post-Mortem and Refrigeration Changes in Meat," Dr. T. Moran, of the Low Temperature Research Station, Cambridge, reviewed the chemical and physical changes in muscle during rigor mortis and then pro-

ceeded to a discussion of the changes in muscle and fat on further storage. These included (a) denaturation of the proteins, (b) changes in the muscle pigments, (c) rancidity in the fat, and (d) bacterial breakdown. The latter could be reduced very considerably by clean handling of the meat, and this was probably the most important factor in the storage of meat. Changes during storage could be controlled by adjusting the conditions of temperature, humidity and the gaseous environment. He illustrated this control by consideration of storage in the frozen state and in atmospheres of carbon dioxide.

Liverpool Section : Annual Meeting

At the annual meeting of the Liverpool Section the following officers and committee for the 1935-36 session were elected: Chairman, Professor C. O. Bannister; vice-chairman, Mr. E. Gabriel Jones; hon. treasurer, Mr. A. E. Findley; hon. recorder, Dr. G. P. Gibson; hon. secretary, Mr. J. S. Towers. Group representatives: Chemical Engineering Group, Mr. W. Ramsay Sibbald; Food Group, Mr. E. Gabriel Jones; Plastics Group, B. D. W. Luff; Road and Building Materials Group, Mr. A. E. Findley. The following were elected to vacancies on the committee: Professor T. P. Hilditch, Professor W. H. Roberts, Mr. W. P. Hayworth and Mr. C. E. Mold. Messrs. Robertson Dodd and James Smith were elected hon. auditors.

Birmingham Section : Lubricants

ADDRESSING members of the Birmingham and Midlands Section of the Society of Chemical Industry, on March 12, Mr. F. J. Slee, of Shell-Mex and B.P., Ltd., said it was impossible to differentiate quickly and simply between a good and an indifferent lubricant. The quality could be determined only by carefully-selected laboratory tests correctly interpreted, followed by a practical test. Before the advent of North American petroleum crudes, fixed or fatty oils were used as lubricants. The tests of specific gravity and viscosity were useful "finger prints" for reidentification purposes. But now, such tests had to be carefully interpreted with reference to the use of lubricants in special cases. For instance, specific gravity did not always indicate the stability of the oil in use, and it was not always safe to assume that an oil of high flash point would carbonise less than one of low flash point when used in an internal combustion engine.

Lubrication was not a science capable of mathematical precision. Laboratory test was not strictly comparable with running test, but, correctly handled, it was in many cases indicative of the results which could be expected and were generally met in practice. Mr. Slee concluded by saying that to-day laboratory specifications, expertly handled, could be considered entirely suitable for the selection of most lubricants.

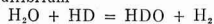
Chemical Society

Bristol : Chemistry of Heavy Hydrogen

LIGHT and heavy hydrogen can form altogether five different kinds of molecules—two modifications of the molecule H_2 , ortho- and parahydrogen, two modifications of the molecule D_2 , para- and orthodeuterium and the molecular species HD —said Dr. L. Farkas in a paper read before the Chemical Society at Bristol on February 15. The ortho- and para-molecules differ from each other by different orientation of the nuclear spins of the atoms. At low temperatures these hydrogens have different specific heats and this difference is the basis of the author's micro-method for the analysis of hydrogen mixtures, which allows a quantitative determination of these components in 0.003 c.c. (N.T.P.) of gas.

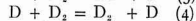
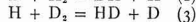
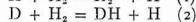
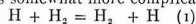
When compared with other isotopes the most striking property of light and heavy hydrogen is the ease with which they can be separated. A physical method for the separation of these isotopes, such as diffusion, is rendered possible by the relatively large difference in their masses. Similarly, differences in the chemical behaviour, in reaction velocity and in chemical equilibria, which can lead to a separation, are due to the different masses. The mass defines the frequency of vibration in the molecule and thus the vibrational energy will be different for the different isotopic molecules. Of particular importance is the zero-point energy, *i.e.*, the vibrational energy which is preserved at the absolute zero.

The zero-point energy of most molecules containing hydrogen amounts to several thousand calories. It can be shown that the differences in the zero-point energies of isotopic molecules appear in chemical equilibria as an additional heat effect and in reaction velocity as an additional energy of activation, which generally causes the reaction involving heavy hydrogen to go more slowly. An example of the former is the equilibrium



in which the equilibrium constant $K = (HDO)/(H_2O)(HD)$ is 3 instead of being unity as it would be were there no zero-point energy. An example for the latter case is the reaction rate of chlorine with H_2 and HD , the reaction with HD being about 3.5 times slower owing to an additional energy of activation equal to the difference in the zero-point energies of the molecules H_2 and HD .

The situation is somewhat more complicated in the reactions

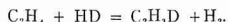


which involve an exchange of an atom. The investigation of the reactions (1) and (4) is made possible by the existence of ortho- and para-hydrogen and ortho- and para-deuterium, which undergo an interconversion by the exchange of atoms. In this particular set of reactions it was found that the energy of activation is determined both by the zero-point energy in the initial state and by the zero-point energy of the activated state, which is a triatomic complex like HHH , HDD , etc. The differences in the zero-point energies of the activated states compensate the effect of the energy difference in the initial state and, in certain cases, the reaction involving heavy hydrogen might even prove to be the faster one.

There is a wide possibility of heavy hydrogen being used as a research tool for the investigation of chemical and physical problems. For instance, the study of the interaction of heavy hydrogen and ethylene has shown that besides the addition reaction



there is also another so far unsuspected reaction proceeding according to



The comparison of the relative rates of the ortho-para-interconversion in hydrogen and deuterium induced by the paramagnetism of oxygen has given us a very important physical constant: the ratio of the nuclear magnetic moments of light and heavy hydrogen.

Society of Public Analysts

Annual General Meeting

THE annual general meeting of the Society of Public Analysts was held at the Chemical Society's Rooms, Burlington House, London, on March 6, the president, Mr. John Evans, being in the Chair. Certificates were read in favour of Frank Bell, James T. Dobbins, and Daniel J. O'Sullivan. The following were elected members of the Society: Albert E. Andrews, William L. Davies, George W. Ferguson, Oswald Hitchen, John Knaggs, and Norman Ratcliffe. Mr. Johan E. Nyrop was re-elected to membership.

The following officers and council for the year 1935 were elected: President, John Evans, M.Sc., F.I.C.; past presidents serving on council, F. W. F. Arnaud, E. Richards Bolton, J. T. Dunn, Bernard Dyer, Edward Hinks, P. A. Ellis Richards, G. Rudd Thompson, J. Augustus Voelcker; vice-presidents, L. H. Lampitt, S. E. Melling, A. More, W. H. Roberts; hon. treasurer, E. B. Hughes; hon. secretary, G. Roche Lynch; other members of council, A. L. Bacharach, H. E. Cox, F. G. Edmed, B. S. Evans, L. Eynon, R. C. Frederick, E. M. Hawkins, G. Hogan, Miss M. Roberts, C. J. H. Stock, J. R. Stubbs, R. W. Sutton, E. Voelcker.

Reminiscences of the Society

In place of the usual presidential address, Dr. Bernard Dyer, at the invitation of the President and Council, gave an address embodying his reminiscences of the Society, from its inception to the present day. At the outset of his address, Dr. Dyer pointed out that the occasion was particularly appropriate, since it was the Diamond Jubilee of the Society, which held its first meeting in February, 1875, when Dr. Redwood was elected president. Much of the early work of the Society

was concerned with food adulteration, which at that time was gross and widespread, although gradually analytical chemistry in general was brought within the scope, and in 1906 this was recognised when the title of the Society was enlarged to include analytical chemists other than public analysts. Portraits of successive presidents were shown on the screen and Dr. Dyer made them live again by his comments on their work and personalities.

British Association of Chemists

Scottish Section : An Analyst's Notebook

A SOMEWHAT unusual lecture was delivered to the Scottish Section of the British Association of Chemists on March 8 by Mr. A. R. Jamieson, B.Sc., the Glasgow City Analyst. The paper was entitled "Pages from an Analyst's Notebook," and consisted of an account of some of the problems and difficulties met with in the course of the very varied duties of a public analyst. Mr. Elce, the chairman of the Scottish Section was in the Chair.

The examination of foodstuffs was the first subject touched upon. This involved the detection of hydrogenated fats, the detection of added water in milk by the determination of the freezing point, and the examination of the gases evolved by defective tinned foods. Mr. Jamieson then dealt with the use of the ultra-violet lamp, which had served in the detection of forgeries and had revealed the removal of the stamped marks on eggs, and by intensifying the Gutzeit stain had rendered the arsenic test about ten times more accurate. The estimation of ethyl alcohol and its distinction from methyl and iso-propyl alcohols was the next subject discussed. Dealing with the presence of artificial dyes in foods, the lecture was enlivened by a display of brightly coloured pieces of flannel, the colouring matter of which had been extracted from such things as strawberry jam, raspberry wine, table jellies and custard powders.

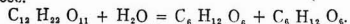
From foods, Mr. Jamieson passed to poisons, one of the most frequent of which, due to its increasing use in fumigation, is cyanide. He outlined the method for the detection and identification of the various poisons, and concluded with a display of specimens of preservatives and other injurious matter extracted from food of ordinary everyday consumption.

West Cumberland Chemists

Technique of Honey Production

BEEs flit from flower to flower but only visit the same type of flower on each particular journey, said Mr. A. C. Nelson, speaking on "The Technique of Honey Production" before the West Cumberland Society of Chemists and Engineers at Workington on February 1. That is to say, if they commence gathering from, say, apple blossom, they will continue to gather from apple blossom and will not visit the sycamore or pear. In entering the flower for the collection of the nectar they become covered with pollen. The bee transfers this pollen from her body into the pollen basket. Nectar is drawn up from the flower and descends into the honey sac of the bee. On her return to the hive she is met by other bees who remove the pollen from her basket and this is used for the preparation of food for the nourishment of the young grubs.

The nectar which the bees collect is a thin watery solution consisting mainly of sucrose (cane sugar). It is emitted from the sacs and mixed with a proportion of saliva. This contains invertase, an enzyme which converts the sucrose into dextrose (grape sugar) and levulose (fruit sugar)—two forms of glucose.



Enzyme + Cane Sugar + Water = Dextrose + Levulose.

After this is done the nectar is distributed in the cells and evaporation takes place. The heat of the hive and forced ventilation of the hive by the fanning of the bees thickens the honey by evaporating water, and it is reduced to one-quarter of its initial weight.

After the honey is ripened the bees introduce a little formic acid from the sting as a preservative. The amount introduced is infinitesimal and has practically no effect on the total acidity of the honey. Honey is slightly acid, but owes this acidity to the presence of malic acid. Composition

varies greatly and depends on the source of the nectar; flavour is also influenced by the source of the nectar and a change of locality for a few miles often makes a great difference. An average sample of English honey will contain:—

Water driven off at 100° C.	about 19%
Water driven off at higher temperature ..	7%
Levulose	30%
Dextrose	36%
Sucrose, wax, pollen, minerals	trace.

The honey, when sealed, is removed from the hive, and, after uncapping the frames, they are placed in an extractor and whizzed at a fair speed for a few minutes. The honey, which is thrown out by centrifugal force, then collects in the container. It is passed through a sieve and run into jars. This is known as "dropped" honey.

The propolis gathered by the bees is a resinlike substance obtained from buds and limbs of trees, especially from the horse chestnuts and different kinds of pine. It is carried like pollen on the hind legs and is used to seal every small crevice about the hive.

Wax for making the comb is produced in some way from honey, but, as yet, we know very little by what process the transformation takes place. The honey is used as a food and the change is physiological. After a period of suspension extending from 18 to 24 hours in a very high temperature white and transparent scales will appear at the opening of four little pockets that every bee has underneath its abdomen. About 10 lb. of honey is used in producing 1 lb. of wax.

The calorific value of honey is 1,485 calories per lb. and exceeds the calorie content of every other food, except dates, and is far ahead of meat, eggs, milk, etc. One pound of honey has approximately the calorific value of 30 eggs, 6 pints of milk, 12 lb. of apples or 20 lb. of carrots, and, in England, we consume 1 oz. per head, whereas in America the annual consumption is about 80 lb. per head. English honey is particularly valuable to those who cannot take cane sugar, for whereas some imported honey contains as much as 4½ per cent. of cane sugar English honey contains no more than 0.4 per cent.

Institution of the Rubber Industry

The Physico-Chemical Properties of Latex

THE physico-chemical properties of latex and their significance in manufacture were described by E. W. Madge in a paper read at a meeting of the Institution of the Rubber Industry on February 18, at the Engineers' Club, Manchester.

From the point of view that latex "creams" under gravity, that the particle carries an electric charge and depends partly on this for its stability and that the swelling of the actual particle in water is very small, it may be called hydrophobic, he said. On the other hand, in view of its behaviour with respect to dehydrating agents, the manner in which it forms aqueous voluminous gels, and more particularly in its reaction to shearing forces, latex may be classed as hydrophilic. Its hydrophilic character is conditioned by the material adsorbed on the surface of the particles and is more pronounced in compounded and treated latices. With latex, as with many other colloids, the shearing force is not a linear function of the velocity gradient, but varies in a more complex fashion, particularly for low rates of shear. The phenomenon is not confined to latex, but is exhibited by many other colloids and suspensions, the anomalous viscosity associated with low rates of shear being termed "the structural viscosity." This may be noticed, for example, in dipping, particularly with some thickened mixings where the rate of withdrawal is slow, the withdrawal times apart from drainage effects affecting the effective viscosity and the weight of the deposit. Hence, latex and many other colloids do not behave like normal liquids in their flow properties, but like pseudo-plastics.

Sixty per cent. is a popular concentration for the higher concentration latices prepared by processes other than those depending on evaporation, as such processes depend on the relative movement of the latex particles and the serum. According to the usual analysis, the resistance to motion of a particle for low velocities is directly proportional to the viscosity and the radius of the particle, and the force producing the motion is proportional to the cube of the radius of the particle and the difference between its density and that of the serum. Consequently, other things being equal the lower the viscosity of the latex the better the separation.

In common with other colloidal suspensions the viscosity of latex mixings decreases rapidly with rise in temperature. The relation is probably a logarithmic one, of the form discussed by Andrade for liquids, $\log. \eta = a + b/T$. The decrease of viscosity with temperature has not been used to any great extent, although a recent patent claims that an increased separating efficiency in the centrifuging process may be obtained by heating the latex due to the reduction in viscosity thereby obtained. The latex system consists of particles suspended in an aqueous medium prevented from coalescing (2) by their charge, (b) by the adsorption envelopes on their surfaces. The methods by which the viscosity of a mix may be altered by agents, therefore, fall into three groups, by (1) influencing the charge on the particle, (2) altering the magnitude of the protective envelope, and (3) altering the viscosity of the aqueous serum itself. The three groups must necessarily be somewhat interconnected, but the three effects may be clearly separated. The effect of ammonia on the viscosity of a latex of the addition of ammonia results in the viscosity falling sharply up to approximately 0.05 per cent. and still decreasing up to an ammonia content of 0.10 per cent. The modification of the nature and amount of the adsorption layer can be done in a number of ways. The hydration of the adsorption layer can be reduced by the use of small quantities of dehydrating agents with a diminution in viscosity; or by treatment with such materials as albumen, casein and haemoglobin, in which case the viscosity is strongly increased. An outstanding example of the effect of heavy hydration of the protective envelopes is afforded by the special case of flocculated rubber precipitates prepared from latex. In conclusion, the author expressed his thanks to the Dunlop Rubber Co. for permission to present the paper.

Faraday Society

Structure of Metallic Films and Surfaces

A GENERAL discussion on the structure of metallic coatings, films and surfaces will be held at the Imperial College of Science and Technology, London, on Friday and Saturday, March 29 and 30. The introductory paper will be given by Professor C. H. Desch. Separate reports, having been issued some days in advance of the meeting, will be taken as read, and the authors will devote some minutes to indicating the matters which they deem to merit particular attention; the subject will then be thrown open to discussion.

By the courtesy of Professor G. P. Thomson and Professor G. I. Finch, their respective laboratories will be available for inspection during the meeting, and arrangements will be made to demonstrate some of the work which is in progress.

The Society will entertain its distinguished overseas guests at dinner in the Union on Friday, March 29. Morning dress will be worn. Price, not including wines, to members, 6s. 6d.; to non-members, 8s. 6d.

Papers on Electron Diffraction Methods will include "An Apparatus for Electron Diffraction at High Voltages" (Professor G. P. Thomson); "Electron Diffraction and Surface Structure" (Professor G. I. Finch); "The Problem of Inner Potential in Electron Diffraction" (Professor W. E. Laschkaraw, of Leningrad); "Electron Diffraction of the Structure of Condensed Metallic Films and Surfaces" (Professor F. Kirchner, of Leipzig); "Thickness of the Beilby Layer on Polished Metals" (Mr. H. G. Hopkins). Papers on the Structure of Metallic Coatings will include "The Crystallisation of Thin Metal Films" (Professor E. N. daC. Andrade); "The Validity of Drudes' Optical Method of Investigation of Thin Films" (Professor L. Tronstad, of Trondheim); "Optical Research on Evaporated Metal Layers" (Professor L. S. Ornstein, of Utrecht); "The Determination of the Structure of Electrodeposits by Metallurgical Methods" (Mr. D. J. Macnaughtan); "The Influence of the Structure of Electrodeposited Metals on its Chemical and Physical Properties" (Professor Mr. Schlöter, of Berlin); "On 'Somatoid' Elements of Structure in Electrolytic Metal Deposits" (Professor V. Kohlschütter, of Berne); "The Controlling Influence of films of the Structure of Electrochemical Metallic Coatings" (Dr. E. Liebreich, of Berlin-Halensee); "Cathodic Films in the Electrolytic Reduction of Aqueous Chromic Acid Solutions" (Dr. E. Müller, of Dresden); "The Structure and Physical Properties of Nickel Deposited at High Current Densities" (Dr. W. Blum and Dr. C. Kasper,

of Washington); "Electrode Potentials and the Nature of Electrodeposits" (Dr. S. Glasstone, of Sheffield); "Contribution to the Experimental Study of the Influence of the Support upon the Structure of Electrolytic Deposits" (Professor A. Portevin, of Paris); "Influence of the Base Metal of the Structure of Electrodeposits" (Mr. A. W. Mothersall); "Differences in the Structure of Electrodeposited Metallic Coatings shown by X-Ray Diffraction" (Mr. W. A. Wood); "The Structure of Electrolytic Chromium" (Mr. L. Wright, Mr. H. Hurst and Mr. J. Riley, of Manchester); "Determination of the Phase-Structure of Metallic Protective Coatings by Anodic Dissolution" (Professor A. Glazunov, of Pribram); "Improvement of the Quality of Sprayed Metallic Coatings by the Use of Non-metallic Intermediaries and Supports" (Dr. E. Reiningger, of Leipzig); "Factors Influencing the formation and Structure of Hot-dipped Tin Coatings" (Mr. E. J. Daniels).

Hull Chemical Society

Microchemical Analysis by Colorimetric Methods

MICROCHEMICAL analysis by colorimetric methods was the subject of a paper read before the Hull Chemical and Engineering Society on February 19, the author being Mr. Norman Strafford, M.Sc., F.I.C., head of the analytical section of the Research Department, Imperial Chemical Industries, Ltd. (Dyestuffs Group).

Colorimetric methods give great increase in sensitivity; for instance, by the use of diphenylcarbazide it is possible to detect one part of chromium in 20 million parts of solution. Secondly, they have simplicity and speed of determination. It is now possible to carry out a colorimetric determination of nickel in 0.1 gram of a copper-nickel alloy in ten minutes; this contrasts very favourably with the time required by classical methods, although it is true that the accuracy attainable may not be so great unless a precision colorimeter be employed. Thirdly, in certain cases the colorimetric method secures the great advantage that tedious chemical separations may be much simplified or avoided altogether. By using colorimetric methods the time and therefore the cost of the analysis is very greatly reduced and the accuracy increased. Fourthly, even where separation from all or most other metals is necessary, the use of the modern organic reagents offers greatly increased facilities for those separations which are otherwise often very tedious. Many of the highly-coloured or insoluble inorganic and organic metallic complexes are co-ordination compounds and not merely adsorption compounds of indefinite composition.

The great advantage of many organic reagents is their comparatively specific action in forming complexes. Compounds containing the rhodanine group



form complexes with silver, mercury, copper and the platinum metals. The CH_2 in the group is generally substituted, e.g., in benzylidene derivatives, such as paradimethylaminobenzalrhodanine; the sensitivity of the reaction is thereby considerably increased. The α -dioxime group



forms complexes with a limited number of metals, particularly bismuth, nickel, cobalt, ferrous iron, copper and palladium. A number of different α -dioximes have been recommended, for example, dimethylglyoxime, α -furildioxime and α -benzildioxime. The reaction is usually made specific for nickel by suitable control of the conditions under which the test is carried out. These are only two of the several examples which may be cited.

Quantitative colorimetric methods may be (a) a direct measure of the ion being determined due to the formation of coloured complexes, e.g., nickel with dimethylglyoxime; (b) a measure of the colour of a second substance produced by the action of the material being determined, e.g., methods for tin depend not upon the colour of the tin compound, but

upon the colour of products obtained by the reducing action of the stannous chloride on cacotheline or phosphamolybdic acid (other examples are the well-known methods for the determination of chlorine or other oxidising substances by benzidine and of nitrates by diphenylbenzidine); (c) indirect measurement of a second substance with which the compound to be determined combines quantitatively.

In the actual determination preliminary treatment must be devised so as to obtain the whole of the material in solution, from which a suitable aliquot may be taken for analysis. In the case of organic compounds, the whole of the organic matter must be removed, either by ignition or preferably by wet oxidation. Reactions which do not suffer interference from other substances, at least to a slight extent, are relatively few. The interfering substance may not mask or appreciably affect the shade of the colour, but may have a most profound effect on its intensity. General methods for avoiding such interference include (1) the suppression of the action of the interfering substance by the formation of complex ions or by the solvent-interface method; (2) removal of the interfering substance by extraction with an organic solvent; (3) isolation of the substance to be determined by formation of an organic complex which is then removed by extraction with an organic solvent; (4) separation by volatilisation; and (5) in the last resort it may be a necessary preliminary to isolate the substance by the ordinary methods of inorganic chemistry, which are often tedious and require very careful manipulation.

Society of Glass Technology

Annual Dinner

THE annual dinner of the Midlands Section of the Society of Glass Technology will be held at Stourbridge on March 19. On March 20 there will be a visit to the Earl of Dudley's Round Oak Steel Works, Brierley Hill.

The 169th meeting of the Society will be held in the Talbot Hotel, Stourbridge, on Wednesday, March 20. Papers to be discussed include "Specification for Sands for Making Colourless Glass" (as proposed by the Glass Standards Committee of the Society); "Standard Specification for Creosote Fuel Oil for Use in Glass Works" (as proposed by the Furnace Committee of the Society); "The Examination of Some Lead Crystal Glasses," by E. Preston, B.Sc., Ph.D., and Professor W. E. S. Turner; "Scratches and Markings on Glass Surfaces," by A. J. Holland, M.Sc., D.I.C., and Professor W. E. S. Turner; "Some Notes on the Spalling Characteristics of Fireclay Bricks," by R. E. G. Evers and J. R. Adderley; and "Fireclay Raw Material Characteristics and their Influence on the Finished Brick," by C. A. G. Thomas and J. R. Adderley.

The Iron and Steel Institute

The Welding of Iron and Steel

A SYMPOSIUM on the welding of iron and steel is to be held by the Iron and Steel Institute in the lecture theatre of the Institution of Civil Engineers, Great George Street, Westminster, on Thursday and Friday, May 2 and 3, at 10 a.m.

The programme of the presentation and discussion of the groups and sub-groups is as follows:—May 2, morning, 10 a.m., Group 1 (a)—Present-day practice and problems of welding in the engineering industries: Bridge and structural engineering, pressure vessels, railway material, shipbuilding. Afternoon, 2.30 p.m., Group 1 (b)—Present-day practice and problems of welding in the engineering industries (continued): aeronautical, automobile, chain, and electrical industries, iron and steel castings and wrought iron. May 3, morning, 10 a.m., Group 2—Welding practice and technique and welding apparatus; Group 3—The metallurgy of welding. Afternoon, 2.30 p.m., Group 4—Specification, inspection, testing and safety aspects of welding. Advance copies of the papers are being prepared; the charge for these is 2s. 6d. per copy for each group or sub-group, or 10s. 6d. for a complete set.

A conversazione will be held at the Science Museum, South Kensington, on the evening of Wednesday, May 1, from 8 p.m. until 11 p.m. Sir Harold Carpenter, F.R.S., president of the symposium and president-elect of the Iron and Steel Institute, and the presidents of the co-operating societies, will receive the guests, after which a display of cinematograph

films on welding will be given. During the evening an exhibition of welding apparatus, with practical demonstrations of welding, will be available for inspection. A dance will be held at Grosvenor House, Park Lane, on May 3. The price of tickets is 31s. 6d. per double ticket admitting one gentleman and one lady, or 21s. per single ticket.

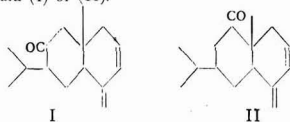
University Chemical Societies

Birmingham: Sesquiterpene Chemistry

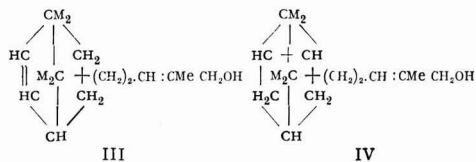
RECENT progress in sesquiterpene chemistry was discussed by Professor J. L. Simonsen in a paper read at a joint meeting of the Chemical Society and the University of Birmingham Chemical Society, at Birmingham, on March 1.

After a brief historical introduction, in which reference was made to the pioneering researches in terpene chemistry made by the late Sir William Tilden, the first professor of chemistry in the Mason College, now the University of Birmingham, Professor Simonsen pointed out that little progress was made in the determination of the structure of the sesquiterpenes and their derivatives prior to the classical researches of Kuzicka (1921). His proof that many of the more important sesquiterpenes were derivatives of the naphthalene hydrocarbons, cadalene and eudalene opened up a wide field of research. It was pointed out, however, that this method of attack had a somewhat limited application.

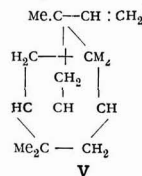
The methods adopted by Bradfield, Penfold and Simonsen in the determination of the structure of the sesquiterpene ketone, eremophilone, were outlined and a new sesquiterpene ketone, cyperone, recently isolated by Rao from *Cyperus rotundus*, was described. This ketone, like eremophilone, is also a derivative of eudalene, and is probably represented by either formula (I) or (II).



An account was next given of the methods adopted by Bradfield, Penfold and Simonsen in determining the constitution of the alcohol, β -santalol (III), which, with α -santalol (IV), forms the main constituent of East India sandalwood oil.



Finally, reference was made to the tricyclic hydrocarbon, longifolene (V), occurring in *Pinus longifolia*.



The investigations of Bradfield, Francis and Simonsen have shown this hydrocarbon to be unusual in possessing a vinyl side chain. It can be derived from eudalene, if a comparatively simple Wagner rearrangement is assumed.

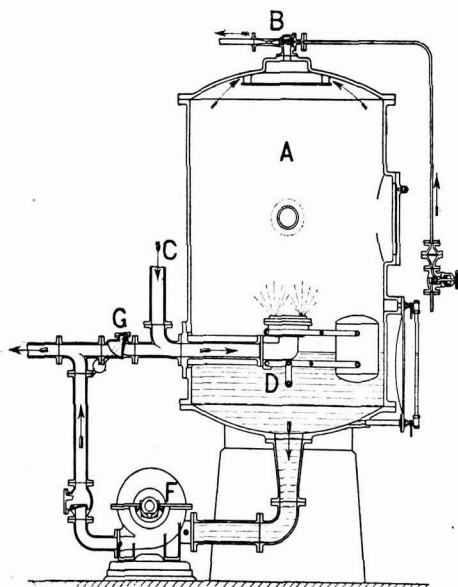
EFFICIENCY-TYPE geared motors are described in a new booklet issued by Crofts (Engineers), Ltd. The chief interest of these is the very wide range of standard units which are included and also the simplicity in method of selection. Full and detail dimensions are given of each type of unit. The powers of the units range up to 120 h.p. and any required ratio can be given with either one or other of the motors listed. A sheet of installation diagrams is given, showing floor, wall and ceiling mountings.

Works Equipment News

De-Aerating Boiler Feed Water

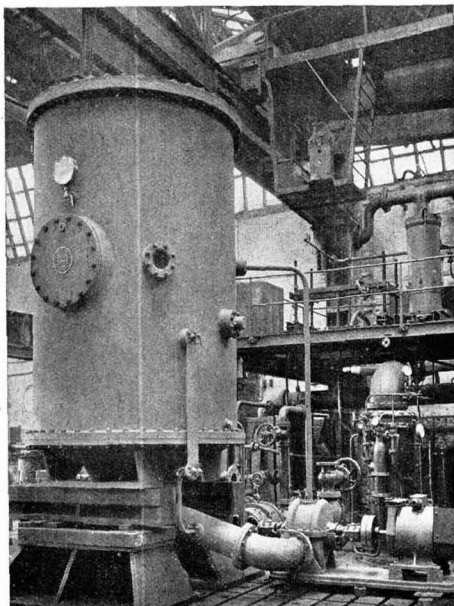
ONE of the most interesting examples of the application of chemical engineering in power practice is the de-aeration of boiler feed water, to below, say, 0.05 c.c. of oxygen per litre, so as to prevent corrosion in water tube boilers and steel tube economisers. The most convenient and efficient method of de-aerating is by heating under vacuum, the solubility of oxygen in water being, of course, dependent upon the temperatures and the pressure.

The latest de-aeration plant made by Hick Hargreaves and Co., Ltd., gives an extremely high efficiency resulting in water having not over 0.05 c.c. dissolved oxygen per litre, whilst, at the same time, being simple in design and operating with an open hot-well or supply tank. Essentially the principle consists in spraying the warm feed water, using a special design of spray nozzle valve, into a closed cylinder, which is maintained at a high vacuum by a steam ejector.



Vertical section of "Hick Hargreaves" Atomising Spray De-aerator. A—De-aerating vessel; B—Steam-operated ejector; C—Inlet pipe for hot feed water; D—Special spray nozzle valve; F—Extractor pump; G—Non-return valve.

This eliminates all complicated mechanically-operated vacuum pumps, and the good results largely depend upon the extremely finely divided particles of water given by the spray. Under these conditions the oxygen almost instantaneously passes out of solution in the water to such a degree that often much less than 0.05 c.c. per litre remains, an amount that cannot be determined by the standard Winkler test using manganous hydroxide and potassium iodide, with the free iodine, equivalent to the oxygen, determined by



Large Feed Water De-aerator Vessel and Pump with a maximum capacity of 150,000 lb. of water per hour, assembled at the works of Hick, Hargreaves and Co.

standard thiosulphate, using starch for the indicator. Generally, about 0.10 c.c. per litre of feed water is regarded as the maximum requirement.

The de-aerator consists of a vertical closed cylinder, forming the de-aerating vessel, having the steam ejector at the top. Warm feed water at about 130° F. enters by an inlet pipe at the side of the cylinder and passes direct to the special spray nozzle valve situated in the centre lower portion of the de-aerating vessel, the inlet flow being controlled by a bucket float which maintains a constant water level in the de-aerating vessel. All the feed water is discharged continuously with great force in the form of the spray, losing its oxygen mainly because of the extreme sub-division in the vacuum, as already indicated, and falling to the bottom. From the latter the de-aerated water is taken by a motor-driven rotary extraction pump and discharged to the boiler feed circuit which has a non-return valve between the de-aerator inlet and the extraction pump discharge. Under these conditions, if the pump is stopped water can pass automatically direct to the boiler feed pump.

The steam ejector discharges the small amount of steam used along with the extracted air to the cold inlet water, thus raising the temperature and giving a very high over-all thermal efficiency. The aeration of the cold water does not matter, since it is already more or less saturated with oxygen. If the raw feed water is not already 130° F. it can easily be warmed to the necessary extent by a small amount of exhaust steam or the use of an auxiliary externally-heated feed heater. Further, when only cold water is available without much exhaust steam, a modified "flashing spray" de-aerator is supplied which operates at less than 130° F., having a 2-stage ejector and an internal tubular vapour heater and feed water heater.

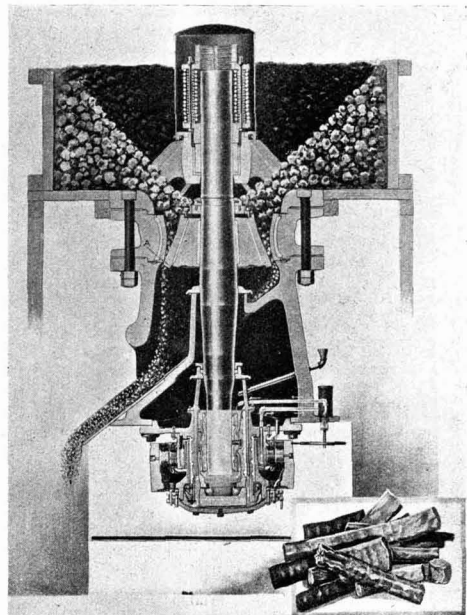
Scientific Crushing

FOR the efficient crushing of hard material, such as ironstone, limestone and flint, a number of requirements are of great importance. For example, the crusher must be low in maintenance costs, and able to run for months without stoppages for repairs and renewals. Also, the drive should not require the use of gears, which in general are noisy and high in power consumption, especially after the inevitable

wear and tear has taken place. In addition, the ideal crusher always delivers the material continuously in the cubical condition, irrespective of the amount of material that has passed through, without chipping and splintering. These requirements are almost completely fulfilled by the "Kennedy" vertical ball-bearing gyratory crusher, manufactured by the Sheepbridge Coal and Iron Co., Ltd.

Essentially, the principle of this crusher consists in the use of a relatively short, vertical, heavy steel spindle or shaft, carrying a manganese steel crushing cone, which is caused to move continuously in gyratory fashion within a manganese steel stationary throat, forming the crushing space. That is, the vertical shaft does not normally revolve on its own axis, although free to do so, but moves in gyratory fashion about a fulcrum at the upper part of the machine, above the crushing space. At the bottom the gyratory drive is given by means of a short foot bearing in which the shaft rests fixed in the right position, off the centre, inside an outer high-speed vertical steel driving ring or pulley, driven efficiently and noiselessly by means of a belt. No gearing of any kind is fitted, all the energy being used direct to crush the material, resulting in very low power consumption. There is also provided at the top of the shaft a series of powerful springs so that if any uncrushable material, such as a piece of iron or steel, should be present no harm is done, the vertical shaft moving downwards momentarily against the compression of the springs and allowing the material to pass through. The springs are of sufficient strength to resist compression during normal crushing, while to adjust the size of the final product all that is necessary is to alter the position of a large adjusting nut at the top of the machine, which moves the shaft in a vertical direction in relation to the throat.

Machines of this type will crush 30,000 tons of granite or over before any minor repairs are necessary. All the crushed material, from first to last, is in the cubicle form, because of the peculiar rotary and gyratory crushing action, quite different, for example, from ordinary impact with severe wear



"Kennedy" ball-bearing gearless type "S" crusher for fine crushing. Inset shows pieces of steel which passed through one of these crushers.

and tear on hammers. The power consumption is very low; the No. 37 machine, which takes pieces up to 7 in. cube and reduces them to any desired size at the rate of 40-50 tons per hour, requires only 40-45 h.p. in the case of a standard product such as limestone. These "Kennedy" machines are supplied in a wide range of sizes from 1½ in. to 14 in. opening at the throat, with capacities of ¼ ton to 550 tons per hour delivered in any size within the range of ¼ in. to 3 in. cube as desired, merely by altering the adjusting nut.

A New Hygrometer

THE "Humatagraph" hygrometer, supplied by the C. L. Burdick Manufacturing Co., utilizes strips of fibre from the outer covering of the ovular bracts from conifer trees as sensitive element. This natural hygroscopic substance has an extraordinary reaction to moisture, its linear expansion being three times that of hair. Another quality which



General view of the "Kennedy" crusher, as made by The Sheepbridge Coal and Iron Co., Ltd.

"Humatagraph" Hygrometer, pocket model. (C. L. Burdick Manufacturing Co.)



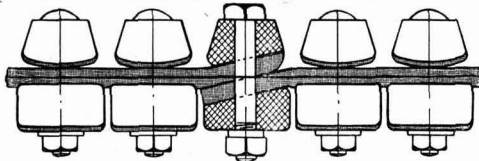
increases its value is that it is practically non-elastic; it also has continuity of reaction over a long period of time. If at any time readjustment is required, the mechanism for the larger instruments provides means to regulate the amplitude of movement, and means for adjusting the relative amplitude

at the two ends of the calibration. The calibration of the Humatagraph, being spaced nearly uniform, it is as easy to read as the time of day with the clock. Three models are now made with the new adjustable internal mechanism with long fibre.

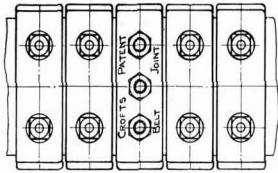
The casing is improved and the instruments are provided with an anodised aluminium dial. The wood-encased models can be supplied with the Rotothem thermometer in the centre of the dial, so that temperature as well as humidity is shown.

A Variable Speed Gear Belt

PARTICULARS of a new variable speed gear belt, with central pull, are given in a leaflet issued by Crofts (Engineers), Ltd. The design and construction of this belt has been arrived at only after extensive experiment and research. It will be appreciated the belt of a variable speed gear is of vital importance to the machine as a whole, and many designs have been adopted to obtain improved performance. It was only after the widest experience in the manufacture and installation of speed gears for industrial drives that this new belt was put forward as the most satisfactory yet produced. It gives maximum gripping surface when driving, with utmost

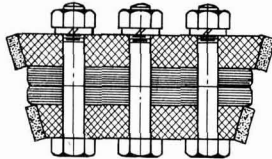


Section through the Crofts Variable Speed Gear Belt joint showing formation of patented lap joint, specially formed lags and securing bolts.



Plan of Crofts Variable Speed Gear Belt showing leather tips or facings which are ground to ensure steady running and perfect contact on cones.

Section through belt lag, leather facings, hardwood lags, and high-tensile steel bolts.



flexibility and with a joint of equal strength to the belt itself, which does not impair the flexibility in any way.

All users of variable speed gears will be interested in this device. The belt lags are closely spaced along inner and outer circumference of the belt, giving continuous contact when running. The lag ends are ground in position on the belt to give full driving contact with the cones and, at the same time, ensure maximum power transmission and steady, even running. The joint provides a straight line drive through the centre of the belt: it consists of an angular lap joint secured by two specially formed metal lags firmly secured by bolts. The full strength of the belt is thus maintained and the high flexibility is not impaired in any way. The belt joint can be connected or disconnected in a few moments.

Welded and Riveted Work

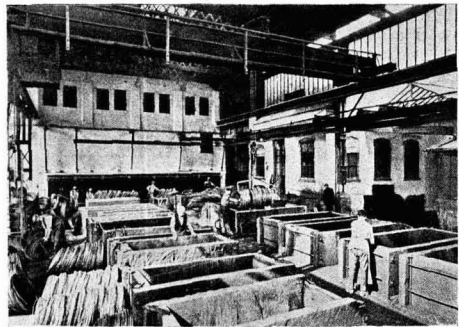
AN old-established business of engineers and iron founders, specialising in plant for the soap and chemical industries, has been acquired by Thomas Locker and Co., Ltd., makers of screens and screening equipment. The engineering section of the business will be carried on as a separate entity, and is registered under the name Lockers (Engineers), Ltd. It will continue the production of agitators, autoclaves, mixers, dryers, digestors, coolers and all plant for the chemical and associated trades, in addition to screens, conveyors, hoppers,

chutes, tanks and every description of welded and riveted work. The works are ideally situated to give prompt service and maintain a special staff to handle breakdown jobs. One of the features of the service is a portable electric welding plant, able to travel anywhere at any time, to deal with urgent repairs. The shops are equipped with the most up-to-date machines, and the foundry, in addition to producing iron castings up to twenty tons, makes brass, bronze, aluminium and special alloy castings, which can be supplied promptly, machined complete, if desired.

The combination of the resources of Thomas Locker and Co., Ltd., and Locker (Engineers), Ltd., will mean greater service to industry, since they will be able to handle structural steel work for screens, conveyors, elevators and material-handling plant generally, in addition to the already well-known "Locker-Trayco" screens, feeders and conveyors, and "Locker-Rotex" mechanical sifters.

Modern Wire Ropes

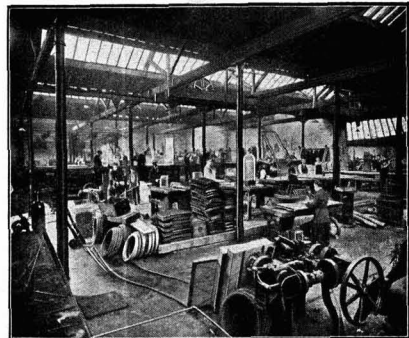
ALMOST every industry uses wire ropes, and, apart from general haulage and aerial rope conveyors, lifts and elevators, such as used in the chemical and allied industries, the wide field of application includes cranes, oil wells, logging, wireless equipment, ships hawsers, cable tramways and steam ploughing. In this connection, considerable interest attaches to the latest addition of the wire rope catalogue of the Whitecross Co., Ltd., which gives sizes, weights, lengths and break-



Pickling wire rods in acid at the works of the Whitecross Co., Ltd.

ing strains of Imperial Standard wire gauges, and also the dimensions of a wide range of ropes. This firm supplies a complete range of wire ropes in steel and other metals, and one typical construction often used, say for crane ropes, is to build up from six strands each of which are made from 19 wires, the rope also having a hempen core. For severe work, however, a special "plough" brand of steel is used, which has a higher breaking strain than the normal.

The process of wire manufacture has been greatly improved during recent years, and the basic principle, with various modifications, is to start with steel billets in the form of long bars of square section, which are heated and then rolled

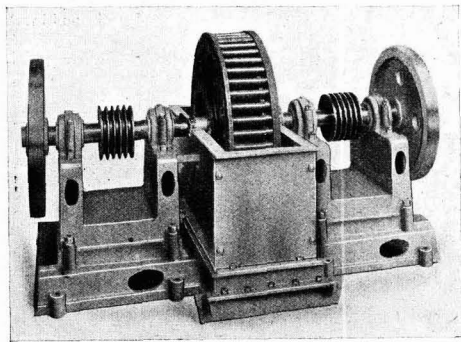


Another modern wire-work factory—that of Thomas Locker and Co., Ltd.

down in a succession of rolling passes to long rods of much smaller cross sectional area than the original billet. These rods are then specially heat treated, a process known as "patenting" to produce a suitable physical condition to allow of drawing down to smaller sizes, followed by cleaning or pickling in dilute acid and then cold drawing into wire. This is carried out, with further patenting when necessary, by pulling the rods in succession through a series of cast steel or alloy dies, having a hole or aperture so that finally the wire is the exact cross section required. Galvanising for protection against corrosion is also extensively used, both for land as well as marine work, and the firm's "Silflex" brand gives a galvanised wire that can be bent and twisted in any direction without the zinc flaking or peeling, the coating being both extremely flexible and strongly adherent. The whole of these operations right from the steel billet, including the subsequent manufacture of wire ropes, are carried out at the Whitecross Works, which was established in 1864.

A British Mill of the "Carr" Type

The accompanying illustration shows a British-made Carr type mill, having six cages, as recently placed on the market by L. A. Mitchell, Ltd. This mill is especially suitable for pulverising precipitated products to 300 mesh, including lithopone, white lead, oxides, pigments, etc. It can be supplied



New "Carr" Type Mill with cover and charging hopper removed. (L. A. Mitchell, Ltd.)

in sizes for outputs up to 1, 2 or 3 tons per hour, and is very suitable for handling materials of a sticky nature, which are difficult to grind satisfactorily in mills fitted with screens, cyclones, air separators, etc. The upkeep cost of this type of mill is claimed to be very low, and it has the advantage of being a cheap mill for handling large outputs. The grinding bars are made of nickel chrome steel.

Personal Notes

MR. ALEXANDER CAMPBELL ROSE has been appointed a director of United Water Softeners, Ltd.

MR. ARTHUR LAIRD MORRISON, who was connected with the United Alkali Co., Ltd., and who died on March 3, was buried on March 6.

MISS MURIEL ROBERTS, of Sefton Park, Liverpool, the only woman public analyst in the country, was elected a member of the Council of the Society of Public Analysts at the annual meeting of the Society held in London.

MR. WILLIAM GRIFFITHS HUGHES, of Battle, Sussex, pharmaceutical chemist, long associated with E. Griffiths Hughes, Ltd., proprietors of Kruschen salts, left £507,081, with net personalty £480,399.

MR. MAX WOOSMAN, group labour officer of the I.C.I. (Alkali) concern, will be among the speakers at a conference of the members of the Institute of Labour Management to be held at the Midland Hotel, Manchester, on March 22.

MR. W. H. ROSS, chairman of the Distillers Co., Ltd., has given £40,000 to establish an organisation in Edinburgh for research work into the cause of blindness and for practical measures for its prevention.

Workmen Overcome in Iodine Tank

Queenborough Inquest Adjourned

AN inquest was held at Queenborough (Kent) on March 9, on the bodies of Frederick Ost, 72, of South Street, Queenborough, and Wallace Holmes, 55, of High Street, Queenborough, who lost their lives through being overcome by fumes at the Sheppey Glue and Chemical Works, Queenborough, on March 5. Ost had been engaged in the cleaning of iodine tanks, a job he had done for many years. Holmes was the foreman of that department.

Richard J. Davis, of Minster Road, Minster, said that his supervisor left instructions for him to look at the iodine plant. He went through the doors of the stillroom and saw Holmes standing on a pipe near one of the tanks which contained iodine. He called out: "Is everything all right, Wallace?" And Holmes replied, "I think so. I will have a look round." Holmes went up to have a look, and in passing the tank suddenly shouted: "Give me a hand, Dick; Fred is in there." Davis added that he rushed up the steps and, looking into the tank, saw Holmes trying to lift Ost up the ladder. "We both tried to pull him up, and then suddenly Holmes started choking. I tried to save him, but it was too late. The weight on me nearly pulled me into the tank. I was gasping for breath and managed to go through the door and fell on the floor. When I got up I shouted for help."

William Thomas Rule, yard foreman, described how he tried to get hold of Holmes's shoulders, but could not get a grip owing to the slime on his coat. Eventually he got his hand under his armpits and hoisted him over his shoulder.

George Ralph Stevens, works manager and director, said that the tank, about 4 ft. deep, contained approximately 3 in. of solid matter and 9 in. of liquid. A similar accident had never occurred before.

Alfred Albert Ponton, chemist at the works for 28 years, said that the plant gave off sulphuretted hydrogen. It was possible that carbon monoxide might be given off. The day after the accident he tested the liquid for any gas given off, and there was no trace.

The jury expressed the opinion that they should view the works and that the organs of the two men should be analysed.

The Coroner adjourned the inquiry until the receipt of the analyst's report.

Carbon Bisulphide

Draft of New Conveyance Regulations

A DRAFT of amended regulations proposed to be made for the conveyance of bisulphide of carbon in road tank wagons has been issued by H.M. Chief Inspector of Explosives. The main amendment of these Bisulphide of Carbon (Conveyance) Regulations, 1935, has been to increase the quantity to be allowed in a tank wagon to 2,000 gallons, but the opportunity has been taken of bringing the regulations into line as far as possible with the recent Petroleum Spirit (Conveyance) Regulations, 1932.

It is laid down that bisulphide of carbon shall not be conveyed except in (a) steel or iron containers, each of a capacity not exceeding 50 gallons, constructed in accordance with specification, maintained in good condition and securely closed so as to prevent leakage; (b) luted and tied-over stoppered bottles, each containing not more than 7 lb. securely packed in strong wooden cases in sawdust, kieselguhr or other suitable material, each bottle being separated from other bottles by wooden partitions and the total weight of bisulphide of carbon in any one case not exceeding 30 lb.; or (c) mechanically-driven tank wagons, subject to the provisions of the new draft regulations.

Containers, bottles and cases containing bottles shall be legibly marked or labeled with the words "Bisulphide of Carbon, Highly Inflammable," together with the name and address of the sender. When containers are filled, allowance shall be made for an air space of at least 7½ per cent.

The capacity of a tank wagon shall not exceed 2,000 gallons. If the wagon is mechanically-driven the engine shall be stopped the whole time the filling or emptying is proceeding and shall not be run until all tanks have been securely closed. Adequate provision shall also be made to prevent the accumulation of a dangerous static charge of electricity.

News from the Allied Industries

Rubber

ABOUT SEVEN HUNDRED EMPLOYEES of the North British Rubber Mills in Edinburgh were on strike on March 7 as a protest against the introduction of a new wages system containing time and bonus payments.

Artificial Silk

EXPANSIONS COSTING £6,000,000 were mentioned by Mr. Samuel Courtauld, chairman of Courtaulds, Ltd., at the ordinary general meeting of the company held in London on March 7. The principal item is a new rayon yarn factory at Preston, which, it is hoped, will be producing by the end of 1936. Another development is the new staple fibre factory at Greenfield, North Wales, now in course of erection. The company have acquired about 340 acres of land in Preston.

Mineral Oil

AN EXPLOSION AND FIRE OCCURRED AT THE OIL REFINERY of the Agwi Petroleum Corporation, at Fawley, on the banks of Southampton Water, on March 12. The explosion blew off the top of the empty tank and set fire to another, sixty feet high, holding 250,000 gallons of gas oil. It lifted the top of this tank and buckled the steel side. In a few moments the

sky was lit by flames which rose to a height of more than 200 feet, and masses of oily smoke drifted over the countryside. Foam powder was used in an attempt to quell the blazing oil. About forty tons were stored at the works, but, in case this proved insufficient, telephone messages were sent to the London Fire Brigade and to shipping companies in Southampton for further supplies. The refinery, which covers an area of a square mile, has a storage capacity of 47,000,000 gallons of oil in 112 tanks.

Fertilisers

FISON, PACKARD AND PRENTICE, LTD., propose to increase their ordinary share capital by the creation of 300,000 additional shares of £1 each. The new capital is required in connection with the arrangements concluded with the Imperial Smelting Corporation, Ltd., for the manufacture and distribution of fertilisers in the west of England by a new company entitled National Fertilisers, Ltd., and the acquisition of the control of two important fertiliser companies. A minimum of 91,800 and a maximum of 102,000 of the new shares will be issued in part exchange for the shares of George Hadfield and Co., Ltd., and the available balance will be issued for cash and offered in the first instance to ordinary shareholders in the proportion of one new share for every three shares held.

Continental Chemical Notes

Italy

MANUFACTURING PERMITS HAVE BEEN GRANTED in connection with the following: Potassium permanganate (S.A. Elettrica ed Electrochimica del Caffaro, Milan); nitrocellulose for celluloid manufacture (Soc. Italo Cremona e C., Gazzada); edible sheet gelatine (Heinz-Erich Tuchmann, Desiv (Milan)); rice glucose in annual production of 7,000 tons (Soc. Ind. Risi e Affini, Milan).

Russia

A CHROME ORE DEPOSIT HAS BEEN FOUND at Transcaucasia, near the River Terter, with a chromium oxide content of 50 per cent. or more.

PLANS ARE BEING WORKED OUT for the establishment of lubricating and other oil-regenerating depots at Russian power stations.

ATTEMPTS TO CONVERT YELLOW PHOSPHORUS (produced by the Apatite Trust) into the red variety are proceeding satisfactorily and the first ton of red phosphorus was turned out at the end of January. The aim in view is the exclusive manufacture of the red variety.

ACCORDING TO A MOSCOW REPORT (quoted in "Chemische Industrie"), the "Aniltrust" has introduced a new earth colour as a substitute for red oxide of iron and red ochre. The raw material is described as the ferruginous sludge formed as a by-product in skin and fur dye manufacture and is dried or ignited in specially designed ovens. Shades ranging from yellow and red to black are obtainable. An output of 500 tons is anticipated this year and the low price (40 kopeks per kilo) should ensure extensive sales.

Germany

FAVOURABLE CLINICAL REPORTS have been published concerning the curative action of liver-oil treated dressings upon skin wounds. Vitamin A is believed to be the specific factor responsible for this effect and can therefore be regarded as an epithelial protective vitamin ("Chemiker-Zeitung").

USED LUBRICATING OILS, particularly motor car oils, will be regenerated by a new process to be operated by the recently-registered Süddeutsche Oelverwertungs G.m.b.H., of Stuttgart (provisional share capital 50,000 RM.). The company has been formed under government auspices and will organise the collection of used oils in addition to their regeneration.

ALTHOUGH GLYCERIDES OF SATURATED FATTY ACIDS have long been available at low prices, the unsaturated glycerides have

not up till now been readily obtainable. Their manufacture has recently received some attention since their unsaturated linkages offer a possibility of reactions of value in the manufacture of varnishes, linoleum and synthetic plastics. The first results of these researches is a synthesis of alpha-mono-olein which is outlined by K. Täufel and F. Künkele in "Fettchem. Umschau," February, 1935. The method is based upon formation of an intermediate reaction product of glycerine and acetone, which is condensed with oleyl chloride. Alpha-mono-olein is a water-white oil, crystallising when cooled to about 10° C. and melting on re-warming to 26° C.

Far Eastern Chemical Notes

China

A TUNGSTEN BUREAU has been established by the Government with the object of reorganising the tungsten mines in the southern area of the province of Kiangsi.

Japan

ACETONE AND BUTYL ALCOHOL are now being produced by the Nagashima Colour Co., who apply a starch fermentation process.

PRODUCTION OF TEXTILE ASSISTANTS has been commenced by two concerns: Sansuiso K.K., of Osaka, and the Kagaku Kogyosho, of Hoshiuo. The respective daily outputs are 3 and 5 tons.

LITHOPONE MANUFACTURE BY A JAPANESE PROCESS is announced to commence by the Korean concern of Chosen Barium Kogyo Kumiai. Barytes will be supplied from the Nakagana Mine at Kogeudo, Korea. The company also intends to market zinc sulphide and barium chloride.

COLLOIDAL SULPHUR FOR RUBBER VULCANISATION will be manufactured in a monthly output of two tons by the Sanwa Gomu Seisakusho of Tokio-Nishiaramachi. The anticipated selling price of 1.2 yen per kg. is well below that of the imported material.

PRODUCTION OF PERFUME RAW MATERIALS in 1934 was valued at 2½ million yen, the chief items being safrole (300 tons), cineole (300 tons), geraniol (50 tons), terpineol (12 tons), linalyl acetate (25 tons), heliotropin (10 tons), amyl cinnamic aldehyde (15 tons), nerolin (10 tons) and synthetic musk (12 tons).

Weekly Prices of British Chemical Products

Review of Current Market Conditions

THERE are no price changes to report in the markets for general heavy chemicals, rubber chemicals, tar products, perfumery chemicals, essential oils, intermediates and wood distillation products. In the pharmaceutical section, the price of quinine sulphate, B.P., has been increased from 2s. 1d. to 2s. 2d. per oz. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

LONDON.—Prices of chemical products in the London chemical market are unchanged and a good steady demand continues. The markets for coal tar products remain as last week.

MANCHESTER.—Despite a certain amount of nervousness here and there, the Manchester chemical market during the past week does not appear to have been much influenced by the rather dismal

outlook in respect of international affairs. There has certainly not been much in the way of fresh contract buying beyond a relatively few forward commitments for moderate quantities with deliveries spread over the next couple of months or so, but a satisfactory feature is that deliveries are being maintained satisfactorily in most directions, with an expanding tendency in evidence occasionally. From the point of view of values the market maintains a reasonably steady front, although here and there prices tend to react. There has been little change in the position of the by-products. The demand for pitch at the low levels now current is small and there has been little improvement in the call for refined tar or the light materials.

SCOTLAND.—Business continues to show a slight improvement in the Scottish heavy chemical market.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £28 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech., 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £28 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11½d. per lb. less 2½%. MANCHESTER: 11½d. to 1s. ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 9d. per gal.; 98/100%, 2s. to 2s. 2d.

ACID, FORMIC.—LONDON: £40 to £45 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works. Full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £55 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 0½d. per lb.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICARBONATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £20 per ton; powdered, £23, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £34 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 2d. per lb.; crimson, 1s. 5d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £22 10s., ex store.

ARSENIO SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton. SCOTLAND: £10 10s.

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF LIMB.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot, 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 in 5/6 cwt. casks for contracts over 1934/1935.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots,

CADMIUM SULPHIDE.—2s. 4d. to 2s. 8d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3½d. to 4½d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10½d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £4 2s. 6d. per cwt. SCOTLAND: £4 2s. less 2½ per cent.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £25 10s. per ton. SCOTLAND: 40%, £25 to £28 ex store.

IODINE.—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34; brown, £31 10s.

LEAD NITRATE.—£27 10s. per ton.

LEAD, RED.—SCOTLAND: £24 to £26 per ton less 2½%; d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £36 10s.

LITHOPONE.—30%, £17 to £17 10s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£40 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—7½d. to 8½d. per lb. for delivery up to June 30.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38.

POTASSIUM BICROMATE.—Crystals and Granular, 5d. per lb. less 5% d/d U.K. Discount according to quantity. Ground, 5½d. LONDON: 5d. per lb. less 5%, with discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99½/100%, powder, £37. MANCHESTER: £37 to £38.

POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 5s. 2d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 10½d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 10½d.

POTASSIUM PRUSSIAN.—LONDON: Yellow, 8½d. to 9½d. per lb. SCOTLAND: Yellow spot, 8½d. ex store. MANCHESTER: Yellow, 8½d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid 76/77° spot, £13 7s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £11 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£22 per ton. LONDON: £23. SCOTLAND: £20.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per 10. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£32 10s. per ton.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.

SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON: Spot, £18 to £20 per ton d/d station in drums.

SODIUM PERBORATE.—10%, 9½d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5½d. ex store. MANCHESTER: 5d. to 5½d.

SULPHUR.—£9 15s. to £10 per ton. SCOTLAND: £8 to £9.

SODIUM SILICATE.—1400 Tw. Spot £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £14 per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 4s. 3d. to 4s. 5d. per lb.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—11d. to 1s. per lb.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID NAPHTHONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.

BENZIDINE HCL.—2s. 5d. per lb.

p-CRESOL 34.5° C.—2s. per lb. in ton lots.

m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.

DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 01½d.

DINITROCHLOROBENZENE, SOLID.—£72 per ton.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags.

α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.

o-NITRANILINE.—3ss. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

o-TOLUIDINE.—9½d. to 11d. per lb.

p-TOLUIDINE.—1s. 11d. per lb.

Wood Distillation Products

ACETATE OF LIME.—Brown, £9 to £10. Grey, £12 to £14. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £11; grey, £13 10s.

ACETIC ACID, TECHNICAL, 40%.—£17 to £18 per ton.

AMYL ACETATE, TECHNICAL.—95s. to 110s. per cwt.

CHARCOAL.—£5 15s. to £10 per ton.

WOOD CREOSOTE.—Unrefined, 3d. to 1s. 6d. per gal.

WOOD NAPHTHA, MISCIBLE.—2s. 6d. to 3s. 6d. per gal.; solvent, 3s. 6d. to 4s. per gal.

WOOD TAR.—£2 to £4 per ton.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 7½d. to 8½d. per lb.; crude, 60's, 1s. 1½d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7½d. per lb.; crude, 1s. 1½d. to 2s. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

BENZOL.—At works, crude, 8½d. to 9d. per gal.; standard motor, 1s. 2d. to 1s. 2½d.; 90%, 1s. 3d. to 1s. 3½d.; pure, 1s. 6½d. to 1s. 7d. LONDON: Motor, 1s. 5½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 5½d. to 5½d. per gal. f.o.r. Home, 3½d. d/d. LONDON: 4½d. f.o.r. North; 5d. London. MANCHESTER: 4½d. to 5½d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4½d.; light, 4½d.; heavy, 4½d. to 4½d.

NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 6d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 2½d. to 1s. 3½d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Purified crystals, £10 per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PITCH.—Medium soft, 42s. to 45s. per ton. LONDON: 45s. per ton, f.o.b. East Coast port.

PYRIDINE.—90/140, 6s. 6d. to 8s. 6d. per gal.; 90/180, 2s. 3d.

TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 2d. to 2s. 3d.

XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—£7 5s. per ton; for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.

CYANAMIDE.—Mar., £7 3s. 9d. per ton; Apr./June, £7 5s.; delivered in 4-ton lots to farmer's nearest station.

NITRATE OF SODA.—£7 12s. 6d. per ton for delivery to June, 1935, in 6-ton lots, carriage paid to farmer's nearest station for material basis 15.5% or 16% nitrogen.

NITRO-CHALK.—£7 5s. per ton to June, 1935, in 6-ton lots carriage paid for material basis 15.5% nitrogen.

CONCENTRATED COMPLETE FERTILISERS.—£10 5s. to £10 17s. 6d. per ton according to percentage of constituents, for delivery up to June, 1935, in 6-ton lots carriage paid.

NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton.

Latest Oil Prices

LONDON, March 13.—LINSEED OIL was easy. Spot, £23 (small quantities); March and April, £20 7s. 6d.; May-Aug., £20 15s.; Sept.-Dec., £21 2s. 6d.; naked. SOYA BEAN OIL was quiet. Oriental (bulk), March-April shipment, £22 15s. per ton. RAPE OIL was quiet. Crude extracted, £32; technical refined, £33 10s., naked, ex wharf. COTTON OIL was easier. Egyptian crude, £26 10s.; refined common edible, £31 10s.; and deodorised, £35, naked, ex mill (small lots 30s. extra). TURPENTINE was steady. American, spot, 49s. per cwt.

HULL.—LINSEED OIL, spot, quoted £21 5s. per ton; March, £20 10s.; April, £20 12s. 6d.; May-Aug., £20 17s. 6d.; Sept.-Dec., £21 5s. COTTON OIL, Egyptian, crude, spot, £26 10s.; edible, refined, spot, £29; technical, spot, £29; deodorised, £31, naked. PALM KERNEL OIL, crude, f.m.q., spot, £20 10s., naked. GROUNDNUT OIL, extracted, spot, £33; deodorised, £36. RAPE OIL, extracted, spot, £31; refined, £32 10s. SOYA OIL, extracted, spot, £26 10s.; deodorised, £29 10s. per ton. CASTOR OIL, pharmaceutical, 40s. 6d. per cwt.; first, 35s. 6d.; second, 32s. 6d. COD OIL, f.o.r. or f.a.s., 25s. per cwt. in barrels. TURPENTINE, American, spot, 51s. per cwt.

Electrical Thermometers and Pyrometers

A CATALOGUE of electrical thermometers and pyrometers recently published by Negretti and Zambra (List No. E/10) describes the principle of construction of thermocouple thermometers and gives technical details of the standard types; details of electrical resistance thermometers made by the firm are also given. The second half of this catalogue is given over to hygrometers of the thermocouple and electrical resistance type, and electrical temperature recorders.

Sale of Iodine Ointment

A Question of Warranty

AN important point as to whether there was an accepted standard for iodine ointment, was raised at London Sessions, on March 8, during the course of an appeal. F. W. Woolworth and Co., Ltd., were fined £15 and ordered to pay £5 5s. costs when they appeared at the Kensington Petty Sessions on January 1 last, on a summons for selling iodine ointment, a drug, which was not of the nature, substance and quality demanded by the purchaser. It was against this conviction that they were appealing, and they were represented by Mr. Gilbert Beyfus, K.C., and Mr. Ryder Richardson, while Mr. Percy William Pottier, the sampling officer to the Hammersmith Borough Council, was represented by Mr. H. Glyn-Jones.

Mr. Glyn-Jones said that on November 21, 1934, the respondent bought a bottle from one of the appellants' branches, which was labelled "iodine ointment," for which he paid 3d. The public analyst reported that the ointment contained 0.60 per cent. free iodine, no potassium iodide, 0.4 per cent. combined iodine, and petroleum jelly 99.54 per cent. The British Pharmacopoeia for 1914 and the British Pharmaceutical Codex for 1923 required that iodine ointment should contain 4 per cent. iodine and 4 per cent. potassium iodide, and the basis described in the 1914 B.P. was glycerine and prepared lard, which should be 92 per cent. The serious thing was the absence of iodine. The object of the potassium iodide was to prevent it becoming dissipated when coming into contact with the other ingredients. The appellants had raised a defence under Section 29 of the Food and Drugs (Adulteration) Act, 1928, and said they relied upon a warranty from their suppliers. They also contended that iodine ointment was not a drug, because it was exempted under the Medicine Stamps Act, and further that there was no standard of iodine ointment, it not being in the 1932 B.P.

Dr. Philip Hamill, of Harley Street, said the ingredient which gave the ointment its disinfectant quality was free iodine.

Dr. James Howell, Medical Officer to the Hammersmith Council for 21 years, said that the ingredients of iodine ointment were set out in the 1914 B.P. The substance sold by Woolworths had no antiseptic value.

On behalf of the appellants, Robert H. Parker, director and buyer to Woolworths, said that last year their turnover with

the suppliers, the Jersey Toilet Soap Co., was £39,000, and no complaint was received as to the merchandise supplied. The conditions of the warranty were sent with every order given by the firm and he had no reason to believe that the Jersey Co. were supplying other than iodine ointment. When complaint was made, the ointment was withdrawn from sale, but not because it was an unsatisfactory article.

Percy Harold Lee, general manager to the Jersey Co., said they did not consider themselves large manufacturers to the drug firm. His firm kept the line for Woolworth's only. A subsidiary company of druggists' specialities sold it elsewhere.

James Wilfred Fordyce, B.Sc., said he was employed by the Jersey Co. and devised the formula from which the ointment was made. The actual formula was 0.63 per cent. of free iodine. He had a limited knowledge of the therapeutic effect of drugs apart from their chemical actions. He acquired his knowledge by serving an apprenticeship in the laboratory of a manufacturing chemist. He knew that a formula for iodine ointment was in the 1914 B.P.

Dr. Henry Cox said he could buy the ingredients in the ordinary market in small quantities for a fraction under a penny. He could not say whether in the manufacture of pharmaceutical preparations, the cost of labour was out of all proportion to the cost of the material.

Sir Percival Clarke, the chairman of the Bench, said the point they had to decide was whether the appellants had received a warranty within the meaning of the Food and Drugs (Adulteration) Act. They had looked with care at the alleged warranty, and did not think that the warranty was sufficient in itself to be described as a warranty within the meaning of the section. The result was therefore that the appeal would be dismissed.

Mr. Glyn-Jones asked for 50 guineas costs, to which Sir Percival agreed.

Mr. Beyfus: You realise that this is an important point to Woolworths, who have bought probably millions of pounds worth of goods in the belief that they had a warranty. Will the court state a case upon the legal point? It is a pure question of law; there is no dispute as to facts at all, and if the court would state a case upon the point of law, it might affect hundreds of other cases if they should arise.

Sir Percival agreed to do so.

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Complete Specifications Open to Public Inspection

CATALYTIC DESTRUCTIVE HYDROGENATION, under pressure, of solid carbonaceous materials.—International Hydrogenation Patents Co., Ltd. Aug. 29, 1933. 21601/34.

TRIAZENE COMPOUNDS and of azo dyestuffs, manufacture.—I. G. Farbenindustrie. Aug. 26, 1933. 24242/34.

HALOGENAMINE ALKYL SULPHURIC ESTERS or alkylsulphonic acids, manufacture and production.—I. G. Farbenindustrie. Aug. 29, 1933. 24641/34.

CONVERTING HYDROCARBON COMPOUNDS in the vapour phase by heating.—Naamlooze Vennootschap Nieuwe Oetroot Maatschappij. Aug. 26, 1933. 24679/34.

POLYMERISATION OF FATTY OILS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Aug. 29, 1933. 24793/34.

VINYL FORMATE, manufacture.—Consortium für Elektro-Chemische Industrie Ges. Sept. 1, 1933. 24997/34.

CONDENSATION PRODUCTS from 2,3-dihydroxynaphthoic acid, manufacture.—I. G. Farbenindustrie. Aug. 30, 1933. 25027/34.

DYEING AND PRINTING vegetable or artificial fibres.—I. G. Farbenindustrie. Sept. 1, 1933. 25179/34.

ESTERS FROM OLFINES, production.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Sept. 2, 1933. 25218/34.

LIQUID ANTHELMINTICS, manufacture of solutions.—I. G. Farbenindustrie. Oct. 25, 1932. 6265/35.

HEXAMETHINE DYESTUFFS, manufacture.—I. G. Farbenindustrie. May 18, 1933. 6381/35.

Specifications Accepted with Dates of Application

DERIVATIVES OF UNSATURATED ACIDS, manufacture.—P. D. Ritchie, D. T. Jones, R. Burns, and Imperial Chemical Industries, Ltd. Aug. 3, 1933. 424,885.

VAT DYE PASTES.—Imperial Chemical Industries, Ltd., H. P. Brown, R. F. Goldstein, and A. Stewart. Aug. 21, 1933. 424,685.

SULPHONATION PRODUCTS, manufacture.—W. J. Tennant (Hempel and Co. Ges.). Aug. 26, 1933. 424,891.

DISTILLATION OF TAR and the cracking of oil.—T. O. Wilton. Aug. 26, 1933. 424,645.

RECOVERY OF ETHYLENE and its homologues from gases.—G. F. Horsley and Imperial Chemical Industries, Ltd. Sept. 1, 1933. 424,843.

OLEGINOUS MATERIALS of vegetables or animal origin, heat-treatment.—Physical Chemistry Research Co. Sept. 9, 1932. 424,847.

UNSATURATED ORGANIC HALOGENATED COMPOUNDS, treatment.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Oct. 4, 1932. 424,659.

CONCENTRATION, distillation, or evaporation of liquid substances. A. Ponzini. Dec. 3, 1932. 424,713.

RECOVERY OF MOLYBDENUM.—J. Y. Johnson (I. G. Farbenindustrie). Dec. 30, 1933. 424,916.

TREATING CELLULOSE and its organic esters, process.—Compagnie de Produits Chimiques et Electrometallurgiques Alais Froges, et Camargue, Feb. 21, 1933. 424,730.

COLLOIDAL ALUMINIUM HYDROXIDE and the colloidal aluminium hydroxide produced thereby, production.—P. S. Moyer, March 23, 1933. 424,734.

CHLORINATION OF WOOD PULP and like materials, method.—C. F. Weitzel, H. G. Potts and J. E. Underwood, April 1, 1933. 424,921.

VALUABLE LIQUID HYDROCARBONS from hydrocarbon mixtures which contain unsaturated compounds, production.—International Hydrogenation Patents Co., Ltd. July 14, 1933. 424,748.

SOLID CARBON DIOXIDE, production.—Mauri Refrigeration Patents, Ltd., and G. Mauri, June 6, 1934. 424,864.

ALKALINE-EARTH METAL COMPOUNDS, processes of dissolving deposits.—Hall Laboratories, Inc. Aug. 22, 1932. 424,677.

DYESTUFFS OF ANTHRAQUINONE SERIES, manufacture.—Soc. of Chemical Industry in Basle. (Switzerland, Feb. 27, '34.) 6266.

Applications for Patents

(February 21 to 27 inclusive).

HYDROCARBONS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 6258.

ACYL DERIVATIVES of germinal gland hormone preparations, production.—Schering-Kahlbaum A.-G. (Germany, Feb. 22, '34.) 5734-5.

REDUCTION PRODUCTS OF HORMONES, production.—Schering-Kahlbaum A.-G. (Germany, Feb. 24, '34.) 5886.

(February 28 to March 6 inclusive).

AQUEOUS BITUMINOUS EMULSIONS, production.—Aktieselskabet for Kemisk Industri. (Denmark, June 29, '34.) 6492.

OXIDISED ORES OF ZINC, reducing.—American Smelting and Refining Co. (United States, March 5, '34.) 6633.

TEXTILE, ETC., MATERIALS, colouration.—British Celanese, Ltd. (United States, March 2, '34.) 6607.

CELLULOSE DERIVATIVES, manufacture.—British Celanese, Ltd. (United States, March 2, '34.) 6608.

COLLOIDALLY-DISPERSED METALS, preparation.—British Electrical and Allied Industries Research Association. 6515.

ALLOY FOR DE-OXIDISING SILICON STEEL.—British Thomson-Houston Co., Ltd. (United States, March 1, '34.) 6382.

CHEMICAL PROCESS AND PRODUCT.—S. M. Burton. 6897.

UNDECYL COMPOUNDS.—Carbide and Carbon Chemicals Corporation. (United States, March 31, '34.) 7001.

PREGNENE DERIVATIVES, production.—A. Carpmael. 6562.

HYDROXY SULPHONATED FATTY ACID ESTERS.—F. B. Dehn. 6801.

CHLOROISOBUTYRIC ACIDS, manufacture.—E. I. du Pont de Nemours and Co. and E. D. Ries. 6806.

HYDROGEN CYANIDE, manufacture.—J. Y. Johnson. 6393.

MORDANT DISAZO DYESTUFFS, manufacture.—Durand und Huguenin A.-G. (Germany, March 5, '34.) 6741.

SEPARATION OF MINERAL OIL from sulphonic acids.—J. Grosjean. 6400.

4:5-ALKYL-SUBSTITUTED 2-AMINODIARYL-KETONES, manufacture.—W. W. Groves (I. G. Farbenindustrie). 6380.

CONVERTING ALKALI SALTS of phenyl-alkyl acids into stable calcium compounds.—R. Gruter. (Germany, March 5, '34.) 6883.

SULPHURIC ACID, manufacture.—C. F. R. Harrison, Imperial Chemical Industries, Ltd., A. M. Clark and C. L. Hilton. 6411.

HEXAMETHINE DYESTUFFS, manufacture.—I. G. Farbenindustrie. (May 18, '34.) (Germany, May 18, '33.) 6381.

SALTS of ω -METHYL-SULPHONIC ACIDS of pyrazolone-amines with cyclic nitrogen bases, manufacture.—I. G. Farbenindustrie. (Germany, March 3, '34.) 6742.

PRODUCTS OF THE NATURE OF PETROLEUM JELLY, manufacture.—I. G. Farbenindustrie. (Germany, March 3, '34.) 6813.

COLORING RUBBER.—Imperial Chemical Industries, Ltd., and W. F. Smith. 6807.

NITRILES, manufacture.—J. Y. Johnson. 6501.

HETEROCYCLIC COMPOUNDS, manufacture.—J. Y. Johnson. 6502.

ALKALINE LIQUORS, manufacture.—J. Y. Johnson. 6614.

HYDRATED OLEFINS, production.—Naamloose Vennootschap de Bataafsche Petroleum Maatschappij. (United States, March 5, '34.) 6953.

TABLETS CONTAINING MAGNESIUM HYDROXIDE.—C. H. Phillips Chemical Co. (United States, Oct. 26, '34.) 6564.

POLYVALENT METAL SALTS.—Resinous Products and Chemical Co. (United States, March 5, '34.) 6824.

DISULPHIDES FROM MERCAPTOHAZOLS, production.—Silesia Verein Chemischer Fabriken. (Germany, Aug. 3, '34.) 6401.

ACETIC, ETC., ACIDS from alcohols, manufacture.—Usines de Melle. (France, March 15, '34.) 6793.

ACYL COMPOUNDS of carbinols of substances of constitution of sterols, production.—W. P. Williams (Schering-Kahlbaum A.-G.) 6814.

From Week to Week

THE BYROM DYING CO., LTD., of Todmorden Road, Bacup, is to be wound up voluntarily. Mr. J. R. Petrie, of Bank Buildings, Bacup, has been appointed liquidator.

THE ADDRESS of the Southern Whaling and Sealing Co., Ltd., is now Unilever House, Blackfriars, London, E.C.4 (telephone No.: Central 7474).

NOTICE WAS GIVEN in the "London Gazette" on March 12 of the voluntary winding up of the Rockhill China Clay Co., Ltd. Mr. A. M. Richards, of Stenales, has been appointed liquidator.

THE 700 WORKERS concerned in the stoppage at the North British Rubber Co.'s Castle Mills, Edinburgh, have been dismissed. A mass meeting will be held by the Union at which the position is to be thoroughly reviewed. The dispute concerns a new wage and bonus system which the workers refuse to accept.

THE TREASURY, on the recommendation of the Import Duties Advisory Committee, has issued the Import Duties (Drawback) (No. 5) Order, 1935 (S.R. & O. 1935, No. 168), authorising, under Section 9 of the Finance Act, 1932, the continuance of the drawback in respect of castor seed used in the manufacture of castor oil. The order provides for an increase in the rate of drawback.

A VERDICT OF "ACCIDENTAL DEATH" was returned at a Runcorn inquest on Lawrence Coleman, of Weston Point, who was killed at Castner Kellner alkali works on March 3. Coleman was engaged on the coal handling plant and after being sent with a message was found beside the railway line suffering from injuries to the right leg. The inspector of factories informed the coroner that there had been no breach of the regulations.

AT A MEETING of the board of the Institute of Physics held on March 12 the following were elected to membership:—Fellow: R. Jessel; associates: E. H. Dock, R. Jackson, and M. Mawson; students: G. E. H. Deadman, J. M. Holmes, A. F. J. Lee, J. M. S. Speirs, and R. H. Teuten; ordinary member: P. A. Crivelli. The first certificates in laboratory arts, awarded under the Institute's recently introduced scheme for the proper certifying and training of laboratory and technical assistants in physics, have been granted to J. S. Burgess, W. J. W. Burrows, H. G. French, G. H. Greenfield, A. L. Horne, J. H. Mayo, L. F. Milton, E. C. Rowe, H. W. Scovell, F. W. J. Shears, A. Swain and H. H. Wells.

A SPECIAL REVIEW OF THE IRON AND STEEL TRADES in 1934 has been issued by William Jacks and Co. It contains articles on imports and exports, pig iron prices, and wages in the steel industry.

MEMBERS of the Institution of the Rubber Industry will visit the rubber exhibition at the Science Museum, South Kensington, on Monday, March 18, at 7 p.m. Members will be received by Mr. James Fairbairn, chairman of the Rubber Growers' Association, and Col. J. Sealy Clarke, F.I.R.I., president of the Research Association of British Rubber Manufacturers.

WORK IS PROCEEDING according to plan on the erection of the coal-oil plant at Seaham Harbour for Coal and Allied Industries, Ltd., London, and it is expected to be under commercial production within six months. It is understood that in addition to making oil the company intends also manufacturing other chemicals which have hitherto been imported into this country. Recently it has taken out 24 new patents.

FIRE BROKE OUT in a large tank containing creosote and tar at the works of the Yorkshire Tar Distillers, Ltd., of Sheffield, on March 11. There was a small explosion and a hole was blown in the side of the tank, through which the burning creosote and tar flowed into the yard. Five fire engines were sent by the Sheffield brigade, and the men fought the flames for half an hour. There is a chemical works adjoining, but the wind blew the flames in the opposite direction. The fire was extinguished by the brigade before much damage had been done.

THE IRISH FREE STATE REVENUE COMMISSIONERS announce that on and after April 1 certificates of origin, except in certain cases, will be required in respect of all goods imported into the Irish Free State in the course of trade. The certificates will have to be produced to the Customs Officer by the importer at the time the official entry form is being presented. In the case of goods imported through the parcel post in the course of trade, the value of which does not exceed £10, the requirement of a certificate will be waived, provided that the consignee declares the origin of the goods on the outer wrapper or container. A certificate will not be required in respect of any goods for which a certificate of origin in support of a claim for an imperial preferential rate of duty is furnished to the Revenue Commissioners.

New Companies Registered

C. F. Abel, Ltd.—Registered March 6. Nominal capital £1,500. To acquire the business of a manufacturing chemist carried on by Chas. F. Abel, at 17a Nunhead Green, S.E.15. Subscriber: Chas. F. Abel, 17a Nunhead Green, S.E.15.

Blackpool Pure Drug Co., Ltd., 61 Cookson Street, Blackpool.—Registered February 28. Nominal capital £100. Chemists, druggists, dyers, oil and colourmen. Directors: Richard H. Speight, Fred. Taylor.

Bonshine, Ltd., 37a Mount Pleasant, Liverpool.—Registered March 2. Nominal capital, £1,000. Manufacturers of and dealers in paints, soap, varnish, enamel, lacquer, shellac, cellulose. Directors: Archibald W. E. Amos, Harry A. Hearnshaw.

British Varnish and Colours, Ltd.—Registered February 20. Nominal capital £1,000. Manufacturers of and dealers in paint, lacquer, varnish, enamel. A subscriber: David L. Hyman, "Westfield," Bentley Road, Broughton Park, Salford, 7.

Caledonian Manufacturing Co., Ltd., 113 St. Vincent Street.—Nominal capital £5,000. Manufacturers and dealers in calcium sulphate products.

Cellulose Patents (International), Ltd., 29 Peter Street, Manchester.—Registered March 7. Nominal capital £80,000. To acquire any inventions or secret processes; to purchase, sell, assign, grant manufacturing licences or dispose of and deal with patent rights and manufacturing processes in connection with an invention relating to an improved process of preparing cellulose solution and process of producing artificial threads. Manufacturers of and dealers in "Viscose," or similar paper, yarns, fabrics, wood pulp, sulphuric acid; wholesale and retail chemists, druggists. A subscriber: J. R. Beckinsall.

R. A. Cripps & Son, Ltd., The Laboratory, Davigdor Road, Hove.—Registered March 2. Nominal capital, £5,000. To acquire the business of manufacturing and analytical chemists carried on by Richard A. Cripps and Douglas H. Cripps at Davigdor Road, Hove, Sussex. Directors: Richard A. Cripps, Douglas H. Cripps, Thos. Harper.

Domestic Finance, Ltd.—Registered February 20. Nominal capital £5,000. Manufacturers of, dealers in plant; machinery for the electrical, mechanical and chemical industries. Director: Eric R. Hillman.

Drug Houses of Australia Export, Ltd., Australia House, Strand, London.—Registered March 5. Nominal capital, £10,000. Wholesale and/or retail chemists, druggists, dyers, oil and colourmen. Directors: Robert E. Wood, Fdk. W. Grimwade.

Duesbury and Bill, Ltd.—Registered February 16. Nominal capital £10,000. To acquire the business of a varnish manufacturer carried on by A. E. Duesbury, at Paraday Works, Monmore Green, Wolverhampton, as "Duesbury and Bill." Directors: Alfred E. Duesbury, 31 Firs Street, Dudley, Worcs., Frederick E. Duesbury, Albert E. H. Duesbury.

N. P. Garside, Ltd.—Registered March 5. Nominal capital £100. Manufacturers of and dealers in paints of all kinds, varnish, enamel, polish, lacquer, shellac, cellulose. Directors: Norris P. Garside, 26 Broadway Place, Nelson, Lancs., Norman Nicholson.

Inns & Co., Ltd.—Registered March 4. Nominal capital, £600,000. Manufacturers, producers of and dealers in tar bitumen, asphalt and oil, chemists, etc. Directors: Jeremiah Inns, Springfield, Stevenage, Herts., John W. Inns, Walter Wallace, Robert Wallace.

Joble, Ltd., Central Buildings, 24 Southwark Street, London.—Registered March 11. Nominal capital £10,000. Manufacturers of and dealers in chemical, industrial and other preparations.

Macwin Products, Ltd., 80 Coleman Street, London.—Registered February 11. Nominal capital £500. Oil and colourmen, importers and manufacturers of and dealers in chemical, industrial and other preparations and articles. Directors: Walter W. Champness, Ian M. Smith.

Hadfield Silks, Ltd.—Registered March 4. Nominal capital £5,000. Manufacturers, importers, exporters, merchants and factors of and dealers in artificial silk, and artificial silk goods. A subscriber: Walter Meyer, 81 Summers Lane, N.12. Directors: Walter Meyer, Frank Hall.

Hines (Chemists), Ltd., 3 Shelford Place, Stoke Newington, N.16.—Registered March 5. Nominal capital, £1,200. Manufacturing, wholesale, retail, consulting, research, analytical and dispensing chemists and druggists. Directors: Cyril T. Hines, Miss Muriel E. Hines, Miss Edna M. Hines.

Howard-Price, Ltd.—Registered March 7. Nominal capital £1,000. Distillers, refiners, blenders and manufacturers and dealers in tar, tar products, oils; manufacturers of and dealers in chemicals, fertilisers, fertilising products, paints, varnishes, disinfectants. Directors: Joseph T. Price, Ty-Cendil, West Common Lane, Scunthorpe, Lincs., Mrs. Florence H. Price, Walter D. H. Price.

North East Paint Service, Ltd.—Registered February 13. Nominal capital £500. Purchasers, vendors, wholesalers, retailers, exporters and importers of and dealers in paints, colours, varnish, japans, oils, pigments, distempers, cellulose, resins and resinous products. Directors: Francis E. Stafford, 16 Berners Street, London, Wm. A. George.

Nust Paint, Ltd., 14 Clarges Street, London.—Registered March 11. Nominal capital £500. Manufacturers and preparers of and dealers (both wholesale and retail) in paints, varnishes, enamels, polishes, lacquers, shellac, cellulose, size, pigments, compositions, colours, oils, greases, chemicals, glass, whitewash, white lead, distemper.

W. G. Products, Ltd., 13 High Street, Watford.—Registered February 28. Nominal capital £10,000. Manufacturing, research and analytical chemists, chemical manufacturers. Directors: Frederick W. Gee, Samuel J. Weaver.

Raines and Co., Ltd., Micklegate House, Micklegate, York.—Registered February 15. Nominal capital £40,000. To acquire the business of manufacturing chemists and wholesale druggists carried on by Alfred Scruton, Walter Scruton and Harold Adams Scruton and Wm. C. Birks at York. Directors: Wm. C. Birks, Alfred Scruton, John F. Birks, Harold A. Scruton.

Rubberware, Ltd., Vulcan Works, Bridge Street, Guildford.—Registered March 8. Nominal capital £50,000. Producers and manufacturers of and dealers in rubber, balata, gutta percha, vulcanite, ebonite; rubber proofers and vulcanisers; manufacturers of and dealers in silk rayon, paper; manufacturing chemists. Directors: Herbert Heather, Walter H. Pawkes, George Springfield, Leon Lewis, John Lewis.

Sander's Chemical Products, Ltd., 43 Regent Street, Loughborough.—Registered March 6. Nominal capital £5,000. Chemists, druggists, manufacturers of and dealers in pharmaceutical, medical and surgical preparations, dressings, bandages, plasters and toilet requisites. Directors: Sir A. Mitchelson, E. G. Martens, A. G. Bathel, E. Sander, G. Durnford and R. Braunnüller.

Silexore, Ltd.—Registered February 28. Nominal capital £5,000. Manufacturers of and dealers in paints, dyes, colours, pigments, oils and varnish; manufacturing and general chemists and druggists. A subscriber: Herbert J. H. Parker, 9 Lambs Conduit Street, London.

M. Whitfield, Ltd., Sunderland Road, Horden, Co. Durham.—Registered February 20. Nominal capital £200. Wholesale and retail chemists and druggists, chemical engineers, sterilisers, dyers, cleaners, makers of chemical plant. Directors: Mrs. Margaret Whitfield, Jane Whitfield, Robert W. Johnson.

Company News

Boots Pure Drug Co.—The quarterly interim dividend is announced at the rate of 6 per cent. (unchanged).

Reckitt and Sons.—A final dividend of 1s. 3d. and a bonus of 3d. per share is announced on the ordinary shares, making 4s. 6d. per share (22½ per cent.) for 1934, the same as for 1933.

United Drug Corporation.—A profit for 1934 equal to \$1.31 per share is reported, compared with that equal to 46 cents per share in the previous year. One third of the 1934 profit, however, is stated to be of a non-recurring nature.

Salt Union, Ltd.—The directors recommend for 1934 an ordinary dividend of 9 per cent. and the dividend statement adds that £90,000 has been transferred to contingencies account and that the carry-forward will be increased to £10,000, against £9,005.

United Glass Bottle Manufacturers.—A final dividend of 5 per cent., less tax on the ordinary shares is declared for 1934, together with a bonus of 1½ per cent. less tax. This makes a total dividend of 9 per cent. for the year, compared with 7½ per cent. for each of the four previous years.

Indestructible Paint Co.—The net profit for the year after writing off the loss sustained by the French subsidiary company and writing down the value of a loan to the German subsidiary company (which is in American currency) to its current value, amounted to £43,898, which compares with £38,651 for 1933.

Hadfields, Ltd.—The directors announce that they have decided to recommend the payment of dividend arrears on the £300,000 4½ per cent. preference share capital to December 31 last. The dividend is at present paid to December, 1930, so that arrears will require £54,000 gross. No payment will be made on the issued ordinary capital of £1,859,784.

W. Canning and Co.—The report for 1934 shows profit £62,749, against £52,626, to this is added £21,381 brought in, making £84,130 available; £10,000 is placed to reserve, £2,000 to employees' fund, £1,000 to hospital fund, £3,000 to new chemistry block of Birmingham University; a final dividend of 5 per cent. and a bonus of 2s. per share is to be paid, making 20 per cent. for the year, carrying £21,630 forward.

Forthcoming Events

LONDON

- Mar. 20.—Institute of Chemistry (London Section). Lecture by Dr. A. E. Dunstan.
 Mar. 21.—Chemical Society. Discussion on "Recent Progress in the Chemistry of the Terpenes," opened by Professor J. L. Simonsen. 8 p.m. Burlington House, Piccadilly, London.
 Mar. 22.—Institution of Petroleum Technologists (Students Section). "Health Hazards in the Petroleum Industry." J. McConnell Sanders. 6.15 p.m. Aldine House, Bedford Street, Strand, London.

BELFAST

- Mar. 19.—Institute of Chemistry (Belfast Section). "Concrete Linings and Peat Water Action." G. B. Brook. Belfast.

BRISTOL

- Mar. 18.—Institute of Chemistry (Bristol and S.W. Counties Section). Annual general meeting and chairman's address. "The Properties of Heavy Hydrogen." Bristol.

BIRMINGHAM

- Mar. 19.—Midland Metallurgical Societies. "Bearing Materials." R. T. Rolfe. 7 p.m. James Watt Memorial Institute, Great Charles Street, Birmingham.

BRADFORD

- Mar. 21.—Society of Dyers and Colourists (West Riding Section). "Adsorption of Solids by Solids, and the Phenomenon of Dyeing." Professor E. C. C. Baly.

CARDIFF

- Mar. 22.—Society of Chemical Industry (South Wales Section). Annual general meeting. 6.45 p.m. Dinner 7.45 p.m. Queen's Hotel, St. Mary Street, Cardiff.

GLASGOW

- Mar. 22.—Oil and Colour Chemists' Association (Scottish Section). "The Nature and Characteristics of Lakes and Pigments." Dr. H. Samuels. 7.30 p.m. Mackay's Hotel, Glassford Street, Glasgow.

HULL

- Mar. 19.—Hull Chemical and Engineering Society. "The Development of the Alkyd Resins in the Paint and Allied Industries." Dr. F. J. Siddle. 7.45 p.m. Municipal Technical College, Park Street, Hull.

MANCHESTER

- Mar. 18.—Institution of the Rubber Industry. Symposium on Rubber Substitutes. Engineers' Club, Albert Square, Manchester.
 Mar. 18.—Institute of Vitreous Enamellers. "Furnaces, Driers and Allied Equipment." J. Fallon. 7.30 p.m. Queen's Hotel, Piccadilly, Manchester.
 Mar. 20.—British Association of Chemists. Annual meeting and dinner of Manchester Section. 6.30 p.m. Engineers' Club, Albert Square, Manchester.
 Mar. 21.—Institute of Chemistry (Manchester Section). Annual general meeting. "Chemistry and Business." Dr. H. Hepworth. 7 p.m.
 Mar. 22.—Society of Chemical Industry (Manchester Section). "Catalysis." Professor M. Polanyi. 7 p.m. Engineers' Club, Albert Square, Manchester.

STOURBRIDGE

- Mar. 20.—Society of Glass Technology. 2 p.m. Stourbridge.

SWANSEA

- Mar. 21.—Chemical Society. "Recent Work on Molecular Structure." Dr. N. V. Sidgwick. 6 p.m. University College, Swansea.

Joseph Nathan and Co.—The report for the year to September 30, 1934, shows profit, after fees, interest, and tax, £55,563, compared with £39,522 for 1932-33. The total credit, including £23,819 brought forward amounts to £79,382; one year's dividend on 7 per cent. preference shares has been paid, and the directors propose to pay one year's dividend on the 8 per cent. preferred ordinary shares; the balance of £28,382 is carried forward.

Thos. W. Ward.—The payment is announced of a further six months' dividend on the second preference and employees' share capital. This brings the payments on these shares up to December 31, 1933. Warrants for the dividend and for the current quarterly dividend on the first preference shares and also the dividend on the £350,000 of first preference shares issued in November last, will be posted on March 30.

United Turkey Red.—Subject to audit, and after providing for all trading charges, including maintenance and depreciation, profit and loss account for 1934 shows a loss of £10,830; to this is added £6,405 brought in, making a total debt of £17,235. The sum of £25,000 has been transferred from reserve, leaving to be carried forward the balance of £7,765. It is proposed to pay a dividend on the 4 per cent. first preference shares and charge this against reserve, but no dividend is recommended on the ½ per cent. second preference or ordinary shares.

Associated Portland Cement Manufacturers.—An ordinary dividend of 10 per cent., less tax, is announced, which compares with 7 per cent. for 1932 and 1933 and with 8 per cent. from 1927 to 1931. British Portland Cement Manufacturers, which is controlled by the former undertaking, is paying 17½ per cent. for the year, against 15 per cent. for many years. In this case, an interim payment of 5 per cent. was made in October last. The Associated company announces that £74,446 has been transferred for debenture sinking funds, and £412,150 for depreciation. These figures compare with £58,484, and £387,150, respectively in 1933. The carry-forward is raised from £170,580 to £171,819. British Portland Cement announces provision of £9,261 for debenture sinking fund, and £255,000 for depreciation. The comparative 1933 charges were £54,123 and £205,000. The carry-forward is raised from £204,778 to £206,084.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

South Africa and Southern Rhodesia.—A firm of manufacturers' agents in Cape Town, with an organisation covering the Union and Southern Rhodesia, is desirous of obtaining United Kingdom agencies for fertilisers, including basic slag and superphosphates on a commission basis. A representative of the firm will shortly arrive in this country to open negotiations with interested firms. (Ref. No. 234.)

Holland.—An agent established at Hilversum wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of chemicals, dyes and paints. (Ref. No. 239.)

Egypt.—The Commercial Secretary to the Residency, Egypt, reports that the Survey of Egypt is calling for tenders, to be presented in Egypt by May 15, 1935, for the supply of (a) 4,026 rolls sensitive paper, for photostat machines, 25 rolls sensitive linen paper, coated on both sides, for photostat recorder machine No. 2; (b) 14,000 tins of developing powder, and (c) 18,000 tons of acid fixing powder. (Ref. B.Y. 7993.)

British Trade Agreement with Poland

Rates of Duty on Chemical Products

An agreement between Great Britain and Poland in regard to trade and commerce was signed at the Foreign Office in London on February 27, and the English text of the agreement (issued as a White Paper on February 28) was reproduced in the "Board of Trade Journal" of March 7. There are three schedules to the agreement, the first relating to duties on imports into the Polish

Customs territory of articles produced or manufactured in the United Kingdom, the second relating to imports from British colonies, and the third relating to imports into the United Kingdom of articles produced or manufactured in the Polish Customs territory. The following are the items of principal concern to the chemical and allied industries (first schedule):—

Imports of United Kingdom products into Poland.	Rate of Duty, in zlotys per 100 kilos.
Essences, esters and extracts, with alcohol, not specified elsewhere in the Tariff	1,350
Hydrosulphite, and its formaldehyde compounds	64
Sodium phosphate, under permit from the Minister of Finance	20
Calcium compounds—	
(a) Carbonate, precipitated, even if containing up to 10 per cent. of carbonate of magnesia	10

Chloride of tin for industrial purposes, under permit from the Minister of Finance	22.50	until Dec. 31, 1935
Lead compounds:—		
Ex (1) Red lead and litharge	13	
Arsenate of calcium, under permit from the Minister of Finance	16	
Cream of tartar (refined acid tartrate of potash)	Free	
Tartaric acid and its salts, not specified elsewhere in the Tariff	20	until Dec. 31, 1935

Imports of United Kingdom products into Poland.	Rate of Duty, in zlotys per 100 Kilos.
Butyric acid and its salts, not specified elsewhere in the Tariff	50
Citric acid and its salts:—	
(1) Calcium citrate	Free
(2) Citric acid and its salts, not specified elsewhere in the Tariff	220
Tannic, gallic and pyrogallic acids, and their salts, not specified elsewhere in the Tariff:—	
(2) Other	30
Benzoic acid, under permit from the Minister of Finance	60
Chlorides of ethane and ethylene:—	
ex (2) Hexachlorethane	20
Chlorides of ethyl and methyl; methyl sulphate:—	
ex (2) Ethyl chloride in containers other than ampoules (including immediate packing)	180
Methyl iodide and ethyl iodide	60
Esters of acetic acid; ethers and esters of fatty and aromatic series, not specified elsewhere in the Tariff, all in the liquid state:—amyl formate, amyl oleate, amyl oxalate, amyl stearate, amyl borate, butyl formate, butyl oleate, butyl oxalate, butyl stearate, butyl borate, ethyl formate, ethyl oleate, ethyl oxalate, ethyl stearate, benzyl acetate, benzyl phthalate, methyl phthalate, methyl pronionate, methyl oleate, isobutyl phthalate, isobutyl salicylate, methyl cyclohexanol oxalate, methyl cyclohexanol stearate, methyl cyclohexanol phthalate. (For the purpose of applying the conventional duty to these esters, an invoice with detailed enumeration of chemical names conforming with the list, endorsed by the Association of British Chemical Manufacturers in London, shall be deposited with the Customs houses. The listed esters must be imported solely through the following Customs houses, viz.: Warsaw, Bielsko, Lodz, Krakow, Poznan, and Gdynia, and in the territory of the Free City of Danzig, Lcegethor, Post Wallraase and Weichselshuhder.)	75
Ethylene glycol	30
Chlorine derivatives of aromatic hydrocarbons:—	
ex (1) Benzyl chloride; benzal chloride	9
ex (1) Chloronaphthalene	9
(2) Other, not specified elsewhere in the Tariff	9
Sulphonic and carboxylic acids of aromatic hydrocarbons, their chlorides, nitroderivatives, and salts:—	
ex (1) Benzene sulphonic chloride	22.50
ex (1) Paratoluene sulphonic chloride	18
ex (2) Naphthalene disulphonic acid (beta compound)	37.50
ex (5) Ortho-nitrotoluene parasulphonic acid	75
Anthraquinone sulphonic acid (alpha and beta)	40
Amino compounds of the aromatic series, their derivatives and salts:—	
ex (1) Ortho, meta and para toluidine and mixed	15
ex (1) Xylidine (as such and in the form of acetate)	15
ex (2) Dimethylaniline; ethyl benzyl aniline and its sulphonic acid	75
ex (3) Ortho-aniline sulphonic acid	52.50
ex (4) Ortho-nitroaniline; thioaniline	52.50
ex (5) Meta-phenylene diamine sulphonic acid	75
ex (6) Toluidine	90
ex (8) Beta-naphthylamine	25
ex (8) Phenyl alpha-naphthylamine; toluyl alpha-naphthylamine	75
ex (8) Ethyl alpha-naphthylamine	75
ex (8) Diaminostibene disulphonic acid; naphthylamine sulphonic acids, viz., 1:5 (Laurent's acid) and mixture of 1:6 and 1:7 (Cleve acid)	75
ex (9) Naphthylamine sulphonic acid, viz., 1:3:6 (Freund's acid)	75
ex (9) Naphthylamine sulphonic acids, viz., 1:8 (Peril acid); 2:6 (Bronner's acid)	75
(10) Aminoanthraquinone (alpha and beta)	35

Imports of United Kingdom products into Poland.	Rate of Duty, in zlotys per 100 Kilos.
ex (12) Phenyl and toluyl naphthylamine sulphonic acid 1:8	105
Resorcin	20
Naphtholsulphonic acid 1:5	75
Amino-oxy compounds of the aromatic series, their derivatives and salts:—	
ex (1) Anilino-phenol and its hydrochlorides	105
ex (1) Dimethyl-aminophenol; diethylaminophenol	105
ex (3) Para-aminosalicylic acid	35
ex (5) Aminonaphthol disulphonic acid 2:5:7 (J acid)	105
ex (6) Urea compounds of J acid	105
ex (6) Diamidophenol (amidol); mono-methylpara-aminodiphenyl sulphate (metol)	105
Phenylsulphomethyl pyrazolone; phenylmethyl pyrazolone	35
Tetramethyl diamino benzhydrol; tetraethyl diamino benzhydrol; tetraethyl diaminodiphenyl methane; tetraethyl diaminodiphenyl methane	105
Schler's ketone	105
Phenyl-drazine	75
Phenylhydrazine sulphonic acid	75
Prepared inks and colours for printing, lithography and other graphic uses, and for duplicating:—	
(2) Other:—	
(b) Containing organic colouring material	300
Essential aromatic oils, not containing alcohol:—	
(2) Other	250
Vanillin	500
Celulose acetate:—	
(2) In blocks, plates, sheets, strips, tubes, sticks, whether or not polished, dulled, coloured in the mass:—	
ex (a) In blocks, plates, tubes, sticks, or sheets of a thickness from 0.127 to 2.03 mm.:—	
I. Not coloured	200
II. Coloured	250
Artificial plastic materials with a base of casein, gelatine, starch, phenol, urea, formaldehyde, etc., such as galalith, bakelite, trolite, etc.:—	
(2) Other:—	
(a) Not worked whether or not coloured, in powder or in lumps, even with addition of wood dust, asbestos, infusorial earth, etc.; scrap	90
(b) In blocks, plates, sheets, sticks or tubes:—	
I. Not worked	100
II. Ground, polished, stuck together or with impressed designs	120
Chemical products not elsewhere specified in the Tariff: ex (2) Organic—including immediate packing:—	
(a) Tricresyl phosphate and triphenyl phosphate	35
(b) Vulcastab A, Vulcafor MA, Vulcafor MT, Vulcafor RN, Vulcafor PT, Monox (rubber vulcanisation accelerators and assistants); Algor (product for softening water in boilers); Galyene (metal pickling product); Whitcol SE, Whitcol SES, Lissapol (textile specialties)	35
(c) Neozine, Vulcafor DA, AS2, Thioflex (rubber vulcanisation accelerators and assistants)	75
(d) Vulcafor TET, Vulcafor TMT, Vulcafor ZDC, Vulcafor DDCN, Vulcafor DAU, Vulcafor SPX, Vulcafor ZIX, Vulcafor SDC, Vulcabond (rubber vulcanisation accelerators and assistants); Shir-lan (textile speciality)	120
(e) Agral WP, Agral WRS, Agral SR, Agral I, Agral N, Whiteol J, Whiteol olein oil, Fixanol, Lissalamin, Permalin W, Permalin N, Permalin EML, Permalin NF (textile specialties)	160
Cut artificial silk (vistra):—	
(a) Not dyed:—	
I. Of acetate silk—under permit from the Minister of Finance, imported through the Customs Houses at Lodz, Warsaw, Gdynia, and in the territory of the Free City of Danzig, Lcegethor	75
II. Other	300

OLEUM (all strengths)

Sulphuric, Battery, Dipping, Muriatic, Nitric, and Mixed Acids.

SPENCER CHAPMAN & MESSEL Ltd.

With which is amalgamated WILLIAM PEARCE & SONS, Ltd.

WALSINGHAM HOUSE, SEETHING LANE, E.C.3.

Telephone: Royal 1166. Works: SILVERTOWN E.16. Telegrams "Hydrochloric Fen, London."

SULPHATE OF ALUMINA

FOR PAPERMAKERS

14/15% IRON FREE. 17/18% IRON FREE finely Ground 14/15% ORDINARY, In Slabs or Crushed.

SODA ALUM for the MANUFACTURE of SATIN WHITE

VIADUCT ALUM CO. LTD.

THE MARSHES, WIDNES.

Tel.—Widnes 339. Tel. Add.—"Viaduct, Alum, Widnes." Codes—Bentley's & A.B.C. (5th Edition).