

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXXII.

January 12, 1935

No. 811

AN index to Volume XXXI of THE CHEMICAL AGE is published with this issue. It will be found inside the back cover, whence it can readily be detached for binding purposes.

Notes and Comments

The Nitrogen Outlook

MORE hopeful prospects for British agriculture have prompted the British Sulphate of Ammonia Federation to increase the efficiency of its propaganda and selling staff throughout the home market in order that the members may be well prepared to stimulate and to deal with an increased demand for fertilisers which is expected to accompany an agricultural revival. The sulphate of ammonia market in recent years has been noteworthy for the fluctuation in prices. In August, 1926, the price was £13 1s. per ton, and in August, 1933, it had fallen to £5 5s. The outstanding feature of the twelve months ended June 30, 1934, covered by the latest annual report of the Federation, summarised elsewhere in this issue, was the successful establishment of a scale of prices based on a spring price of £7 5s., as compared with £6 10s. and £5 5s. for the two previous years. It was inevitable that an increased price should arouse some unfavourable comment from the consumer, and much propaganda activity was devoted to convincing the agricultural world that the price charged, although representing an increase of 38 per cent. above the lowest level, was no more than fair and reasonable bearing in mind the entirely uneconomic level to which prices had previously sunk under the stress of foreign competition. In the circumstances the Federation feels that the volume of home sales cannot be regarded as unsatisfactory.

Stable Price Structure

WORLD production of pure nitrogen reached its peak in the fertiliser year 1929/1930, since when there have been decreases of 23 per cent. and 6½ per cent., and increases of 5.8 per cent. and 6.55 per cent. respectively. Consumption figures have followed a similar trend, with decreases of 16.9 per cent. and 4.1 per cent. and increases of 12.3 per cent. and 6.6 per cent. The output of by-product nitrogen increased by 18 per cent. in the year under review. While production showed an improvement, synthetic nitrogen plants operated on an average at less than 41 per cent. of capacity during the year. Continuation of agreements with Continental nitrogen producers had a steadying effect on the market and resulted in British producers receiving a slightly higher price for their output than in the previous year, but the absence of a definite agreement with the Chilean interests led to price-cutting in some markets. Prospects for a more stable price structure in 1934/1935 are more encouraging as not only have the

agreements with the Continental producers been renewed and an arrangement reached with Japanese ammonium sulphate producers, but a definite agreement has also been concluded with the Chile nitrate industry.

Chemical Developments in Germany

IT may be because Germany has rightly or wrongly secured a reputation as the home of industrial chemistry, it may be because in past years so large a volume of trade flowed between this country and Germany, but whatever the reason it cannot be denied that developments in that country are attracting unusual notice here. In past issues we have commented upon the production of hydrogenated oil from brown coal by compulsory formation of an industrial organisation for that purpose. It would appear that the actual present and projected developments extend a good way beyond that one source of petrol. According to the "Berliner Borsen-Courier" it is anticipated that 300,000 tons of petrol will be produced by the end of the year by the I.G. hydrogenation process. The Brown Coal Organisation expects to produce 400,000 tons of petrol annually, and coke ovens and gasworks should achieve the recovery of 350,000 tons of benzol. The distillation of brown coal and German mineral oil should produce another 150,000 tons, making no less than 1,200,000 tons of light petrol and benzol oils per annum, which is expected to be blended with a further 150,000 tons of home produced alcohol. In this way, by the end of 1935, no less than 70 per cent. of the German requirements of motor fuel and aviation spirit will be produced in that country.

Nor is this all; an experimental plant having a capacity of 1,000 tons annually is working on the Franz Fischer process whereby petrol is manufactured from CO and hydrogen by the aid of a catalyst at atmospheric pressure and under a temperature of 190-210° C. There is a good deal of hydrogen from synthetic ammonia plants for which there is no immediate outlet, and this plant is designed to solve that problem. If successful, several large installations are projected.

Progress in Other Fields

GERMANY is striving for economic self-sufficiency not only in the field of liquid fuel. Efforts are being made to free Germany from dependence upon foreign sources of supply for textile yarns, mineral ores, and fats hitherto imported. Professor Ubbelohde in the "Deutsche Volkswirtschaft" claims that mixtures

of flax and artificial silk have been found that are quite satisfactory substitutes for wool and cotton, and that experiments to produce chemically fats for the soap and other industries are on the verge of success. Synthetic food is another field wherein the German chemist shines. These new food products have yet to prove themselves; it may be that the synthetic material will be found to be but a poor substitute for the natural product. The artificial clothes may be perfect as insulators and perspiration absorbers, but may let the wearer down in some quite catastrophic manner in public. Does this mean the inception of a new era for chemistry, the commencement of a new order of things wherein the world will look to the chemist and the chemical industry for everything it wants? Germany is to-day in the special position of having an internal economic problem due to her attempt to maintain artificially the gold parity of the mark whilst at the same time creating a great domestic trade expansion financed by borrowed money in order to raise internal prices and to create internal employment. These two contradictory policies are making it very difficult for the German to buy abroad even his essential raw materials; hence the need to produce them at home. The Germans evidently think they can live by taking in each other's washing!

Many nations have had to embark on strange policies in the endeavour to extricate themselves from the present pressing difficulties. It does seem a pity when many nations are beginning to climb out of the morass, and when trade is beginning to flow more freely, that one large nation should deliberately cut itself off from this movement. If this policy is successful, and every need of the human race is manufactured synthetically, we shall have to envisage a new outlook for the economics of the world and a redistribution of population and employment.

Plant Accessories

HAVE you ever thought of the extent to which one particular feature will enable you to obtain greater efficiency from a particular plant accessory? In the first place, consider the question of temperature indicating and recording instruments. The men who operate valves can control the process more closely if an indicating recorder is showing the temperature of the process which they are regulating. If the dial is large enough to be conveniently read from a distance, the men will look at it more often and will be able to anticipate its movements and are therefore able to effect better control. Secondly, consider steam pipes. The steam trap is an inexpensive item, but it makes all the difference in the return which you get from your steam. Properly trapped, with the trap installed at low points in the line, your steam pipes will deliver drier and hotter steam at longer distances from the boiler. Steam traps aid in maintaining proper temperatures without fluctuation and thereby raise the efficiency of operations where a steady and even heat is required. Thirdly, installation and maintenance costs for pipework can be definitely lowered by the use of precision-machined pipe fittings. Flanged fittings should have their faces accurately machined at a true right angle to the line of flow, with the bolt holes properly aligned and spaced. Screwed fittings should have threads which are cut true to gauge and free from burr, and the ends are profitably chamfered to give easy entrance for the pipe. To give one further

instance, consider the use of flexible rubber pipes for the conveyance of abrasive and corrosive materials. Rubber has a greater resistance to wear in comparison with metal and even curved rubber pipes can be easily and quickly adjusted to present a new surface at the point of wear after the flange bolts have been loosened. In addition, rubber pipes are easily and quickly installed where it is necessary to join up two flange connections which are out of alignment.

An Ancient Industry

THE January issue of the "P.L.A. Monthly," the magazine of the Port of London Authority, contains an illustrated article on essential oils by G. W. Booth, in which he reviews the historical development of one of the oldest trades in the world. Up to the beginning of the sixteenth century only thirteen distilled oils were known, including cedar wood, rose, juniper wood and cinnamon oils. During the sixteenth century, however, considerable progress was made in the art of distillation and by the end of the century 65 different oils appeared in pharmacopoeias and price ordinances issued in various German cities to regulate the sale of drugs and spices. Since the seventeenth century great progress has been made, and modern science and industry working hand in hand can force almost any flower, herb or fruit to yield up its secrets of sweetness and beneficence. Perfumery, confectionery, toilet goods, flavourings, antiseptics, inhalants and antiseptics are cited as the principal applications of essential oils, but no commentary on essential oils would be complete without reference to the fixatives which form an integral part of the same trade. The natural fixatives are musk (from the musk deer), ambergris (from the whale), civet (from the civet cat of Abyssinia), and castoreum (from the beaver), and there are, of course, a number of fixatives of a vegetable nature—balsams, benzoin, olibanum, etc.

The essential oil trade in the Port of London has its home in No. 2 Department, London Dock, and there in drums, large and small, tins in cases, carboys, bottles and pots may be seen the modern evidence of the ages of long conquest of the vegetable kingdom by man. There, in handling oils, some of which are worth many shillings an ounce, exactitude and perfect cleanliness are essential. Sampling is an operation requiring care and knowledge, some drums having to be rolled first in order that a fair sample may be obtained. The majority of essential oils are dutiable, and the customs authorities frequently send samples to the official laboratory to test the possibility of the oil containing spirit. Oils from all countries of the world find their way to London Docks. Those obtained from similar plants in different countries often vary in value and quality. Lavender oil from France is quite different from the spike lavender oil of Spain, and sandalwood oils betray to the expert their origin in either India, the West Indies or Australia.

Expansion of Indian Sugar Industry

THE annual report of the sugar technologist to the Imperial Council of Agricultural Research, India, shows that there were in all 112 sugar-making factories in India in the year 1933-34, a large number of them having opened during the year. The production of sugar direct from cane totalled 454,000 tons as against 290,000 tons in the previous year, while the increase in sugar produced was 56 per cent. and molasses 45 per cent.

Paraffin Wax and Petroleum Ceresins

THE ease with which paraffin wax may be adapted to varied operating conditions is largely responsible for the diversity of its uses. It melts readily at a low temperature and may be kept liquid by simple means; on melting, it immediately yields a liquid of very low viscosity and is, therefore, well suited to impregnation work requiring high fluidity without the necessity for high temperature, said Mr. P. G. Higgs in a paper on "The Utilisation of Paraffin Wax and Petroleum Ceresin," read before the Institution of Petroleum Technologists, in London, on December 11.

The candle industry is still the largest consumer of paraffin wax. Its technical value lies in its good appearance, its satisfactory burning properties (freedom from mineral matter, high illuminating power, etc.), and the facility with which it may be moulded. It has disadvantages—*e.g.*, its tendency to bend and liability to mottle—but the candle-maker is able to cope with them successfully. The tendency to bend, or any other property which is closely connected with composition, cannot be judged from the setting-point of the wax.

The lower grades of paraffin wax (setting-point 106-115° F.) are used in the match industry, where every splint is treated with wax before the head is put on, in order to facilitate the ignition of the wood. Match wax is required to have good impregnating qualities and must not so affect the striking composition, which is applied immediately after waxing, as to prolong its drying time or lessen its adhesion to the splint. It is doubtful whether a large oil-content adversely affects these properties; wax-oil blends containing up to 50 per cent. oil have been stated to be satisfactory, provided that the viscosity of the oil be correctly chosen.

Paraffin Wax as a Proofing Agent

The proofing of porous materials (paper, fabric, wood and leather) against liquid water may be accomplished either by filling up the interstices of the material or by treating the fibres with sufficient wax to make them water-repellent; proofing against air or water-vapour, however, is possible only by the first alternative.

The value of refined paraffin wax for paper treatment lies in its insolubility, stability and innocuousness. The low temperature at which it can be applied ensures that the mechanical properties of the paper suffer but little damage as a result of loss of natural moisture. Cartons and boxes which are not intended to contain actual liquids are made up from flat blanks, previously surface-waxed. Containers for liquids—*e.g.*, milk cartons—and those of such a shape that assembly from previously waxed paper or board would present difficulties, must be impregnated after manufacture. Packages which have subsequently to be stored at low temperatures, and which would otherwise be merely surface-waxed, should be impregnated in order to prevent the removal of the protecting effect of the wax by cracking and flaking.

The usual type of waxing machine for paper or board in flat form consists essentially of a number of horizontal rollers. The lowest of these rotates in a bath of molten wax and transfers wax to one or more of the others, between which the paper is passed. If the paper travels at a high speed, and especially if the temperature of the rollers is not too high, the film of wax solidifies before it can penetrate far into the body of the paper. Complete impregnation can be effected, if required, by passing the surface-waxed paper through a further pair of heated rollers. This method of waxing is very rapid; no drainage period is necessary, since there is no excess of wax on the paper and the hardening period is very short. The extent of the wax penetration in a surface-waxing process may be varied fairly widely by adjusting the temperature of the rollers and time of contact of the paper with the rollers.

Highly-proofed wrapping papers and shaped articles, such as paper milk cartons, are treated by actual immersion in molten paraffin wax under conditions which favour more or less complete impregnation. Wrapping paper for bread covers, biscuit packings, external box wrappers, etc., is passed from a large reel, under a guide roll immersed in wax, and then, on emerging from the bath, through a roller or other device to remove excess wax. The waxed strip is next cooled by an air-blast or by contact with a water-cooled drum and is finally re-reeled. A shaped article is carried through

Their Use in Industry

the wax by an endless conveyor and is kept completely immersed for a few seconds. It is held in such a position that all air bubbles in its interior may rise to the surface of the wax. On leaving the bath the conveyor carries the article until draining and hardening of the wax have been accomplished. The duration of the process varies considerably from one case to another, but the waxing and cooling are usually completed in a few minutes. Impregnation treatment is much less economical of wax than is surface-waxing.

Paraffin wax for the treatment of paper is required to be fully refined and without odour or taste. The critical attitude taken by the paper trade on the question of odour has made it more necessary than ever to control carefully factors such as efficiency of fractionation in the production of wax-distillate, oil removal and the final chemical treatment of the wax. Paraffin wax readily acquires odours from external sources and has, in fact, been used as an extractive in perfumery; if it is intended for paper treatment it should therefore be stored and despatched so that it is not in direct contact with odorous packing materials, such as certain fabrics and woods. On the user's side it is equally important to minimise the development of odour during service, due to mild oxidation, by careful temperature control. At temperatures up to 100° C. paraffin wax is practically inert towards air or oxygen, but as the temperature is raised above 100° C. the rate of attack becomes increasingly greater.

Certain foodstuffs which must maintain their quality during export or prolonged storage may be waxed directly. In the Californian fruit-packing industry citrus fruits are coated with a very thin film either by rubbing between blocks of paraffin wax or more frequently nowadays by spraying with wax followed by brush polishing; this treatment greatly retards shrinkage and inhibits mould formation. Certain kinds of Continental and Colonial cheeses and the small varieties which cannot be bandaged in the ordinary way are coated by dipping in the molten wax in order to prevent loss in weight and to retain the moisture necessary for their proper ripening.

Manufacture of Polishes

The consumption of paraffin wax in polish manufacture is very large and is next in importance to that of the paper trade, the bulk of it entering into the preparation of paste polishes for furniture and leather. These consist usually of a mixture of waxes, together with a solvent, such as turpentine or white spirit, which is insufficient in quantity to dissolve more than a small proportion of the total wax at ordinary temperatures. Paraffin wax itself has poor polishing qualities, but its purpose is to secure the required pastiness without the use of unnecessarily large proportions of expensive waxes of animal or vegetable origin. All grades are sold for polish-making, but for the best quality products the higher melting-points (130° F. upwards) are preferred and probably result in better stability in warm weather. An important function of the wax in paste polishes is to prevent too rapid evaporation of the solvent and so to increase the spreading capacity.

Applications in Electrical Industries

Large quantities of paraffin wax are used in admixture with other materials in compounds for sealing dry batteries, etc., and for filling cable junction and terminal boxes. It is used alone as a filling for instrument transformers and as an impregnant for the insulation of inductance coils, windings and cables of all sizes. In many cases paraffin wax is used simply for waterproofing other forms of insulation. The only extensive use of the wax, unmixed with other ingredients, in which its electrical properties are comparable in importance with water resistance is in the construction of paper/metal fixed condensers. The latter have been used for many years in telegraphy and on a large scale in the wireless trade.

Paraffin wax of high setting-point is usually selected for electrical purposes in view of the high working temperatures which it must frequently meet without melting out of the apparatus. The electrical properties of wax vary rapidly and somewhat irregularly with rising temperature as the melting-

point is approached. This behaviour is undesirable in certain instruments in which invariability is important, such as condensers for radio-frequency circuits. If high setting-point wax is used, its average working temperature will probably be well below that at which extreme changes in resistance and dielectric properties begin to occur. As in the waxing of paper, mild oxidation of the wax by overheating must be minimised as far as possible by adequate temperature control. The formation of acidic oxidation products, potentially corrosive to copper, and water is particularly undesirable in wax for electrical purposes.

Application by Solutions and Emulsions

For certain purposes paraffin wax is conveniently used in solution or emulsion instead of by direct application after melting. In emulsion or dilute solution the wax may be applied at ordinary temperatures; a very light waxing treatment may be given in this way, *e.g.*, in the waterproofing of fabrics and in the dressing of shoe upper leather. Saturated solutions, excess wax being present, as in certain polishes and paint strippers, enable the wax to be used in paste form. Among the best solvents are chlorinated hydrocarbons and liquid hydrocarbons themselves, the latter including benzol, turpentine and the lighter petroleum fractions. As a general rule, oxygenated liquids are poor solvents for wax. At 15° C., even in the most favourable media, the solubility of refined commercial waxes is relatively low, but it increases rapidly with rise in temperature. For many practical purposes the saturation point is deemed to have been reached when a clear, dilute solution of paraffin wax becomes just turbid on cooling.

Petroleum Ceresins

It has long been known that a type of solid hydrocarbon occurs in petroleum which cannot be classed with distillate paraffin wax. Such material is frequently deposited spontaneously from crude oil in wells, pipelines, etc.; it is only within recent years, however, that deliberate efforts have been made to isolate it from crude oil for its own sake. The manufactured substance may conveniently be termed petroleum ceresin, although, as with ozokerite ceresin, its true nature is little understood. The ceresin from crude oil may differ physically in several respects from that obtained by refining ozokerite, but there is a strong possibility that both are basically of a similar constitution.

Petroleum ceresins are characterised by relatively high setting point and microcrystalline structure. They are usually non-distillates, the general method of isolation being by the dilution of a suitable wax residue by means of a volatile solvent for oil. After settling at a suitable temperature the precipitated ceresin is recovered by filtration or centrifuging and is subsequently refined.

The petroleum ceresins as a class melt at relatively high temperatures. Those obtainable from certain East Indian crudes are especially noteworthy in this respect and have been made with setting points as high as 93° C. The best known from this source is a hard material setting at about 85° C. and possessing a granular, microcrystalline structure; as marketed at present it is orange-yellow, the further reduction in colour presenting difficulty. It has been used with success as a substitute for certain of the high-melting natural waxes.

A Dope for Paraffin Wax

Perhaps the most interesting property of petroleum ceresins is their effect on the crystallinity of ordinary distillate paraffin waxes. It has been known for many years that certain mixtures of ozokerite ceresin with paraffin waxes are of a minutely crystalline nature. Petroleum ceresins, however, show a much greater activity in this respect. This property has been remarked in a general way by several observers, but the exceptional activity of these ceresins does not appear to have been fully appreciated. In the case of the East Indian ceresin it has been found that the addition of 0.3 per cent. is sufficient to render commercial paraffin wax almost microcrystalline. All the characteristics of the original wax which are due, directly or otherwise, to marked crystallinity are then much modified.

The efficiency of petroleum ceresin in reducing the crystal size of paraffin wax is well shown by allowing a fairly concentrated solution (say, 20 per cent. wt.) in a suitable solvent to cool to ordinary temperature from a higher at which the solution is clear. Solutions of ordinary paraffin wax deposit

large crystals which gradually increase in quantity until the whole mixture becomes a porous mass of large, interlacing crystals amongst which the solvent is entrained. If this mass is allowed to warm up slowly, gradual dissolution occurs and the loose crystals settle, leaving above them an increasing layer of clear liquid. On the other hand, if the solution is prepared from paraffin wax containing 0.3 per cent. petroleum ceresin, a smooth, cream-like mass composed of very small crystals distributed evenly throughout the solvent is obtained on cooling.

Personal Notes

MR. G. W. TALBOT has been appointed chief engineer of I.C.I. (Lime), Ltd.

MR. C. I. KELLY has been appointed chief chemist to Herbert Green and Co., Ltd.

MR. H. W. CHADBOURNE has resigned from the Board of the Base Metals Mining Corporation and has been succeeded by Mr. G. C. Ames.

SIR HARRY MCGOWAN, chairman of Imperial Chemical Industries, Ltd., sailed by the "Windsor Castle" yesterday (Friday) for a business tour in South Africa. He expects to return in March.

MR. E. S. SHRAPNEL-SMITH has accepted the chairmanship of the Petroleum Industry Committee of the British Standards Institution, in succession to Admiral Sir George Goodwin, who has resigned.

MR. HENRY PRINGUER BENN, of 25 Connaught Gardens, Muswell Hill, London, N., the last survivor of four brothers who founded the firm of Benn Brothers, publishers, left estate of the gross value of £1,925, with net personality £1,888.

DR. R. G. W. NORRISH has accepted the invitation of the council of the Chemical Society to act as local representative for the Cambridge area in place of Dr. H. McCombie, whose resignation from that office has been accepted with much regret.

MR. W. H. COLEMAN retired last week from his position with the National Benzole Co., Ltd. He has for forty-one years been an active member of the Society of Chemical Industry and has served on the Council and the committee of the London Section. He is also a past chairman of the Chemical Club.

SIR JOHN CADMAN, chairman of the Anglo-Persian Oil and Iraq Petroleum companies, left Croydon on January 5 for Palestine and Iraq to attend the official opening by King Ghazi of Iraq of the two new pipelines of the Iraq Petroleum Company, which are to convey the crude oil from Kirkuk to the Mediterranean ports of Tripoli and Haifa.

PROFESSOR ALEXANDER GRAY has been appointed a member of the Food Council in place of Professor F. W. Ogilvie, who recently resigned on his appointment as president of Belfast University. Professor Gray has also been appointed to succeed Professor Ogilvie as a member of the Consumers' Committee for Great Britain and the Consumers' Committee for Scotland under the Agricultural Marketing Act, 1931.

The Development of Inventions

The third edition of "Practical Hints on the Patenting and the Development of Inventions," issued by the Imperial Patent Service has been enlarged and completely revised. The protection of valuable ideas is dealt with and the need for expert assistance when applying for protection is stressed. The Imperial Patent Service gives service to inventors who have limited means. A perusal of this booklet, which has just been published, will indicate the several phases through which an invention must go, and also emphasises the experience and technical knowledge necessary in all patent matters. Investigations in the chemical industry are in the hands of a graduate, with an honours degree in chemistry, who has had considerable experience in chemical research and also in the design of industrial plant. Research in electrotechnics and physics is supervised by an electrical engineer, who is a Fellow of the Physical Society. Questions regarding inventions by employees can be submitted to the Principal for a free preliminary opinion; advice is also given on the selection of countries in which an invention is to be patented.

British Sulphate of Ammonia Trade in 1933-34

Increased World Output : Reduced Home Consumption

THE annual report of the British Sulphate of Ammonia Federation for the year ended June 30, 1934, just issued over the signatures of Sir David Milne-Watson (chairman) and Mr. F. C. O. Speyer (general manager), is the fourteenth submitted by the Federation and deals with the thirty-seventh year of propaganda work undertaken successively by the Sulphate of Ammonia Committee, the Association, the Federation, Nitram, Ltd., and Imperial Chemical Industries, Ltd. During the year under review it is estimated that there was an increase of 109,917 metric tons of nitrogen, or about 6.55 per cent., in actual production. The production in Chile increased by 14,400 tons, or over 20 per cent. (following a decline of about 58 per cent. in the previous year), and output in other countries increased by 95,517 tons, or 6 per cent. The output of by-product nitrogen has increased by 18 per cent. More than half of this improvement is due to the U.S.A. While production thus shows an improvement, synthetic nitrogen plants have on an average operated at less than 41 per cent. of capacity during the year. The world capacity for synthetic nitrogen, including cyanamide, is estimated at 3,310,000 tons of nitrogen.

Total Consumption

The total consumption increased by 115,159 tons, or about 6.6 per cent., following an increase of 12.3 per cent. last year. The increase in fertiliser nitrogen consumption was 77,000 metric tons, or 4.85 per cent., as compared with 12.3 per cent. in the previous year. Each main class of fertiliser showed an increase except ammonium sulphate (including ammonia for mixed fertilisers), which declined by 36,445 tons of nitrogen, or 4.2 per cent., from its 1932-33 record figure. In individual countries, the largest tonnage increases in nitrogen consumption have been in the United States, Germany, Italy, Russia and Egypt, and the greatest decrease in China.

The development in recent years of production and consumption of "other synthetic nitrogen fertilisers," particularly of lime ammonium nitrate forms, has been remarkable. Sulphate of ammonia has, however, been able to maintain and in some years to increase its proportion of the total world fertiliser nitrogen consumption by virtue of its economy and efficiency. While the continuation of the agreements with the most important Continental nitrogen producers had a steady effect on the market and resulted in members of

the Federation receiving a slightly higher price for their output than in 1932-33, the absence of a definite agreement with the Chilean interests led to price-cutting in some markets. In this respect the prospects for 1934-35 are more encouraging, as not only have the agreements with the Continental producers been renewed and an arrangement arrived at with Japanese ammonium sulphate producers, but a definite agreement has also been concluded with the Chile nitrate industry. These arrangements should provide a more stable price structure.

Home Production and Consumption

The figures in the left-hand table showing the total production of ammonia products, expressed as sulphate, are calculated on the basis of 25 per cent. ammonia (about 20.6 per cent. nitrogen). The figures for sulphate of ammonia production and trade, however, apply to actual tons of product with a nitrogen content varying from an average of about 20 per cent. in the earlier years to about 21 per cent. in recent years.

Home consumption of sulphate of ammonia showed a decrease on the 1932-33 figures of 27,924 tons, or 12 per cent. The decline in home deliveries against sales was larger, but 9,500 tons, mentioned in last year's report, which were delivered to merchants and mixers in the last six weeks of 1932-33, in excess of normal requirements at that time, were consumed in 1933-34. The decline in consumption affected all three parts of the home market, but was greatest, proportionately, in England and Wales. About half of the decline in sulphate was counterbalanced by an increase in the agricultural use of other nitrogen fertilisers. This exchange was partly due to the raising of the sulphate price (from the abnormally low level reached under the stress of foreign competition in 1932-33) accompanied by a slight reduction in nitrate prices. Foreign imports amounted to 1,666 tons, against 226 tons in 1932-33, 1,500 tons coming from Canada. The total consumption of pure nitrogen in the British Isles for all purposes amounted to about 76,200 metric tons against 75,600 tons last year. The tonnage used in industry is estimated at 20,400 tons, against 17,300 last year. The total consumption of Chile nitrate is estimated at 25,300 tons as against 21,700 tons for last season.

Total exports from Great Britain and Ireland show a decrease of 33,831 tons, or about 10 per cent. on last year's

PRODUCTION IN GREAT BRITAIN AND IRELAND.
(Tons of 2,240 lb.)

Calendar Year.	Total production of Ammonia Products, expressed as Sulphate of Ammonia equivalent (basis 25 per cent. ammonia (a)).		Included in Total.	
	Total Great Britain and Ireland.	Industrial Ammonia Products (basis 25% ammonia) (e).	Industrial Ammonia Products (basis 25% ammonia) (e).	Sulphate of Ammonia as such (actual tons of product).
1913	423,066	66,375	66,375	365,000
1918	423,900	173,261	173,261	257,948*
1923	441,216	49,614	49,614	387,612
1928	644,836	63,258	63,258	564,180
1929	943,537	79,520	79,520	840,396
1930	893,060	89,328	89,328	678,442
1931	693,319	86,156	86,156	524,651
1932	771,480	85,595	85,595	628,349
1933	692,675	94,361	94,361	574,743

* Excluding the ammonium sulphate converted into ammonium nitrate for munitions, which is included in the previous column under "Industrial Ammonia Products."

(a) 25 per cent. ammonia = 20.6 per cent. of nitrogen (approx.). The figures for total production of ammonia products are recalculated from the Alkali Inspectors' Reports, except for the estimates shown. The Alkali Inspectors' Reports included Ireland up to 1921, so that to obtain comparable totals estimates for Ireland have been included for the years 1922-1933.

(e) Estimated.

DETAILED FIGURES FOR SULPHATE OF AMMONIA. GREAT BRITAIN AND IRELAND AND CHANNEL ISLANDS.
(Tons of 2,240 lb.)

Fertiliser Year.	Total Production of Sulphate of Ammonia as such.	Agricultural Consumption of Sulphate of Ammonia in British Isles and Channel Islands.	Agricultural Consumption of Chile Nitrate. (e)	Sulphate of Ammonia Exports Imports from into	
				Great Britain and Ireland other than to or from the Channel Islands.	
1913/14	364,500(e)	60,000(e)	80,000	323,444	†
1918/19	310,000*(e)	269,000	25,000	37,026	†
1919/20	361,360	233,500	40,000	116,134	†
1920/21	315,630	166,920	47,500	134,378	243
1921/22	229,390	136,000	56,000	116,377	2,142
1922/23	344,824	140,200	57,000	186,045	23
1923/24	399,204	142,400	50,000	258,274	—
1924/25	411,650	153,200	40,000	261,131	37
1925/26	377,497	168,650	48,600	223,210	215
1926/27	321,913	109,340	33,000	137,319	4,401
1927/28	472,029	167,720	37,000	302,596	—
1928/29	645,042	186,710	49,500	428,437	384
1929/30	865,878	183,516	48,000	634,495	3,556
1930/31	554,806	155,814	45,000	456,467	3,067
1931/32	600,204	228,338	33,000	375,757	14,187
1932/33	599,128	238,643	20,000	335,173	226
1933/34	508,463	210,719	22,000	301,460	1,666

* Excluding the ammonium sulphate converted into ammonium nitrate for munitions.

† Not reported separately.

(e) Estimated.

figures, but during the year there has been a further reduction in the stocks on hand in export markets.

The outstanding feature of the period under review was the successful establishment of a scale of prices based on a spring price of £7 5s. as compared with £6 10s. and £5 5s. for the two previous years. It was inevitable that an increased price should arouse some unfavourable comment from the consumer, and much propaganda activity has been devoted to convincing the agricultural world that the price charged, although representing an increase of 38 per cent. above the lowest level, was no more than fair and reasonable, bearing in mind the entirely uneconomic level to which prices had previously sunk under the stress of foreign competition. In the circumstances the volume of home sales cannot be regarded as unsatisfactory, bearing in mind that there was an exceptionally heavy carry-over of stocks in merchants' hands, and also that the actual financial position of the farmer showed but little improvement.

The report states that there are more hopeful prospects before British agriculture, and a feeling of greater confidence is generally abroad in those branches which have begun to organise their production and marketing. The opportunity has therefore been taken to increase the efficiency of the pro-

paganda and selling staff throughout the home market by various means. A revival in British agriculture will thus find the Federation well prepared to stimulate and to deal with an increased demand for fertilisers. Advertising has been on a more extended scale. At the great national shows—the Royal at Derby, the Dairy Show in London and the spring shows in Belfast and Dublin—large stands were erected. Space was also taken at certain smaller shows, such as, amongst others, the Yorkshire, the Lincolnshire and the Royal Cornwall. As usual, merchants and agents were encouraged to display fertilisers on their stands at local shows all over the country. The winter lecture programme again demonstrated the close interest of farmers in the information imparted by our representatives. Audiences totalling 9,304 were attracted by 206 lectures. Jealott's Hill once more proved a great attraction to farmers during the summer.

At June 30, 1934, seven producing members of the Federation resigned; their combined output for the fertiliser year 1933-34 represented 1.29 per cent. of the total output of the members. An important new producer joined the Federation and one former member, on resuming production, has rejoined. At July 1, 1934, the Federation numbered 211 members.

Water Treatment for Industrial Purposes

Application of Sodium Metaphosphate

It has long been realised that water of a high degree of purity is required for many manufacturing processes. In the past, certain industries have developed in districts where suitable water was found, e.g., the woollen industry in Yorkshire, where the moorland waters are fairly soft. Nowadays, however, it is unnecessary to locate a works in a soft water district, for with the appropriate filtration treatment and softening plant, it is usually possible to obtain a water supply more or less suitable for the purpose for which it is required, but, though the reduction of the residual hardness of waters used in process work (by suitable softening apparatus) is definitely of immense value, it is now becoming recognised that for many purposes this is not enough. In the case of boiler feed water, for example, the necessity of further treatment after preliminary softening is obvious, particularly with modern water tube boilers, where high furnace temperatures render even small deposits of scale not only wasteful but positively dangerous.

Boiler Feed Water

As a result of research into the subject of the treatment of boiler feed water, the interesting properties of sodium metaphosphate were discovered. This substance is the most suitable agent available for the final conditioning of boiler water. It possesses the advantage over tri-sodium phosphate in that it does not cause precipitation of calcium phosphate in the feed line, but when in the boiler it reverts to orthophosphate, liberating ionic hydrogen which neutralises a portion of the gradually increasing alkalinity of the boiler water and causing the calcium and magnesium to form a soft sludge, instead of adherent scale on the boiler surfaces.

Not only will sodium metaphosphate soften water without forming a precipitate but it will cause insoluble calcium and magnesium salts to be dissolved. This very interesting property is most important in many textile processes, for even with so-called softened water, trouble is experienced with the "lime soaps" caused by the combination of calcium and magnesium salts with the fatty acid radicles. Metaphosphate will convert these lime soaps to the corresponding soluble sodium soaps, with obvious advantages to the textile process. The calcium remains in solution as a complex double salt of sodium and calcium.

Calgon is the name given to a material consisting essentially of a mixture of sodium metaphosphate and sodium pyrophosphate, now being produced in this country by Keith Piercy, Ltd. This product is readily soluble and free from impurities, such as iron, which would be undesirable when the material is used in textile or laundry processes. As usually supplied, it has a pH value of 8.5 in dilute solution and can therefore be used safely with the most delicate fabrics.

It is believed that the sodium metaphosphate is a polymer

(NaPO_3)_n, i.e., hexametaphosphate, and that in solution this large molecule ionises into the anion $\text{Na}_6\text{P}_6\text{O}_{18}$. Secondary ionisation takes place and with an excess of metaphosphate a complex double salt $\text{Na}_2\text{Ca}_2\text{P}_6\text{O}_{18}$ is formed. The concentration of the calcium ion is very low, less than that in equilibrium with saturated lime soap or saturated calcium carbonate. Under these conditions it is impossible to detect the calcium by any of the ordinary methods, and even ammonium oxalate will not produce a precipitate; these remarks apply also to magnesium. Water treated with Calgon will therefore not only be completely softened, but it will maintain in solution normally insoluble lime salts and lime soaps. It is probably unnecessary to remind our readers of the importance of avoiding lime soaps in any dyeing, finishing or laundering process of textile fabrics. Lime soaps form an insoluble waterproof coating on the fibres, which causes uneven penetration of dyes, dull colours and a poor handle, and in the case of laundering, retain soiling matter and cause a bad colour.

Application in Wool Scouring

Wool scouring can be taken as an example of a textile process where Calgon can be used in conjunction with the usual materials with advantage. The process consists in passing the wool through a series of tanks or "bowls." After a preliminary immersion in water to remove some of the "suint" or perspiration and other impurities adhering to the wool it passes first through a bowl containing alkali, then through one or more soap bowls, and is finally rinsed. It is usual to add Calgon to the last soap bowl, with a smaller quantity of soap than the amount usually used. The effect of Calgon is immediately apparent, for the bowl remains clear instead of becoming cloudy—due to precipitation of small quantities of lime soap—and a lather is developed when the wool passes into the rinse bowl, owing to the conversion of previously formed lime soaps to soluble sodium soaps. The effect of Calgon is apparent in the appearance and handle of the wool, and in the chemical analysis and microscopic examination.

Calgon is also being used advantageously in the scouring and dyeing of woollen and cotton piece goods, and in the dyeing and finishing of silks, both real and artificial. It is usual to add Calgon to the dye-bath or scouring bath, the amount used being dependent on the residual hardness of the water. As it is stable in both acid and alkaline baths, it can be used for all classes of dyeing, eliminating completely such troubles as scum and soap spots, and giving brighter colours, more level dyeing and a better handle.

In other directions Calgon is used in the cleaning of the exteriors of large buildings, for dish and bottle washing, and in liquid soaps for domestic purposes.

Technical Aspects of Emulsions

Agriculture—Textile—Leather

A SYMPOSIUM on "The Technical Aspects of Emulsions" arranged by the British Section of the International Society of Leather Trades Chemists was held at University College, London, on December 7 under the chairmanship of Professor F. G. Donnan, F.R.S.

Dr. A. TURNBULL, president of the British Section of the I.S.L.T.C., in his opening remarks, said that it was fresh in the memory of most that the British Section of the Society held a conference on "The Swelling of Proteins and Allied Phenomena" at the Leathersellers' Hall, about two years ago. This was so successful that the Society had ventured another on the technical aspects of emulsions. Then, as now, they had been favoured by the kindly assistance of Professor F. G. Donnan, who needed no introduction to leather trades chemists. Procter's work on the swelling of gelatin and his use of Donnan's theory of membrane equilibrium was sufficient proof that Professor Donnan had been a good friend to leather chemistry.

Emulsions in the Patent Literature

The multiple uses of emulsions as indicated in the patent literature was reviewed by Dr. W. Clayton with special mention of the value of extended oil area. Emulsions for use as insecticides or for leather oiling were also described. Enumeration of familiar emulsifying agents was followed by examples of the newer compounds based on the modern views of polar and non-polar groups. Particular mention was made of the idea of "balanced" emulsifying agents with lipophile-hydrophile groups. Patents dealing with de-emulsification were named, with particular reference to the breaking of crude petroleum emulsions (water-in-oil type). Finally, attention was drawn to several patents of special scientific character, including four patent specifications claiming the use of a pre-formed emulsion as an emulsifying agent of unusual virtue.

The history of the use of emulsions in agricultural and horticultural practice was briefly sketched by Dr. R. M. Woodman. With regard to mineral oil emulsions, particular attention was focused on their use as summer foliage sprays and dormant sprays for plants and as sprays for insects attacking animals, on their action on the plant, on the toxicity and necessary degree of purity of the emulsified oil, and on the emulsifiers employed and the compatibility or otherwise of these emulsifiers with natural hard waters and other spray substances.

Tar distillate emulsions, tar-petroleum washes, emulsions of true oils and organic liquids and emulsions of oil solutions of various insecticides were also discussed, and reference was made to the analysis of emulsions, the stimulation to the plant following their application, the amount of oil retained by the foliage, and the removal of oily spray residues from fruit. In addition, the wetting, fungicidal and weed-killing properties of oil emulsions were described. The formation of opposite-type emulsions with one pair of liquids and the same emulsifier, the stability to ageing and also to subsequent mechanical treatment of the two types in dual systems near the common phase volume ratio and the danger to plants arising from the use of these dual emulsion systems, received attention.

Emulsions in the Wool Industry

Following a survey of everyday practice for removing wool, fat, olive oil and olefine from wool, Dr. J. B. Speakman and Dr. N. H. Chamberlain showed that the ease of removal of thin films of oil from textile fibres was determined by adhesion phenomena as well as by the magnitude of the oil-water interfacial tension. As regards the former, the extent of adhesion depended on the character of the surface to which the oil was applied and on the length and polar character of the oil molecules. All such factors, discovered by Sir W. B. Hardy in his studies of lubrication and related phenomena, have been shown to operate in scouring processes. Regarding interfacial tension, it is important, in the case of blended oils, to know the distribution of polar compounds between the wool-oil and oil-water interfaces. Preferential adsorption at the wool-oil interface opposed scouring by increasing adhesion; preferential adsorption at the oil-water interface promoted scouring by reducing the interfacial

tension. The paper concluded with a brief survey of modern synthetic scouring and emulsifying agents and their utility.

An outline of the main factors controlling emulsification and the development of emulsifying machines was given by Mr. R. I. Johnson, leading up to a classification of emulsifying machines, for descriptive purposes, under three headings; (1) agitators, (2) colloid mills, and (3) homogenisers. Various types of agitation emulsifiers were described, including whisks used for mayonnaise and salad cream production and batch and continuous churns employed in margarine manufacture. Brief reference was also made to various types of beaters and impellers and to portable emulsifying units.

Machines consisting of a rotor and stator, between which emulsification is effected, are classified as colloid mills, although many of these machines are described in the trade as homogenisers. Colloid mills are divided broadly into two types, smooth surface and rough surface mills, and, following a general description of their construction, machines were described to illustrate the fundamental design of these mills, details of output and power consumption being given. The chief factors influencing the design of the homogeniser pump system, and the homogenising valve, were considered and reference was made to two-stage homogenisation and pressure measurement. In conclusion, brief reference was made to hand-operated homogenising machines suitable for laboratory use.

Mechanism of Emulsification

The stabilising influence of gases on emulsions produced by ultrasonic waves was most likely a secondary effect, said Professor H. Freundlich, thin layers of gas on the surface preventing or retarding the coalescence of the droplets. Ultrasonic waves acting upon an emulsion (or a coarse suspension) in a thick-walled capillary tube caused striations owing to stationary longitudinal waves in the liquid. In the nodes of these striations large drops are formed, presumably owing to an orthokinetic coagulation of the droplets, when travelling from the antinodes to the nodes. It is probable that the facts which are instrumental in the formation and the destruction of emulsions by ultrasonic waves are of general importance, when producing emulsions by any mechanical means.

Emulsions in the Leather Industry

Oil and greases are used in leather manufacture for rendering the leather either more waterproof or more soft and pliable, said Mr. W. R. Atkin and Mr. F. C. Thompson. The more important processes involving oils and fats may be classified under four types: (1) Oil tannages, where the oil treatment actually provides the tanning agent; (2) impregnation, where the dry leather is immersed in hot greases or waxes to render the leather waterproof as in chrome sole leather; (3) currying, in which the grease is applied to the damp leather; (4) fat-liquoring, in which the leather is drummed with a dilute oil-emulsion. The first two processes did not call for consideration in a discussion on emulsions. Currying was described as the utilisation of the spreading properties of oils on water, and the necessity for having leather in a suitably damp condition for currying was explained. Fat-liquoring consisted of two stages, first, the absorption of oil from the dilute emulsion and the electrical discharge of the oil-droplets, and, secondly, the breaking of the absorbed emulsion by acid and by basic chromium compounds in the interior of the leather.

Insecticides from Volatile Oils

SOUTH African insecticides are now being made up of volatile oils guaranteed not to stain, although they are fatal to such forms of insect life as moths and mosquitoes. Most of these compounds are applied with the aid of sprays, and in this way they are used widely in business premises, hotels and hospitals. One such preparation has the additional advantage of being suitable for use as an antiseptic or a deodorant, and this has been sold widely for sickroom use. In spite of this activity, similar imported products are still used widely.

“Glass Silk” as a Heat Insulating Material

By Alex Carlisle

THE engineer has always been faced with the problem of efficient heat-conservation, and he has not been slow to devise means to ensure that heat shall be employed as far as possible for the purpose for which it is generated. It is not difficult to name a dozen materials, ranging from cork to asbestos, and from “slag wool” to metallic foils, that have attained wide usage as heat insulation.

“Glass silk” was a product of war-time necessity; in those years Germany experienced a shortage of asbestos, and “glass silk” was one of the substitutes. In Germany this “glass silk” is regarded as one of the finest forms of heat insulation. Of recent years it has been manufactured in America and has found many uses. In England also it has been manufactured since 1930 and it has found many industrial applications in the comparatively short period of its production.

The Raw Material

Ordinary commercial glass is used as raw material for the manufacture of “glass silk,” and is heated in electric furnaces which are provided with apertures through which the glass exudes when it reaches the molten state. As it exudes a skilled operator touches the spot with a glass rod, a strand of the glass is drawn out, and this is deftly whisked across to a revolving drum alongside the furnace. The drum continues to revolve rapidly, drawing out strands from all the apertures and lapping them over and over until the drum is covered with a thick felt of the thin glass fibres. A cut is then made across the drum, and the spun glass comes away in the form of a blanket of fibres, each in the neighbourhood of 0.001 in. diameter. The fibres, as they come from the drum, lie almost parallel and possess such tensile strength that they can be folded and crumpled with no ill effect. Such blankets of fibres are “opened out” into fine layers which have the appearance of silky veils, and they are laid one upon another until sufficient thickness has been built up to give a good degree of heat insulation. Intimately meshed, the fibres enclose innumerable minute air spaces but no large pockets, and it can be readily appreciated that a felt which is an inch or two in thickness should be an excellent non-conductor of heat.

Being composed of nothing but glass, it is not difficult to foresee the advantages that “glass silk” possesses for chemical engineering purposes. In the first place it is not affected by any degree of cold, and it suffers no ill effect on being subjected to temperatures up to 900° F. It has, indeed, been employed at 1,100° F. without undergoing disintegration. Secondly, it is unaffected by the frequent alternations of those temperatures which are often necessary in the chemical works. Thirdly, the material is non-hygroscopic, and therefore does not promote or assist corrosion when used for the lagging of pipes, etc., in exposed positions and situations where corrosion is liable to take place. Neither is it affected by chemical fumes, other than those of hydrofluoric acid. In addition it is insect-proof, fungus-proof and rodent-proof, factors which not only recommend its use in food industries, but which all contribute to an exceptional degree of permanence.

Low Temperature Trials

Low temperature trials have been carried out by the National Physical Laboratory, at Teddington, which show that the thermal conductivity of “glass silk” compares well with the characteristics of all other insulating materials. The experimental department of Chance Bros., and Co., by whom the material is made in Great Britain, has also carried out tests on electrically-heated cylinders to determine the respective heat losses for “glass silk” and 85 per cent. magnesia, and it is reported that the “glass silk” shows up well in such a test.

After “glass silk” has been cut from the drum on which it is spun it is made up into various forms to suit the convenience of the engineer. “Sheets” may be 45 cm. to 100 cm. wide and 3,000 cm. long, thickness ranging from 1 to 2.5 cm. In this form “glass silk” is used for insulating

large surfaces such as tanks and large bore pipes, and is secured to such surfaces by wire or straps so as to be in close contact with the surface which is to be insulated. “Mattresses” of the material are also produced for covering large surfaces, and these are made to special sizes and shapes as desired, the “glass silk” being enclosed in wire netting, asbestos cloth or other covering; such mattresses are particularly useful for those positions where it is necessary to remove the insulation easily and quickly from time to time to facilitate inspection, repairs, etc. “Strips,” a third form in which the material is produced, are 8 to 15 cm. wide and 1 to 2 cm. thick; they can be quickly unwrapped from a pipe and just as quickly rewound, no matter whether the pipe is hot or cold. Where particularly efficient lagging is required the strips can be bound round the pipes to any desired thickness by overlapping. Finally, the insulation may be obtained in loose or “ravelled” form, suitable for packing enclosed spaces such as engine cases.

In most situations a finishing cover is required and practically all of the usual finishes may be applied. The cheapest and most suitable finish is obtained on pipes by wrapping closely woven canvas round the insulation and sewing it into position. If a neater finish is desired thin felt board or mill-board can be used before the canvas is wound, whilst if a plaster finish is preferred wire netting can first be used followed by a hard-setting cement, trowelled-off smooth. Finally, in exposed positions, waterproof felt held in position with wire netting may form the finishing cover.

Use in Ocean Liners

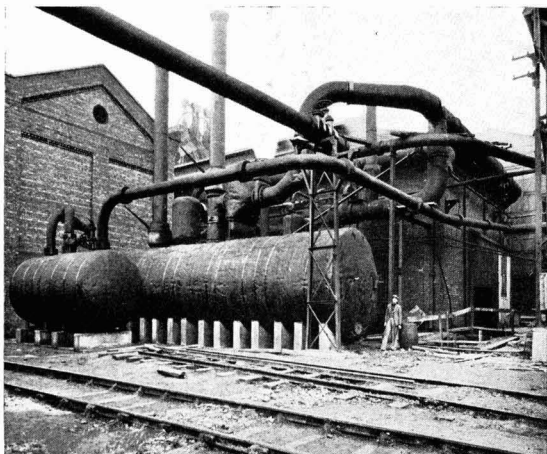
The possibilities of using “glass silk” in situations where disintegration through vibration is one of the troubles of insulation have come to the fore largely as a result of the German-produced material having been used in a number of ocean-going liners, notably the “Europa” and the “Bremen.”

The character of the material makes it appeal especially to the chemical industry, in which heat processing and pipeline transmission are general, and where an insulating material that will not be affected by chemical fumes is essential. Such reasons are no doubt responsible for its use in the factories of Imperial Chemical Industries, Ltd.; an interesting application has also been found for it in insulating tank wagons destined for the transport of asphalt, a material which must be retained at a temperature high enough to ensure fluidity. At several collieries, steam accumulators, piping and valves are insulated with “glass silk.” Mention may also be made of its use for insulating the fronts of “Lancashire” boilers, “mattresses” being employed with a cement finish; for insulating the boiler drums and piping of a 1,500 lb. per sq. in. experimental boiler installed by Babcock and Wilcox, at Renfrew, Scotland; for insulating steam mains at the Glangarnock Steel Works, of Colvilles, Ltd., Scotland, and for insulating super-heated headers and steam pipes in many power stations, where heat conservation is a prime necessity in ensuring the utmost efficiency.

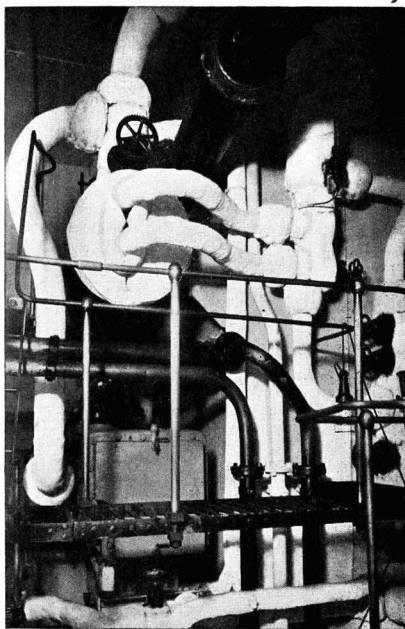
Feldspar Processing Proposed in Sweden

PLANS for the processing of feldspar, involving the use of sea water, have been submitted to the Academy of Engineering Sciences, in Stockholm. A pilot plant to cost \$32,000 has been proposed, to be replaced later by a larger plant for the working of about 20,000 tons of feldspar. Details of the process have not been received, but it is stated that the invention creates possibilities for production of substantial quantities of chlorides of sodium, potassium and magnesium, silicic acid and raw materials for the aluminium industry.

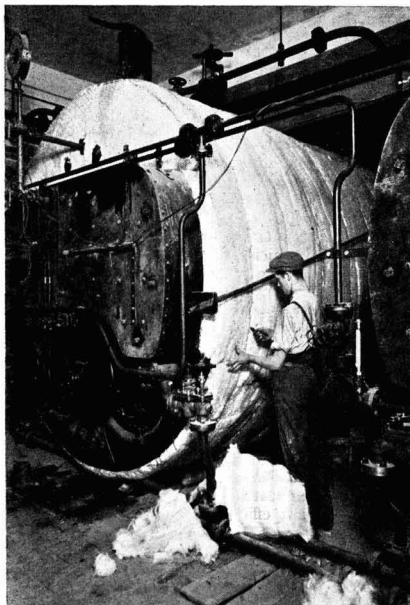
Typical Applications of "Glass Silk"



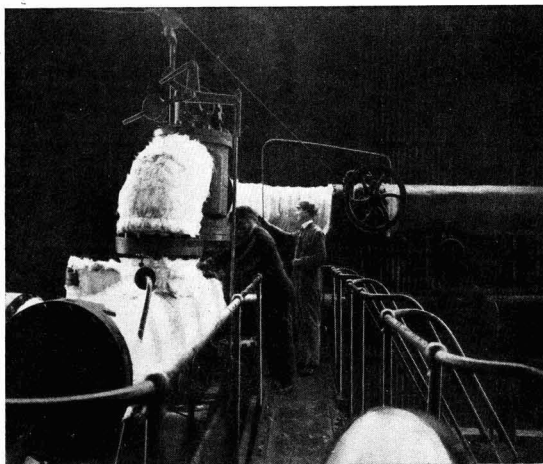
Steam Accumulators, Pipes, etc., at a colliery, insulated with "Glass Silk."



Pipes of the S.S. Baron Elgin recently built and insulated with "Glass Silk."



Insulation of a Boiler at Claridge's Hotel, London.



Workmen applying "Glass Silk" to Large Bore Pipes.

THE production of "glass silk" is an industry with a considerable future and one that will benefit many other industries, not least among them being the chemical industry. In the preceding page we publish an article on its qualities as a heat insulating material, and above are illustrated some typi-

cal examples of its application in industry. "Glass silk" has found its way into most corners of the earth, where it is used for many diverse purposes—in locomotives in Uganda, in sugar factories in Peru, in oil refining plant in Persia and in passenger coaches in Southern India.

Progress in Bleaching, Dyeing and Finishing

Rate of Absorption of Dyes by Viscose Rayon Yarn

AN important contribution to our knowledge of the physico-chemical processes which occur in the dyeing of viscose rayon has recently been made by J. Boulton and B. Reading ("J. Soc. Dyers and Col.," 1934, 50, 381). It is concerned with the rates at which some seventy direct dyes are absorbed by viscose rayon yarn under standardised conditions which approximate to those common in large-scale dyeing, and succeeds in correlating the dyeing speed with the even-dyeing properties of a direct dye towards varying grades of rayon.

After the discovery of the important fact that the speed of dyeing is not much affected by variations in the concentration of common salt and dye in the dye liquor (provided that the speed is measured by the time required for the dye liquor to become 50 per cent. exhausted) with Benzopurpurine 4B and Chlorazol Sky Blue FF, it became possible to measure the rates of dyeing with a fair degree of accuracy. In brief, the method consists of immersing one gram of viscose rayon yarn in 40 c.c. of dye liquor at 90° C., containing sufficient sodium chloride to give 50 per cent. exhaustion, and 0.005 grams of the direct dye and measuring the time required for 50 per cent. exhaustion; the degree of exhaustion of the dye liquor is determined by colorimetric methods using a standard solution of the dye being tested. In practice it is necessary to carry out about three such dyeings which give exhaustion around 50 per cent. and then calculate for 50 per cent. exactly from the results obtained.

Dyeing of Cotton-Wool Mixtures

A somewhat startling discovery is that some dyes are absorbed 2,000 times faster than others. Thus, the times for 50 per cent. exhaustion of Chlorazol Fast Orange GS, Chlorazol Fast Eosine B, Chlorantine Fast Green BL, and Diphenyl Fast Blue Green BL are 0.07, 10.0, 55.2 and 159.2 minutes respectively. The rates of dyeing have been compared with the level dyeing properties of the dyes as found by practical experience and the various tests which have been devised from time to time.

Shortly after the introduction of Katanol O (a sulphurised phenol) as a substitute for antimony tannate in the mordanting of cotton previous to dyeing with basic dyes it was found that the presence of this water-soluble substance in solutions of direct dyes much hindered their absorption by wool and could thus be usefully employed in the two-colour dyeing of union materials. Subsequently, a modified product, Katanol W, was introduced because it gave better results. But a disadvantage of Katanol W is that it becomes browner when exposed to light. This is not noticeable in mixture materials dyed in deep or dark shades but in mixtures where the wool is left undyed, for then its original white colour gradually changes to pale brown.

According to Rabe ("Textilberichte," 1935, 26, 47) two further improved brands of Katanol have been produced and are being marketed as Katanol WL and Katanol SL. Both of these products do not discolour on exposure to sunlight. Katanol WL is most efficient in dye liquors at 50 C. or less, whilst Katanol SL is most effective in liquors at 50 to 60 C. and only slightly loses its efficiency when the dye liquor is used at 80 to 90 C. It is suggested that Katanol SL is likely to find use in the dyeing of wool-cotton mixtures which have seams difficult to penetrate by dyes at low temperatures, for it allows the dyeing to be carried out near to the boil.

Dyeing of Wollstra Fabric

At the present time much interest is being taken in Germany in the use of fabric (called Wollstra) made with yarns consisting of a mixture of staple viscose rayon and wool, it being considered that imports of textile materials could be reduced if such fabric proves useful and popular. From samples of this type of fabric now to hand in this country it is obvious that whilst they cannot be regarded as a perfect substitute for real all-wool materials they can be regarded as reasonably satisfactory. Wollstra fabric can be dyed and finished so as to have a nice soft full handle reminiscent of a wool fabric and also so that it has an attractive lustre due to the presence of the rayon.

The dyeing of Wollstra fabrics will, of course, cause certain

difficulties in dyeing (new fabrics always bring some troubles to the dyer) and it is therefore opportune that G. Rudolph ("Kunstseide," 1934, 16, 431) has published an article giving detailed instructions concerning the large-scale dyeing of this type of fabric. For dyeing, the fabric is treated as a cotton-wool union and most of the methods which have proved satisfactory for dealing with union fabrics in the past are now found capable of adaptation to the new fabric. Rudolph gives full details of the dyes and dyeing conditions found satisfactory for dyeing Wollstra fabric so that the wool and the rayon are brought to the same shade or dyed in different colours, and also so that one of these fibres is left white whilst the other is coloured. Particulars are also given of the various types of dyes which should be used to produce different degrees of fastness. It is not possible to summarise the information here but readers interested should consult the original article.

Protecting Acetate Rayon in Alkaline Treatment

In dyeing and printing textile fabrics containing acetate rayon it is sometimes necessary to submit them to an alkaline treatment which in normal circumstances would result in saponification of the rayon with consequent loss of its characteristic properties. Thus, in discharging vat dyed fabrics it is necessary for the discharge paste to contain a caustic alkali in order that the discharged parts should be clean and clear in outline; obviously under such conditions any acetate rayon present would be saponified. Also, it is scarcely possible to apply vat dyes to acetate rayon by the usual method without saponification. But, according to Eng. Pat. 417,978, it is surprisingly possible to substitute caustic soda by magnesium hydroxide in many of these processes with the advantage that this last-named alkali does not cause saponification.

As an example, it may be mentioned that a good blue shade can be produced on acetate rayon satin fabric by treating it for about one hour at 75 C. in a bath consisting of sodium hydrosulphite 0.250 parts, magnesium hydroxide 0.250 parts, and Indigo N2B 0.050 parts (total volume 50 parts), it being noticed that the usual caustic soda is replaced by the magnesium hydroxide. Viscose-acetate rayon fabric (the viscose rayon dyed with Melantherine BH and the acetate rayon with Duranol R) can be discharged on both fibres without saponification of the acetate rayon by using a discharge paste consisting of Leucotrope W 130 parts, Thiodiglycol 150 parts, water 60 parts, zinc formaldehyde sulphoxylate 170 parts, magnesium hydroxide 40 parts, and 25 per cent. gum arabic solution 450 parts. After printing on the discharge paste the fabric is dried, steamed under pressure for half an hour, washed rapidly in cold soda ash solution, rinsed and dried. It seems likely that this peculiar use of magnesium hydroxide can be extended.

Far Eastern Chemical Notes

Manchuria

THE DAIREN FACTORY OF THE KANTOSHU KOGYO K.K. (authorised capital 1,000,000 yen) was completed and put into operation in November last with a commencing daily output of 12,600 litres alcohol from millet starch.

Japan

THE HYDROGEN PEROXIDE OUTPUT of the Edogana Kogyo-Sho, which is now 45 tons (35 per cent. concentration) per month, is being enlarged with a view to producing an additional 40 tons per month from February next.

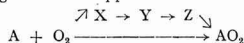
NEWCOMERS IN CELLULOSE ACETATE PRODUCTION are the Nippon Chisso K.K., and the Tekkosha concerns. Japan's monthly consumption of this product is over 15 tons and the current market price is 6.50 yen per kilogram.

THE JAPANESE SODA CO. (Nippon Soda K.K.) propose to market barium chloride, decahydronaphthalene, hydroquinone, monochloroacetic acid, sodium hydrosulphite and chloroform.

Autoxidation of Hydrocarbons

THE autoxidation of hydrocarbons and its disadvantages was the subject of a lecture which Professor Chas. Dufraisse gave at a meeting of the Société d'Encouragement pour l'Industrie Nationale in December last, and which has now been published in the "Bulletin" of the Société, 1934 (p. 107-121).

Autoxidation, or the addition of free oxygen to oxidisable substances, is not comparable to other chemical reactions, and if it was merely oxygen fixation, there would be little to say about it. Thus, if A is a molecule of a substance capable of joining with oxygen to give an oxidation compound AO_2 , the following scheme is applicable:—



The end reaction is never attained at once but passes through the intermediate stages X, Y, and Z, which are peroxides, *i.e.*, substances in which oxygen is endowed with special properties. These intermediate peroxides are represented conventionally by $A[O_2]$, the brackets indicating that the oxygen enclosed is "active." No matter how inert be the final product, AO_2 , the peroxides $A[O_2]$ are always very active chemically. The high activity of these peroxides is shown by (1) oxidising power, (2) catalytic action in polymerising and (3) explosive power.

The autoxidation peroxides are energetic oxidising agents, more so than the original oxygen they contain, although this element has lost, by the fact of its combination, a part of its oxidising capacity.

Explosive Power of Peroxides

The explosive power of the peroxides is comparable to that of ordinary explosives. Melinite $C_6H_2(NO_2)_6OH$, for example, is nothing more than a peroxide, that is to say a compound in which the oxygen is present in an unstable form, and which tends to gain a position of stable equilibrium with the disengagement of a large quantity of energy. This rearrangement is produced with sufficient force to create an explosion.

In a somewhat similar manner the autoxidation peroxides $A[O_2]$ are compounds where the oxygen does not seem to be in its proper place and tends towards a rather violent rearrangement. Such conditions render many autoxidation experiments rather dangerous, and it is generally unsafe to allow accumulation of peroxides. In fact, numerous explosions have been recorded through this cause. One such explosion, towards the end of the war period, resulted in the destruction of Berthelot's bomb calorimeter. In another case an explosion occurred with some paraffin wax after it had been submitted hot to the action of oxygen by Grun.

By catalytic polymerising power is meant the property of the peroxides to induce association of molecules of the same type, giving rise to agglomerates of high molecular weight, or to use a recent expression "marcomolecules." This transformation is made apparent in many ways according to the material exposed to polymerisation. There is sometimes a change in colour as with furfural, which gives a dark inky liquid, sometimes cloudiness or even deposits of a sediment, as with acroleine which gives a substance which is known as "diacryl."

Other cases are marked by progressive thickening, as with the drying oils, or gum formation with styrolene. Finally, there is the phenomena of hardening which is best illustrated by the ageing of vulcanised rubber. The polymerising power of the peroxides is really enormous. It has been found that 1 per cent. of oxygen will solidify styrolene, while with acroleine as small a quantity as 1/100,000 of oxygen will cause it to cloud. Such consequences are important from a practical point of view, especially in connection with the gumming of hydrocarbons.

Antioxidants and Peroxidants

To overcome the effect of peroxides there is a means which is as simple as it is effective. The autoxidation is hindered by suppressing the formation of the peroxides. The practice is to add to the oxidisable material a small quantity of substances which, with Moureau, the author termed antioxidants (antioxygènes). At the Collège de France some 40

A Review of its Disadvantages

papers have been published embodying the results of over 100,000 measurements of oxygen absorption. The results obtained from these are briefly given below.

High Activity of Antioxidants. The antioxidants are often very active and protection is offered with less than 1 per cent. Thus, styrolene remains intact when treated with 1/10,000 of hydroquinone, while acroleine is sensitive to the presence of 1/1,000,000 of hydroquinone. The antioxidants act apparently by paralysing, so to speak, the oxygen, depriving it of its oxidising powers.

The Antioxidant Phenomena. All autoxidations should be able to be inhibited by an appropriate antioxidant, and every substance should, under appropriate conditions be able to function as an antioxidant. The first point is illustrated by observation of the varieties of oxidation which can be inhibited, *i.e.*, those of styrolene, acroleine, rubber, linseed oil and furfural. The second point is emphasised by the substances which can act as antioxidants, *i.e.*, the phenols, amines, alcohols, nitriles and HCN among organic compounds, and the halogens and halogen-containing substances, iodine and iodides, sulphides, and selenium compounds among the inorganic substances. The rare gases cannot be included on account of their well-known inert characters. To sum up, the position is now to find an autoxidation which cannot be restrained.

Inverse Catalysis

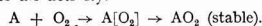
Antioxidants are found naturally as in rubber and various oils. In oil-refining care is necessary not to remove or destroy these natural antioxidants, otherwise there is a loss of stability on keeping.

The next point dealt with was inverse catalysis where a catalyst may act in both directions, *i.e.*, either retarding or accelerating the reaction. When it acts in the latter manner, the name pro-oxidant has been given in keeping with other nomenclature. As an example, phosphorous oxybromide can stop the oxidation of benzaldehyde, but accelerates the oxidation of styrolene to a remarkable degree. It has been repeatedly noticed that a slight change in experimental conditions will bring a reversal of the reaction. This point has not been sufficiently made known to the practical man.

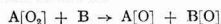
In explanation of this strange action of antioxidants, the theory outlined by the author some 10 years ago still holds good, while others have failed to take into account this reverse catalysis phenomena. The theory was inspired by a classic experiment, the mutual reduction of two peroxide compounds, hydrogen peroxide and potassium permanganate. If these two substances, in solution, are mixed, there is a rapid effervescence with the evolution of oxygen and the disappearance of the permanganate colour. The molecule of the oxidisable substance is called A, which, it is generally agreed, takes up free oxygen in entire molecules. The initial formation is the primary peroxide $A[O_2]$, the peroxide form being indicated by brackets.

Loss of Activity

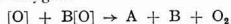
If no outside influence intervenes, this addition product should proceed to the formation of the stable AO_2 where the oxygen loses all activity.



If, however, an antioxidant comes into play, the antioxidant being represented by B, there is a distribution of the peroxide oxygen between A and B.

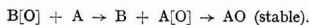


These two peroxides, being antagonistic as with hydrogen peroxide and permanganate, they mutually reduce with the liberation of oxygen.

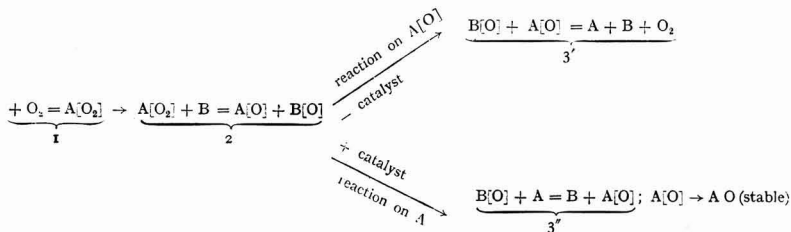


The system therefore reverts to its initial condition. With regard to the inverse catalyst, this is explained by the fact that the peroxide of catalyst B is found outnumbered, or

swamped, so to speak, by a large mass of reducing molecules of the substance A. These should react as follows:—



This transformation represents B as a positive catalyst. It should be noted that the two reactions have in common the first step in the processes as follows:—



The positive or negative tendencies of the catalyst remain undecided until the last stage, and catalyst B retains to the last moment the property of accelerating or retarding oxidation. Thus, it is possible for small changes in experimental conditions to reverse the reaction.

Application to Hydrocarbons

We will now see how these ideas can be applied to hydrocarbons in technical use. Many of them are very sensitive to autoxidation and therefore give rise to peroxides. The oxidisable compounds are mono- or polyolefinic such as the rubber hydrocarbon, or some of the hydrocarbons which are found in many petrols, especially those obtained by cracking. But, contrary to what is usually supposed as regards the chemical inactivity of the paraffins, these saturated hydrocarbons are capable of absorbing oxygen at a relatively low temperature, with the formation of peroxides. The extent of oxidation is variable, and depends upon the length of the carbon chain. The reaction with oxygen is marked by a light, visible in darkness. This phenomenon was noted in 1882 by Perkin and given the name of "cold flame." Again, there are certain hydrocarbons which are rather resistant to the action of oxygen, such as the aromatic hydrocarbons, benzenes and naphthalene.

Rubber, which has become so indispensable to civilisation, does not perish by usage, but by alteration termed "ageing." This ageing is an effect of autoxidation and is catalysed by peroxides, as amounts of less than 1 per cent. of oxygen only are required to bring about a complete deterioration. In this alteration antioxidants have a remarkable effect and their use in the rubber industry dates from the first publication in 1921 by Bierer and Davis ("Institute of Rubber Industry," 1927, p. 151). Quite recently Shepard ("Industrial and Engineering Chemistry," 1933, p. 35) places the discovery of antioxidants among the three most important connected with the rubber industry.

A Simple Method

The antioxidants are generally introduced into the rubber mass along with the other ingredients, but, as has been shown by Lotte, Drich and Vieillefosse with the author, equally remarkable results can be obtained by a simple method. It is merely sufficient to cover the surface of the objects with a solution of the appropriate antioxidant, when the latter penetrates slowly into the interior. A piece of English sheet rubber was partly dipped into an ether solution of hydroquinone and after evaporation of the solvent was left to age. That part which had been protected by the antioxidant remained in perfect condition, while the unprotected part became rigid and hard. It will be seen therefore that the use of antioxidants is a most important development in the rubber industry, and has resulted in an appreciable prolonging of life of manufactured goods, principally pneumatic tyres.

In petrols and their derivatives autoxidation has brought about several disadvantages such as acid deposits by thickening and corrosion with accompanying loss of lubricating properties, the gumming of liquid fuels and knocking in motor engines, this last having received special attention. The cause of knocking was fully explained and it was pointed out that conditions in a motor engine favoured peroxide

formation. There was heat, a fine state of division of the oxidisable material, which increases the surfaces of contact. In every case it is to peroxide formation in the compression phase that we have attributed knocking in a series of works published by Mouro in 1925 and 1927 in collaboration with Chauv.

This work led to the conclusions that (1) anti-detonants such

as tetra-ethyl-lead and the arylamines are antioxidants; (2) arranging fuels in their order of oxidising tendencies, production of the Perkin cold flame, etc., corresponds to their tendency to knock; (3) a large number of materials used or usable as fuels oxidise by peroxide formation at temperatures not exceeding those reached in cylinders; (4) peroxides are formed during the functioning of the engine. It was also pointed out that the peroxides at the high temperatures to which they are exposed during combustion are transformed partly into tarry hydrocarbons or carbonaceous matter, difficult to burn.

In spite of what has been done, there are still many who view the role of peroxides with some degree of scepticism, even doubting their existence as separate entities. This, however, can be proved by a simple experiment. All that is necessary is to pass a vaporised fuel over a slightly warmed tube and test for peroxides in the vapour afterwards. Thus, if ordinary ether is treated in this way, peroxides can be detected by their oxidising action on hydriodic acid, $2HI + O = I_2 + H_2O$.

Industrial Solvents

New British Standard Specifications

EIGHT additional British Standard Specifications for solvents have been issued by the British Standard Institution in further development of the setting up of a comprehensive series of nationally-agreed standards for solvents. These specifications deal with diethyl phthalate (No. 574), dibutyl phthalate (No. 573), technical ether (No. 570), carbon tetrachloride (No. 575), hexachlorethane or hexachloroethane (No. 577), trichlorethylene or trichloroethylene (No. 580), and technical acetic acid (No. 578) and glacial acetic acid (No. 576), and have been prepared by the technical committee of the Chemical Division of the B.S.I., which committee has been actively working for the past two years under the chairmanship of Dr. Vargas-Eyre, of the Distillers Co.

Limits are laid down in the specifications for specific gravity, distillation, acidity, alkalinity, etc., whilst standard methods of test for determining these properties are included in appendices. The details of the tests adopted have been arrived at after careful examination of existing methods of analysis, particularly from the standpoint of accuracy and reliability and in many cases experimental work has been carried out by members of the committee in practical verification of the methods. The limits specified have been fixed by agreement between the principal users and manufacturers. It is of interest to note that in the case of both glacial and technical acetic acids, specifications are provided for 80 per cent., 60 per cent. and 40 per cent. acids in addition to the concentrated acid.

The specifications for solvents issued previously by the British Standards Institution provide for acetone, ethyl, methyl and butyl alcohols, diacetone alcohol and amyl, butyl and ethyl acetates. Copies of the new specifications may be obtained from the Publications Department of the British Standards Institution, 28 Victoria Street, London, S.W.1, price 2s. 2d. each post free.

Weighting and Dyeing of Silks

Progress during 1934

A NUMBER of new processes have been devised for weighting real silk materials. One means for producing heavier weightings with the tin chloride method consists of making the stannic chloride bath more basic (yet without liability to precipitate) by the addition of rare earth metal carbonates, such as those of zirconium, thorium and lanthanum (U.S. Pats. 1,896,381 and 1,896,858). It has also been found (U.S. Pat. 1,898,105) that the presence of zirconium carbonate in the stannic chloride bath enables it to be used for the weighting of viscose rayon; without this addition the viscose rayon in a silk-viscose mixture fabric is left almost unaffected. Silk already weighted with tin salts has been found (U.S. Pat. 1,902,336) to be capable of further weighting by passage through a bath of lead acetate. A somewhat similar process has been described in Brit. Pat. 398,323. Processes for improving the transparency and handle of real silk fabrics have been protected by a Continental firm (Brit. Pats. 397,878 and 397,838). They involve treating the silk with swelling agents, such as sulphuric acid and concentrated solutions of zinc chloride, under controlled conditions.

No substantial improvements have occurred in the dyeing of silk goods but some interesting information on the absorption of chromium salts, as in mordanting processes, has been disclosed (L. Michel, "Rev. Gen. Tein. Imp. Blanch. App.," 1934, 9, 89). It appears that the amount of chromium oxide fixed in the silk increases with the basicity of the chrome liquor and also with its temperature and concentration. It is recommended, in mordanting, to steep the silk in a boiling liquor containing 40 per cent. of chromium sulphate and 2 per cent. of caustic soda (these percentages are calculated on the weight of silk) for about one half-hour whereby up to 2 per cent. of chromium oxide is fixed on the fibre.

Research on Vegetable Oils

Effect of Low Temperature and Absorption Agents

INTERESTING work on the changes which take place in vegetable oils when exposed to very low temperatures, and also when treated with various kinds of absorption agents, including residual meals from the solvent extraction of vegetable oils has been carried out in Russia by S. L. Ivanov and co-workers ("Chim. Shurn.," Ser. B, 1934, 7, 179).

Sunflower seed oil and soya bean oil were cooled down to -14° and -20° , and the solid and liquid constituents were separately analysed. The sunflower seed oil fraction, which solidified at -12° to -16° , had iodine number of 119.4, as compared with 125.35 for the original oil, and 126.47 for the liquid fraction. The fractions solidifying at low temperatures have lower densities, sapon, numbers and iodine values than the original oils; but the rhodan number may be smaller or greater or remain the same. In freezing sunflower seed oil a larger proportion of the saturated constituents and of linolein than of olein are solidified; but with frozen soya bean oil the changes are somewhat different: at -14° the condition of the fraction remains practically unchanged. At -20° more olein and less linolein and solid glycerides pass into the solid portion, as shown both by the iodine value and the rhodan number. The cotton seed oil fraction which solidifies at 4° has an iodine number of 86.3, as compared with 104.2 for the original oil. The designation "stearin" for the fraction which separates out in the cold is therefore entirely wrong. The solidified part consists exclusively of fat, and not of albuminous or gelatinous matter. The separation of definite individual glycerides obviously only occurs with fats of relatively simple structure.

The residue obtained in the production of sunflower seed oil by solvent extraction had its oil content reduced to a minimum and was further purified by boiling with alcohol. It was then shaken up with oil and absorbed from 16 to 21 per cent. of the oil. This absorbed oil showed a higher acidity and a lower iodine value. If linseed extracted meal was used as absorbent, very considerable changes took place in absorbed sunflower seed oil or linseed oil; bleaching earths gave similar results. Oil absorbed by bleaching earths showed a very remarkable increase in acid number.

New Dyestuffs

Increased Fastness and Levelling Power

ELEVEN new products have been added to the range of dyestuffs made by J. R. Geigy Soc. An., of Basle, who are represented in this country by The Geigy Colour Co., Ltd.

Diphenyl Fast Yellow 2RL is a new fast to light direct colour for dyeing cotton and cellulose artificial silk bright golden shades of very good fastness to light and possesses excellent levelling power. It is suitable not only for dyeing cotton and cellulose artificial silk materials alone, but, in particular for mixed fabrics consisting of these fibres, as self colour and also as combination product.

Tinon Chlorine Violets BW and 2BW are two new vat violets of the highest fastness properties, both of which are distinguished from the older Tinon Chlorine Violet brands by an outstanding fastness to water drops. Both of these new Violets are suitable for dyeing fast shades on cotton in all stages of manufacture, on artificial silk and on real silk and for printing of cotton and pure silk.

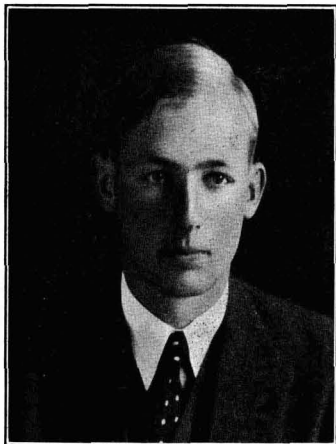
Eriochrome Red 6G is a new homogeneous chrome colour of clear yellowish scarlet shade, possessing the characteristic high general fastness properties required for the fast dyeing of wool. Particular mention should be made of its exceptional fastness to light and conditions of wear generally, perspiration, milling and very good fastness to potting. Eriochrome Red 6G is suitable for the dyeing of wool in all the stages of manufacture, in both open and closed machines of all descriptions. Hard water is, however, to be avoided where possible. It can be dyed according to all the usual chrome dyeing methods, *i.e.*, by the afterchrome, Eriochromal, Eriochromal mordant or chrome mordant processes.

Setacyl Direct Brilliant Blue FFS conc. is a new blue for acetate artificial silk suitable for both dyeing and direct printing, and particularly distinguished by a greenish very bright and clear blue tone of remarkable shade in artificial light. In general, it possesses the well-known good fastness properties of the older Setacyl Direct Blues. It is not dischargeable.

Eriochrome Blacks HTF and HTB are two new chrome blacks for the fast dyeing of wool being placed on the market under the above names. They are suitable for dyeing wool in all stages of manufacture, loose material, slubbing, yarns of all descriptions in hank or in cheese, artificial wool or wool in piece form. The HTB brand is rather bluer and more bloomy than the HTF brand and both are distinguished by a pleasing deep black shade of the best fastness properties in every respect, combined with very good levelling properties. There is no tendency to "bronzing" in deep shades with either product and no unpleasant residue is left in the dyeing apparatus.

Eriochrome Orange 2RL conc. is a new homogeneous chrome colour of very pleasing bright fiery orange shade, possessing all the high fastness properties required for the fast dyeing of wool. Particular mention must be made of the outstanding fastness to light and exceptional fastness to conditions of wear, perspiration, milling, potting and stoving. It can be applied to wool in all stages of manufacture in open and closed machines of all descriptions; hard water in dyeing is, however, to be avoided. Eriochrome Orange 2RL conc. can be dyed by all the usual methods for fast dyeing of wool, *i.e.*, afterchrome, by the Eriochromal method, with Eriochromal Mordant and also on chrome mordant, and is, in addition, suitable for direct printing and for melanging (Vigoureux printing).

Three new additions have been made to the Setacyl Direct series for dyeing acetate silk. Setacyl Direct Yellow GGN supra is the greenest-yellow with all the good fastness properties of the older brand. It is particularly to be noted that this new brand gives a good discharge by the well-known Hydrosulphite method of discharging acetate rayon. Setacyl Direct Rubine B supra gives a clear bluish-red, with outstanding dischargeability, and possesses, in addition, the exceptional fastness properties characteristic of this range of dyestuffs. Setacyl Direct Green G supra is a bright green of very good fastness to light. It is chiefly suitable for the production of various shades of green for which purpose, in order to retain the high degree of fastness to light, shading should be carried out with Setacyl Direct Yellow GGN supra or Setacyl Direct Blue LS conc.



Mr.
Kenneth
Frankland
Armstrong.

Avalanche Victims in Tyrol

Mr. Kenneth Armstrong and Mr. John Howard killed while Ski-ing

WE regret to record the tragic death of Mr. Kenneth F. Armstrong and Mr. John Howard, both aged 25, who were killed last week-end in a ski-ing disaster near Vent, in the Austrian Tyrol. Mr. Armstrong was the elder son of Dr. E. F. Armstrong and grandson of Professor H. E. Armstrong, to whom the news of the tragedy came as a terrible blow. Only a fortnight ago, in our Annual Review number, we had the privilege of publishing an article from the pen of Mr. Kenneth Armstrong on "New Fields in Organic Chemistry."

Mr. Kenneth Frankland Armstrong went to Oundle School, and from there to Magdalen College, where he had a demyship. He obtained his degrees of B.A. and B.Sc. with the highest possible honours. Going to America, Mr. Armstrong went to Harvard University for a Julia Henry Fellowship, and on his return to England won a Harmsworth Scholarship at Merton College, Oxford, where he engaged in research work in chemistry. He wrote several works on chemistry and collaborated with his father in two books on sugars.

Mr. John Howard was also at Oundle, and he and Mr. Armstrong had been friends from the time they met there. Mr. Howard next went to Corpus Christi, Oxford, and, having taken a first-class degree in physical chemistry, he sailed for America at the same time as Mr. Armstrong, but went to Princeton with a Commonwealth Fellowship. Here he gained the degree of Doctor of Science. He was a B.Sc. and a B.A., with honours, at Oxford. Since his return to this country, Mr. Howard had held the position of personal assistant to Dr. F. S. Sinnatt, director of the Fuel Research Board.

Dr. E. F. Armstrong, father of Mr. Kenneth Armstrong, is a chemical consultant and was for three years ending last October chairman of the Association of British Chemical Manufacturers. He was president of the Society of the Chemical Industry from 1922 to 1924, and chairman of the British Association of Chemists in 1926. He is chairman of the Soap Manufacturers' Federation and of the Joint Industrial Council of the soap trade and a director of the South Metropolitan Gas Company.

Mr. Fred Howard was mayor of Holborn two years ago and deputy-mayor last year. He founded the Stadium Club in 1922 and did much to promote boxing among young men. He had a stroke through overwork two years ago and has not fully recovered.

The two young men spent a good part of their holidays together. While they were in the United States they drove by motor-car from the Atlantic to the Pacific and back.

Mr. Armstrong and Mr. Howard, who were staying at Vent, set off on Wednesday morning, January 2, on skis for a new rest hut on the Hochjochspitz—an hour and a half's climb. When they had not returned by the evening of January 4 alarm was felt, and on Saturday a rescue party, accompanied by a number of gendarmes, set out and discovered the body of Mr. Howard. A second rescue party searched in vain for the other body. The path taken by the two men was known

to be dangerous on account of the small sudden avalanches that are prevalent in the neighbourhood. The avalanche carried Mr. Howard's body into a 150-ft. deep canyon, and the position was difficult to reach. The tragedy occurred near the spot at which Professor Piccard landed after his first balloon ascent into the stratosphere in 1931.

Alpine experts are of the opinion that the two friends had reached the Hochjochspitz hut on the summit, where they obviously took some food. Then they wanted to take the ski route to the Vernagt hut, 8,000 ft. high, and, on the way, Mr. Howard, who had been ahead, seems to have been caught by an avalanche and buried. Mr. Armstrong, seeing this, started for Vent to fetch a rescue expedition, but two hours from home he suffered the same fate as his friend. The young men had been warned by expert Alpinists in Vent before their climb that great quantities of loose snow had fallen recently and that a storm was raging in the mountains, but they insisted on going.

Inspector Peif, of the gendarmerie at Vent, and leader of the expedition that recovered Mr. Howard's body, said: "We found the body already dug out by yesterday's expedition, but it took us more than an hour to drag it by means of ropes, 150 feet long, from the bottom of the canyon to the narrow footpath. Then only one man at a time could carry the body, which had to be tied to the bearer's back."

On Tuesday afternoon a search party found the body of Mr. Armstrong, about 500 yards from the spot where the body of Mr. Howard was found on Sunday. The body was discovered under the frozen surface of a brook, and the ice had to be broken before the body could be recovered. The funeral of the two victims took place on Wednesday at Vent.

It is now clear how the two men lost their lives. They set out on skis to climb the Hochjochspitz. Mr. Howard, who was ahead, was swept by an avalanche into a ravine, and Mr. Armstrong set out to fetch help. In descending he broke his skis on some rocks, and when he continued his descent without them he was struck by another avalanche and was flung on the rocks below, sustaining fatal head injuries.

Petrol for the Royal Air Force

A Temporary Defect and Its Sequel

WHEN Mr. Ernest Brown, Secretary for Mines, opened a new extension of plant at the works of Low Temperature Carbonisation, Ltd., at Askern, last month, it was stated that nine home defence squadrons of the Royal Air Force were then flying on petrol produced from Yorkshire coal at Askern and the company's Barugh plant, and that at the last Hendon air pageant over eighty aeroplanes used it.

The "Financial News," on Wednesday, published an erroneous message from a correspondent to the effect that the Royal Air Force had suspended the use of British synthetic petrol for flying purposes, and had reverted to natural petroleum spirit. The message added: "The supply of British spirit to be returned, amounting to 100,000 gallons, is to be submitted to a special cleansing process in the hope that the difficulty may be solved."

A correction was published on Thursday, when it was explained that there had been no general suspension of the use of spirit produced by the low-temperature carbonisation process. One consignment of spirit was found to have become contaminated through a temporary defect in the lubrication system on part of the plant, and immediate steps were taken to ensure the purity of future supplies of spirit.

It has long been the wish of the British Government to make the Royal Air Force, as the first line of defence, independent of foreign fuel supplies, and to this end it has vigorously supported the use of synthetic petrol produced by the low temperature carbonisation process.

Death of Sir Alfred Ewing

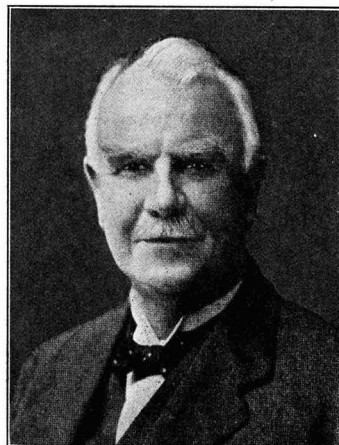
Past President of the British Association and Ex-Principal of Edinburgh University

SIR J. ALFRED EWING, formerly principal and vice-chancellor of Edinburgh University, died at his residence at Cambridge on Monday, at the age of 79. Sir Alfred was president of the British Association in 1932, and the subject of his presidential address at the annual meeting at York was "An Engineer's Outlook," during which he recalled some of the milestones in engineering and scientific progress, and made references to the work of such men as Bessemer, Hertz, Glazebrook, Rayleigh, Marconi and Ramsay. He had, in 1924 and succeeding years, as chairman of the Bridge Stress Committee, carried out experiments on bridges on Yorkshire railway routes, notably the Goole-Selby line. The object of this work, which was done by means of delicate instruments, was to discover the reaction of old bridges when locomotives ran on them at various speeds. He discovered that in most instances the bridges of 50 years of age and older had been built far better than was generally realised.

Sir Alfred Ewing was the author of many books, treatises, pamphlets and papers, all dealing with various aspects of scientific work. Among the more notable are his "Treatise on Earthquake Measurement," "The Steam Engine and other Heat Engines" (a standard work first published in 1894 and which appeared in its fourth edition in 1926), "Strength of Metals," and "Thermodynamics for Engineers."

He was made a Knight Commander of the Bath in 1911, he was a J.P. and a Deputy Lieutenant for the County and City of Edinburgh, an M.A., and an honorary LL.D. of Edinburgh, honorary D.Sc., of Oxford and Durham, an F.R.S., and an honorary Fellow of King's College, Cambridge.

Before the war, Sir Alfred had taken what he called a casual and amateurish interest in ciphers. Soon after the



Sir
Alfred
Ewing.

outbreak of war he took charge of what became mysteriously known as "Room 40" at the Admiralty. His task was to decipher radio messages which a series of small receiving stations dotted along the east coast continuously intercepted between German battleships and Kiel. The messages, when intercepted, were immediately re-transmitted to Room 40, deciphered, and sent to other departments of the Admiralty. As many as 2,000 a day were dealt with by Sir Alfred Ewing and his staff, and they were of exceptional value in many instances. Perhaps the most spectacular message he decoded was the notorious "Zimmerman" message which had been intercepted by his stations, and which was one of the direct causes of bringing the United States into the war.

Letter to the Editor

Heat and Power

SIR.—Heat and power are essentials to industry. Up to the days of the Tudors "power" was represented almost entirely by man- or animal-power and heat depended upon the combustion of wood. British commercial prosperity is largely dependent upon iron and steel, which in turn cannot be made without fuel. A writer who lived between 1551 and 1623 says of Sussex, then the seat of the iron manufacture of this country: "Full of iron mines it is in sundry places, where for the making and founding thereof, there be furnaces on every side, and a huge deal of wood is thereby burnt." Following the progress made under the Tudors and early Stuarts, the denudation of the forests became a major issue, and there were loud complaints that the whole community would be unable to procure fuel for domestic purposes if this denudation were persisted in.

An Act was passed in 1558 prohibiting the cutting of timber for the making of iron, a similar decree abolished iron smithies in Lancashire for the same purpose, and in 1581 a further Act set forth the scarcity of timber consequent upon the erection of sundry iron mills near London and prohibited the erection of such furnaces in certain districts situated mainly in Sussex. A further more sweeping Act was passed in 1584. These Acts were not rigorously enforced, but in Charles I's reign the wastage of timber became chronic and Cromwell finally destroyed many of the iron forges. Finally, in 1676, owing to the scarcity of timber many of the iron works in Kent, Sussex, Surrey and the north of England were closed and England's supply of iron had to be imported from "Sweden, Flanders and Spain." Such was the effect of the shortage of fuel that by the year 1740 the total production of pig-iron in England and Wales was but 17,350 tons. It was not until the middle of the eighteenth century when coke

came into use as fuel that the English iron trade really began, and by 1913 the output of pig-iron was some 10 million tons.

It was but 200 years ago that we began to use coal supplies; there is ground for thinking that at the present rate they will not last for more than another 500 years; long before that we are likely to be passing Acts of Parliament for the regulation of the use of our dwindling supplies of fuel. Considerable interest was aroused by the fact that the American Association for the Advancement of Science, on December 27, inspected Dr. C. G. Abbot's solar heat collector. This device, which has been used in California for the generation of steam for power, and for cooking, collects the solar radiation by means of a number of small mirrors fixed at right angles to the earth's axis, and mounted on a frame which turns suitably to catch the sunshine. The heat is reflected on to tubes filled with oil and protected from radiation and convection losses by double vacuum jackets. The heated oil flows into a reservoir in which the ovens for cooking, or the boiler tubes are immersed. Interesting as the device is in certain climates, similar things have been tried before, but have proved more costly than coal. Could Dr. Abbot operate a steam boiler by any solar heat device in England? The fact that this device is inapplicable in most countries does not obscure the undoubted need for thought upon methods of obtaining heat and power without the use of terrestrial fuels, at a cost of something less than coal. Even to-day such a device would have an undoubted value. If and when the chemist manufactures everything we eat, drink, wear and use, large supplies of carbon will be necessary; our coal-fields should be deemed to be the raw material for the chemical industry.—
Yours faithfully,
CHEMICAL CONSULTANT.

Notes and Reports from the Societies

Institute of Metals

Annual Meeting

THE Institute of Metals is to hold its annual general meeting in London on Wednesday and Thursday, March 6 and 7. There will be two morning sessions, as well as an afternoon session on March 6, at all of which papers of metallurgical interest will be presented for discussion. In the evening of March 6 the annual dinner and dance will be held at the Trocadero, and in the afternoon of March 7 there will be a visit to the Battersea Power Station.

An additional gathering will take place in the evening of Tuesday, March 5, when a joint meeting will be held with a number of technical institutions to enable members to participate in a discussion of "Problems of Cold Presswork." The discussion will be opened by a paper by Dr. H. J. Gough, F.R.S., superintendent of the Engineering Department of the National Physical Laboratory, and in the following paper, by Dr. C. H. Desch, F.R.S., superintendent of the Metallurgy Department of the National Physical Laboratory, there will be summarised the existing information regarding cold pressing from the metallurgist's point of view.

Educational Tour to Germany

Following the success of last year's educational tour to Belgium the Council of the Institute of Metals has now completed plans for an educational tour to Germany for junior members of the Institute, college students and members of staffs of educational and research institutions. The tour will begin on Saturday, April 6, the party being due back in London on Monday, April 15. During the visit, which will be to the Rhineland of Germany, several important works of metallurgical interest—ferrous and non-ferrous—will be inspected. Opportunities will also be afforded to meet German students as well as to see something of the beauties of the Rhine. The cost of the tour is expected to be approximately £12.

Annual May Lecture

Professor W. L. Bragg, F.R.S., is to deliver the 25th annual May Lecture of the Institute of Metals on Wednesday, May 8. He has chosen as his subject "The Atomic Arrangement of Metals and Alloys." It is interesting to recall that Professor Bragg's father, Sir William Bragg, F.R.S., delivered the 6th May Lecture in 1916, on the subject of "X-Rays and Crystal Structure, with Special Reference to Certain Metals."

The Institute's 27th annual Autumn Meeting will be held in Newcastle-on-Tyne from Monday, September 9, until Thursday, September 12. This will be the first occasion on which the Institute has re-visited Newcastle since its first meeting there in 1911. The members will receive a welcome from the Lord Mayor; sessions for the reading and discussion of papers will be held and visits to works will be made.

London Section: Manufacture and Uses of Powdered Metals

THE manufacture and use of powdered metals were dealt with by Mr. J. C. Chaston, B.Sc., A.R.S.M., in a paper read before the London Section of the Institute of Metals, on January 10. A large number of methods are available for producing powdered metals in a variety of shapes and sizes from numerous metals. These methods can be classified on the basis of the nature and state of the substance taken as a starting point—whether this is a metal or compound, and whether either is in the solid, liquid, or gaseous state.

The methods available for making powder from the solid metal are interesting. In the first place, the metal may be subdivided by transcrystalline fracture; this can be effected by a tearing action—as in the manufacture of magnesium powder by the action of milling cutters on the solid metal—or by the action of repeated working, as in the stamp mill process for making bronze and aluminium powders and the German eddy mill process. The stamp mill process produces a thin, leaf like product, in which the particles may have a width as much as 200 times the thickness. This shape is particularly desirable for the purpose of paint manufacture,

as it results in great covering power. The eddy mill process is an exceptionally ingenious method of severely deforming small particles out of contact with any wearing parts which might cause contamination. The particles are caught up in two opposing eddies in the interior of the mill, and hurled against one another—coming together in the free central space away from the walls or the impellers. The forerunner of the stamp mill process for paint powders was the Bessemer process, which has some historical interest since it laid the foundations of Bessemer's fortunes and enabled him to afford those experiments which led to the Bessemer converter and the era of cheap steel. In his process, irregular particles produced by machining were flattened by passing them between rolls.

A second method of subdividing a metal is by fracture on a cleavage plane, and is utilised in making bismuth and antimony powders. A third method is by intercrystalline fracture. This involves the preliminary production of a fine-grained metal having intercrystalline brittleness. Two methods are available for this purpose. It can be effected by electrodeposition—a method used for making powdered iron for magnetic cores—or (in nickel-iron alloys) by hot-rolling a material which, when cold, has brittle grain boundaries owing to the presence of impurities. Liquid metals can be used to make powders by atomising in a steam or air blast or, in the case of aluminium, merely by stirring during solidification so as to entrap oxide. Metal vapours, such as zinc, can be condensed as powder under suitable conditions.

Processes which employ compounds of the metals can reduce these to powder by the action of hydrogen at high temperatures, by precipitation from solution, by electrodeposition, or by decomposition of a gaseous compound. An example of the last process is the production of small, spherical, beautifully regular particles of iron, nickel, and nickel-iron alloys by the thermal decomposition of the corresponding carbonyls. Powders made in Germany by this method are finding a wide application for such purposes as magnetic cores. Considerable attention is also being given to the possibilities of employing these powdered metals for making solid ingots, bi-metals, and moulded parts by a process of pressing and sintering.

Society of Chemical Industry

Manchester Section: The Chemical Engineer's Training for Industry

IN a paper on "The Chemical Engineer and his Training for Industry" read before a meeting of the Manchester Section of the Society of Chemical Industry on January 4, Dr. A. J. V. Underwood urged that the whole question of practical training for the engineer required much more attention than it has received hitherto. The practical training of the chemical engineer, he said, was just as important as his academic training. Whereas the latter was generally carried out systematically, the former was too frequently of a haphazard nature. Practical training generally depended on the particular job a graduate managed to secure on leaving college and there was a welcome tendency on the part of some large firms to give a systematic practical training to newly-engaged staff. Probably the best method was to combine the academic training with practical training under industrial conditions as was done at some American colleges, but it would probably be more difficult to introduce such a system in this country.

As a preparation for specific instruction in chemical engineering, a sound foundation of chemistry, mathematics, physics and general engineering should be provided. It was doubtful whether this could be covered in a three years' course, and probably four years was the minimum. The course should be organised as a part of the faculty of engineering and not the faculty of chemistry. The chemical engineer was mainly concerned with physical operations or the physical effects of chemical reactions. The nature of the reaction being given and its thermal effect being known, the main problems for the chemical engineer, in carrying out the reaction industrially, were physical ones, such as heat transfer, mixing, transportation of fluids or solids. The

operations by which the product was finally obtained in the desired form, such as crystallisation, filtration, distillation, drying, grinding, etc., were again physical ones. In this example, the choice of materials of construction was the only question where purely chemical considerations played an important part. Indicating, recording or regulating apparatus used in the control of the process were again physical rather than chemical.

Laboratory work was also a vital part of the chemical engineering training. Its object was not to carry out chemical reactions on a somewhat larger scale than was practicable in a chemical laboratory, but to illustrate the basic principles of the unit operations of chemical engineering and their quantitative application to plant design. Electrical engineering and metallurgy were necessary subjects in a chemical engineering course. The student should also have some training in the use of sources of information, such as technical journals, patent literature, abstract literature, trade catalogues, etc., and as chemical processes were carried out industrially for economic reasons, economic considerations must be clearly brought out.

Birmingham Section : Water Wash Towers in Sulphuric Acid Manufacture

In a paper to be read before the Birmingham and Midland Section of the Society of Chemical Industry on January 21, Mr. N. J. Price and Mr. A. Dooley will jointly describe a water wash tower which has been used since 1931 by Chance and Hunt, Ltd. (a subsidiary of Imperial Chemical Industries), in the absorption system of a large chamber sulphuric acid plant. The method has been effective in reducing the average total acidity of the plant exit gases from 1.1 grains per cubic foot (expressed in sulphur trioxide) to less than 0.30 grain. It will be shown that a suitably constructed water wash tower after the first Gay Lussac, in addition to reducing the escape of acid gases from a chamber process sulphuric acid plant, increases the efficiency of recovery of both nitre and sulphur dioxide, and largely reduces the amount of fumes escaping into the atmosphere.

Chemical Engineering Group

Joint Meeting with Road and Building Materials Group

A JOINT meeting of the Chemical Engineering Group and the Road and Building Materials Group will be held in the Rooms of the Chemical Society, Burlington House, London, on Wednesday, January 16, at 8 p.m., when Dr. E. Neumann will read a paper on "Some Properties of Fillers Intended for Bituminous Road Construction." Dr. Neumann, who is an authority on this subject, will give an account of recent investigations carried out in Germany and particularly of the work done in the laboratories under his personal direction at Stuttgart. The chair will be taken by Professor R. G. H. Clements.

Institute of Fuel

The Pyrolysis of Hydrocarbons

THE pyrolysis of hydrocarbons considered from the standpoint of classical organic chemistry, chemical thermodynamics and chemical kinetics was the subject of a paper which Professor Morris W. Travers, F.R.S., read before the Institute of Fuel, in London, on November 28, 1934.

In the pyrolysis of hydrocarbons three main processes operate. The first of these involves hydrogenation and dehydrogenation, of which an illustration is the reversible reaction involving ethane, ethylene and hydrogen. The second involves the breaking of carbon chains, which is the basis of all cracking operations. In the third, compounds containing few carbon atoms combine together; or internal changes take place, generally involving the formation of ring compounds from chain compounds.

The results of the investigations to which Professor Travers referred are probably more directly applicable to the processes of gas manufacture, and particularly to the carbureting of water gas. In the latter case an oil fraction boiling between 120° and 400°, and containing hydrocarbons up to

about 20 carbon atoms, is sprayed into an apparatus at about 700°, together with a mixture of hydrogen and carbon monoxide. The ideal result would be to obtain the whole of the hydrocarbon as a mixture of ethane and ethylene. The next best result is to obtain as much ethane and ethylene as possible, and the rest of the carbon in the oil as methane. What is to be avoided is to produce either carbon or tar, and, of course, uncracked or incompletely cracked oil. Temperature, time of heating, usually referred to as time of contact with the brickwork in the apparatus, though actual contact has probably little influence, hydrogen concentration, and possibly the concentration of the other gases present effect the process. High hydrogen concentration will tend to increase conversion to methane and retard the formation of tar (condensate).

In the primary stages of the hydrogenation of coal we are probably dealing with the treatment of aromatic compounds, but in the later stages chain compounds are involved, and processes such as Professor Travers indicated may operate.

Chemical Society

Forthcoming Papers

AN ordinary scientific meeting of the Chemical Society will be held on Thursday, January 17, at 8 p.m., when the following papers will be read: "Nuclei formation of crystals of copper sulphate pentahydrate" (N. F. H. Bright and W. E. Garner). "The thermal reaction between chlorine and gaseous formaldehyde. Part I" (R. Spence and W. Wild). "The decomposition of ozone photosensitised by chlorine" (R. G. W. Norrish and G. H. J. Neville). "Free radicals and atoms in primary photo-chemical processes: the photodissociation of aliphatic ketones and aldehydes" (T. G. Pearson).

Britain's Jubilee Fair

Stands would Stretch from Buckingham Palace to Windsor Castle

LONDON is sending most of the 1,550 exhibitors to Olympia and the White City for the British Industries Fair which opens on February 18. The London total is 756, according to the advance overseas edition of the catalogue, ten thousand copies of which were posted on Wednesday to prospective overseas buyers by the Department of Overseas Trade. Birmingham is next with 114, and Staffordshire third with 55. After them come Scotland (47); Yorkshire, apart from Sheffield (46); Lancashire, apart from Manchester (41); Manchester (35); Middlesex (29); Sheffield (25); the furniture makers of High Wycombe (24); Nottingham (20); Surrey (15); and Walsall (8).

Thirty of the 1,550 exhibitors have had stands at every Fair in London since the first was held in 1915 at the Agricultural Hall. In London alone, the Fair of the King's Jubilee year will be six times as big as that war-time test of British enterprise. The stands would line the whole of the way from Buckingham Palace to Windsor Castle; and, apart from London, the engineering and hardware section which is being held at Castle Bromwich, Birmingham, from May 20 to May 31, is so popular that last year's area of 345,000 sq. ft. has had to be increased by 120,000 sq. ft. Most of the foreign buyers will be from Holland, with Belgians second, and Germans, Danes, Frenchmen and Swiss next in order. The Irish Free State leads among the countries within the Empire who are sending buyers, followed by Canada, India and South Africa. The growth of the Fair may be gauged from the fact that the advance catalogue, issued in nine languages, runs to 684 pages, or about 152,000 words.

THE Japanese coal-tar industry has developed rapidly during the past few years, as a result of the heavy demand for domestic dyestuffs and the efforts of the Government to encourage an industry which would make Japan independent of other nations in this respect. At the end of 1932, 440 different coal-tar products were being manufactured in Japan in 58 factories, the value of the output of the industry being 30,613,290 yen.

Continental Chemical Notes

Czecho-Slovakia

THE KOH-I-NOOR PENCIL MANUFACTURING CONCERN (L. and C. Hardtmuth) is reported to have embarked on the production of cosmetics.

Sweden

ODOURLESS WHALE OIL has been produced by a Swedish chemist and a consortium may be formed with a view to its exploitation ("Chemische Industrie").

Poland

ACTIVATED CARBON MANUFACTURE is to be commenced by the Sylbirst Co., of Lemberg, at a factory in Komorowice, near Biala.

WITH A CAPITAL OF 10,000 ZLOTY, a zinc white manufacturing concern has been registered in Warsaw under the name of "Warszawska Fabryka Bieli Cynkowej" Polak and Co.

Austria

A GERMAN CHEMIST CLAIMS to have discovered a method for producing synthetic asbestos using cheap quartz sand as raw material. The process has not yet reached the industrial stage ("Kunststoffe," December, 1934).

Turkey

PLANT FOR DISTILLING ROSE OIL is under construction at Isparta. The Turkish rose harvest has increased from 390,000 kg. in 1932 to 450,000 kg. in 1933.

Russia

THE GORLOWKA NITROGEN FACTORY has been operating with a newly-discovered catalyst which produces considerably higher ammonia yields, according to a report in "Sa Industrialisazyu."

THE RUBBER SECRETING PLANT, kau-sagis, is now being grown on an increasing scale on the collective farms of Southern Kasakstan and a total area of 200 hectares will be under cultivation in 1935.

Germany

THE WOOD SUGAR MANUFACTURING CONCERN, Deutsche Bergin A.-G., of Heidelberg, has enlarged its plant for producing crystalline dextrose which was started up at the beginning of 1934. The dextrose complies with the most stringent requirements of the German Pharmacopoea. Both the crude wood sugar and the by-products accumulated in the preparation of pure dextrose are being utilised in various directions, including cattle feed, baking yeast and industrial spirit.

Sudden Death in Plating Works

Questions on the Effects of Trichlorethylene

A VERDICT of death from natural causes was returned by a jury at an inquest at Birmingham last week on Albert Edward Loach (32), a cycle accessories plater, employed by J. A. Phillips and Co., Ltd., Smethwick, who died on December 8. Dr. W. H. Davidson, the Coroner, told the jury that Loach was employed on a special type of machine for removing grease from plated articles. There was a tank of trichlorethylene, which had not been in use sufficiently long to enable experts to know all about the possibilities that might arise from its use.

Wilfred Field, works manager, said the work was degreasing cycle handlebars and the machine had been in use since 1932. He said that 2½ gal. of the liquid was placed in a 6 ft. galvanised iron tank. It was turned into a heavier-than-air vapour which condensed on the handlebars placed inside and cleansed them of all grease. Men on night duty were allowed to smoke. Witness was shown a long list of precautions issued by Imperial Chemical Industries, Ltd. He said he had never seen them, though he had seen some regulations. Not until after Loach's death did he know of a warning in a booklet handed by the Coroner to the jury: "Do not smoke when working the degreaser or where there is a smell of trichlorethylene." He had since been told that if the vapour were inhaled through a cigarette, thus increasing its temperature, it would be inclined to turn into phosgene. Loach had been given no warning that he was following a dangerous occupation. The degreasing plants were in general use, and until now witness had known of no danger. He knew, however, that if inhaled in quantity the vapour had a narcotic effect.

Bertram Philip Crawshaw, consultant chemist, the designer of the machine concerned, said that the heavy vapour dissolved grease as tea dissolved sugar. Neither he nor Imperial Chemical Industries, Ltd., had regarded the liquid as dangerous. It was of the same type as ether, an asphyxiating chemical, but not toxic. This was the first death in England. There had been four in Germany, he believed, but not in using a degreasing plant. He had heard of smoking creating hydrochloric acid, but he had not heard of phosgene being created. He contended that it was perfectly safe to use the liquid. There were 1,000 plants in this country.

In reply to Dr. J. C. Bridge (Senior Medical Inspector of Factories at the Home Office), Mr. Crawshaw said he would be surprised to hear that there had been four or five deaths in England through using trichlorethylene.

Dr. Bridge told the Coroner they were acute cases, and Mr. Crawshaw remarked that he should have been advised of them.

Dr. Bridge said the information was published in the Chief Inspector's annual report.

Henry Shaw, an industrial chemist, of Imperial Chemical Industries, Ltd., said trichlorethylene was a narcotic, similar to chloroform, and was a combination of chlorine and ethylene. It had been used for thirty years; for degreasing, for about ten years. There was nothing to show that a man could be poisoned by taking small doses. It could have an acute effect if taken in volume. Two years ago, Imperial Chemical Industries, Ltd., following tests, warned plant owners not to permit smoking. If air containing 0.1 per cent. of trichlorethylene vapour were drawn through a cigarette, the temperature of the lighted end being 600° C., the air inhaled would contain three parts of phosgene in one million parts of air.

Asked what was a fatal dose of phosgene, Mr. Shaw said he thought it was twenty-five parts in one million. Rats subjected to the vapour over a period of six months had shown no signs of poisoning. They had, in fact, put on weight.

Dr. Whitelaw, pathologist, said that at the post-mortem examination he could find no natural cause of death. Professor Haswell Wilson, of the University, said there was no evidence of any gaseous poison, but there was paralysis of the respiratory centre. Death was due to paralysis of the respiratory centre due to some poisonous substance. He could find no evidence that death was due to natural causes. He could exclude trichlorethylene poisoning by inhalation, and there was no evidence of acute or chronic phosgene poisoning.

The Coroner, addressing the jury, said some people were attracted by trichlorethylene and liked it, and they (the jury) must decide how Loach died, considering, among other things, the question of suicide. Even pathologists had their limitations in a case like this. They did not know what were the effects of trichlorethylene.

The jury returned a verdict of "Death from natural causes."

The Coroner: I will record that on the depositions. I hope the evidence will be of considerable value to the persons interested in the effects of trichlorethylene and that the day will not have been spent in vain, apart from the verdict.

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

RE-DRYING COPPER SULPHATE after use in the dehydration of organic materials.—H. A. M. Toledo. June 30, 1933. 825/34.

SOLVENT RECOVERY.—Carbo-Norit-Union Verwaltungs-Ges. June 28, 1933. 14501/34.

AMMONIUM SULPHATE, manufacture.—Naamlooze Venootschap de Bataafsche Petroleum Maatschappij. June 24, 1933. 17279/34.

CHLORAL AND BROMAL DERIVATIVES, production.—J. Gaathaug. June 29, 1933. 17406/34.

REMOVING ACIDIC COMPONENTS.—Naamlooze Venootschap de Bataafsche Petroleum Maatschappij. June 28, 1933. 17537/34.

PURIFYING NAPHTHALINE and products of the process, process.—Soc. Industrielle des Carburants et Solvants. June 24, 1933. 18611/34.

4-NITROSO-DIPHENYLAMINE DERIVATIVES, manufacture.—I. G. Farbenindustrie. June 24, 1933. 18716/34.

SOLID TETRAZO-SALT, manufacture.—I. G. Farbenindustrie. June 24, 1933. 18717/34.

ALKALI METAL ADDITION PRODUCTS of aromatic hydrocarbons, manufacture.—E. I. du Pont de Nemours and Co. June 29, 1933. 18886/34.

GLAZED CERAMIC PRODUCTS of low coefficient of expansion, production.—Porzellanfabrik Kahla. June 26, 1933. 18892/34.

VISCIOUS SOLUTIONS OF SALTS of anesthetic substances with hydroxy-carboxylic acids, manufacture.—I. G. Farbenindustrie. June 28, 1933. 18991/34.

GUAIACOL COMPOUNDS, method of producing.—Syngala, Fabrik für Chemisch-synthetische und Galenische Arzneimittel Ges. June 28, 1933. 19019/34.

PHOSPHORIC ACID-CONTAINING FERTILISERS, manufacture.—Aktiebolaget Kemiska Patent. June 29, 1933. 19040/34.

MONO-OXYCHRYSENE, manufacture.—Soc. of Chemical Industry in Basle. June 30, 1933. 19107/34.

AZO DYESTUFFS, manufacture.—Deutsche Hydrierwerke A.-G. June 28, 1933. 19142/34.

Specifications Accepted with Dates of Application

SYNTHETIC RESINOUS COMPOSITIONS, manufacture.—E. I. du Pont de Nemours and Co. March 21, 1932. 421,542.

AMINES AND AMIDES, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). April 26, 1933. 421,718.

PIGMENTS, manufacture.—Krebs Pigment and Color Corporation. March 24, 1932. 421,535.

PHARMACEUTICALLY-VALUABLE SUBSTANCES, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). May 20, 1933. 421,589.

HYDROGEN SULPHIDE from liquids, removal.—Gas Light and Coke Co., H. Hollings and W. K. Hutchison. June 21, 1933. 421,643.

SUBSTITUTES FOR COMMON SALT, production.—S. Michael. June 22, 1933. 421,554.

SOLID CARBONACEOUS MATERIAL mixed with oil, distillation.—E. W. Brocklebank and W. B. Mitford. June 22, 1933. 421,556.

ANTHRAQUINONE ACRIDONE DERIVATIVES, manufacture.—I. G. Farbenindustrie. June 25, 1932. 421,591.

DYESTUFFS OF THE TRIARYLMETHANE SERIES, manufacture.—I. G. Farbenindustrie. June 25, 1932. 421,592.

STARCH-DISINTEGRATION PRODUCTS capable of forming films, manufacture.—W. J. Tennant. June 23, 1933. 421,593.

ALKYL DERIVATIVES OF AMMONIA, manufacture and production. J. Y. Johnson (I. G. Farbenindustrie). June 24, 1933. 421,596.

EXPLOSIVE COMPOSITIONS of the character of gelatin dynamites, manufacture.—E. I. du Pont de Nemours and Co. June 24, 1932. 421,598.

CELLULOSE ESTERS, manufacture.—E. I. du Pont de Nemours and Co. June 24, 1932. 421,599.

TEXTILE DYING AND PRINTING.—Imperial Chemical Industries, Ltd., and A. Wormald. June 26, 1933. 421,606.

AZO-DYESTUFFS INSOLUBLE IN WATER, manufacture.—I. G. Farbenindustrie. June 25, 1932. 421,610.

4 : 8-DIHYDROXY-1 : 2 : 5 : 6-DIBENZOPHENAZINES and azo-dyestuffs therefrom, manufacture.—I. G. Farbenindustrie. June 25, 1932. 421,611.

ARTIFICIAL FILAMENTS, yarns, and the like, containing organic derivatives of cellulose, manufacture and treatment.—H. Dreyfus. June 27, 1933. 421,613.

WATERPROOF AND OILPROOF MATERIAL, manufacture.—E. I. du Pont de Nemours and Co. June 28, 1932. 421,649.

CATALYTIC PURIFICATION OR POLYMERISATION of cracked hydrocarbon vapours.—Houdry Process Corporation. July 11, 1932. 421,650.

COMPOUNDS OF THE BENZANTHRONE SERIES, manufacture.—E. I. du Pont de Nemours and Co. July 2, 1932. 421,732.

DISTILLATION OF FATTY ACIDS and the products resulting therefrom, methods of and apparatus for.—New Process Fat Refining Corporation. April 1, 1933. 421,733.

RHODAMINE DYES and their application, manufacture.—Imperial Chemical Industries, Ltd., and M. Wyler. June 30, 1933. 421,737.

DISAZO DYESTUFFS and intermediates, manufacture.—I. G. Farbenindustrie. June 30, 1932. 421,739.

MATERIALS CONTAINING FATTY SUBSTANCES soluble in strong alkaline baths, manufacture.—Deutsche Hydrierwerke A.-G. Sept. 27, 1932. 421,625.

DIACETYL, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Oct. 5, 1933. 421,676.

SOLID CARBON DIOXIDE, method of preparing.—A. H. Stevens (Carbonic Development Corporation). Oct. 6, 1933. 421,754.

GERMINAL GLAND HORMONE DERIVATIVES, process for the manufacture.—Schering-Kahlbaum A.-G. Oct. 27, 1932. 421,681.

SOLID FORMALDEHYDE, production.—Deutsche Gold-und Silber-Scheidanstalt Vorm. Roessler. Nov. 29, 1932. 421,691.

GLAUCONITE, treatment.—United Water Softeners, Ltd. June 19, 1933. 421,762.

FOLLICLE HORMONE, method of isolating.—Schering-Kahlbaum A.-G. Jan. 31, 1933. 421,630.

WATER-SOLUBLE ANTHRAQUINONE DYESTUFFS, manufacture.—Chemical Works, formerly Sandoz. Feb. 8, 1933. 421,632.

NUCLEAR SUBSTITUTED AROMATIC AMINES, catalytic process for the manufacture.—I. G. Farbenindustrie. July 29, 1933. 421,791.

Applications for Patents

(December 27 to 31 inclusive.)

PRECIPITATES OF TIN, melting, etc.—E. A. Ashcroft. 37342.

METALLIC TIN from stannous chloride solutions, production, etc. E. A. Ashcroft. 37343.

IMPURITIES FROM ORES, elimination.—E. A. Ashcroft. 37344.

HOMOGENEOUS DERIVATIVES OF UNSATURATED STEROLS, manufacture.—A. G. Bloxam (Soc. of Chemical Industry in Basle). 37275.

DI-ARYLMETHANES, etc., manufacture.—W. Blythe and Co., Ltd., W. H. Bentley and B. Catlow. 37235.

JIG DYING, ETC., FABRIC-TREATING PROCESSES.—British Celanese, Ltd. (United States, Oct. 4.) 37333.

DISTILLABLE CARBONACEOUS MATERIAL, treatment.—C. Cockram, Imperial Chemical Industries, Ltd., and R. Holroyd. (Jan. 5.) 37032.

LOW-TEMPERATURE CARBONISATION OF COAL, ETC.—N. Consitt, J. Smith and R. E. Cowell. 37383.

REACTANTS DURING HYDRATION OF PROPYLENE, separation.—Distillers Co., Ltd., W. P. Joshua and H. M. Stanley. 37173.

DYESTUFFS, manufacture.—Durand and Huguenin A.-G. (Germany, Dec. 27, '33). 37073.

AROMATIC NITROGEN COMPOUNDS, manufacture.—W. W. Groves (I. G. Farbenindustrie). 37150.

BICHROMATED PHOTOGRAPHIC MATERIAL, manufacture.—W. W. Groves (I. G. Farbenindustrie). 37360.

CARBONISATION OF WOOD.—P. Guillaume. 37327.

TREATMENT OF SOLUTIONS OF CHLORINATED RUBBER.—Imperial Chemical Industries, Ltd., J. G. Moore, J. P. Baxter and T. N. Montgomery. 37103.

DYING.—Imperial Chemical Industries, Ltd. 37104.

TRIARYLMETHANE DYESTUFFS.—Imperial Chemical Industries, Ltd., F. W. Linch and H. H. Stocks. 37175.

PURIFYING ZINC METAL.—Improved Metallurgy, Ltd. (United States, Dec. 28, '33). 37131.

PURIFYING ZINC METAL.—Improved Metallurgy, Ltd. (United States, Dec. 28, '33). 37132.

SULPHIDE ORES, preparing, etc.—H. W. K. Jennings (Verein für Chemische und Metallurgische Produktion). 37184.

AQUEOUS LIQUIDS FROM PHENOLS, etc., purification.—J. Y. Johnson (I. G. Farbenindustrie). 37064.

HALOGEN-AMINO-1-9-ANTHRAPYRIMIDINES, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 37065.

AZO DYESTUFFS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 37346.

SINTERING FINE ORES.—F. Krupp. A.-G. (Germany, Jan. 9.) 37141.

PHTHALIC ANHYDRIDE RECOVERY.—National Aniline and Chemical Co., Inc. (United States, Dec. 29, '33). 37416.

CATALYSTS, production.—H. F. Potts (International Hydrogenation Patents Co., Ltd.). 37033.

CARBON BLACK, granules.—H. E. Potts (United Carbon Co.). (May 2.) 37124.

METHACRYLONITRILE, polymerisation.—Triplex Safety Glass Co., Ltd., L. V. D. Scourah and J. Wilson. (Dec. 7.) 37279.

REMOVING RESIDUAL GASES from highly-evacuated vessels.—D. A. Wright. 37216.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

CONDITIONS generally have remained steady with no appreciable price changes for general heavy chemicals, perfumery chemicals, essential oils and intermediates. In the rubber chemicals section there have been slight increases in the prices of antimony sulphide (golden and crimson) and carbon black. Mineral rubber (Rupron) has decreased from £13 10s. to £12 10s. per ton. There have been price reductions in a number of wood distillation products and the price range for unrefined wood creosote has been extended from 6d.-9d. per gal. to 3d.-1s. 6d. per gal. Carbolic acid crystals have fallen by halfpenny per pound, and in the pharmaceutical and photographic section pyrogallic acid, cryst., has fallen from 7s. 6d. to 6s. 3d. per lb. Unless otherwise stated the prices quoted below cover fair quantities, net and naked at sellers' works.

LONDON.—Chemical markets have received a fair average of inquiry and there are signs that business is once more getting into swing after the holidays and stock-taking period. Prices continue firm and there are no changes to report. The prices for coal tar products are also unchanged from last week.

MANCHESTER.—Business in most descriptions of chemical products on the Manchester market is now almost entirely free from the quietening effect of end-of-the-year influences, and conditions during the past week have got back to at least where they were early in December. So far as actual new transactions are concerned, these have not been very extensive so far, for the simple reason that most of the chief users in Lancashire and the West Yorkshire districts have already covered their major requirements over the next few months. There has, however, been a sprinkling of orders this week, but most of them have covered comparatively small quantities. Most traders report a fair flow of specifications against contracts and the movement of most materials is satisfactory in the aggregate. As before the end of the year the general price position is steady and only occasionally are values being shaded.

SCOTLAND.—There is little or no change in the Scottish heavy chemical market as most of the works have just resumed after the new year holidays.

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%, £23 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%, £29 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, £29 10s. packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots.

ACID, CHROMIC.—10jd. per lb., less 2½%. d/d U.K.
ACID, CITRIC.—11jd. per lb. less 5%. MANCHESTER: 11jd.
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, £43; 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°, £23 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. 0jd. to 1s. 0jd. 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°, 2jd. to 3d. per lb., d/d.

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

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. 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, 6jd. 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, £21 10s. ex store.

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

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

BARITES.—£6 10s. to £8 per ton.

BISULPHITE OF LIME.—£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. 5d. to 2s. 9d.

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.—3jd. to 4jd. per lb. LONDON: 4jd. to 6d.

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

CHROMIUM OXIDE.—10jd. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3jd. 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, £32.

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 ld. 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.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—7jd. to 8jd. per lb. for delivery up to June 30.

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

POTASSIUM BICROMATE.—Crystals and Granular, 5s. per lb. less 5% d/d U.K. Discount according to quantity. Ground, 5jd. 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: £38.

POTASSIUM CHROMATE.—6jd. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P., 6s. 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: 9jd. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 10jd.

POTASSIUM PRUSSIATE.—LONDON: 8jd. to 8jd. per lb. SCOTLAND: Yellow spot, 8jd. ex store. MANCHESTER: Yellow, 8jd.

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

SODA ASH.—58% spot, £5 15s. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 10s. 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.—£23 per ton. LONDON: £23.

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 lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. 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 (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, £15.

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.—LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSATE.—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.—140° 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 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

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 2s. 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, £9 10s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £14 5s. 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, 3s. 11d. to 4s. 1d. 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.

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. 11d. 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, 9d. to 9½d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 5d. per gal. f.o.r. Home, 3½d. d/d. LONDON: 3½d. f.o.r. North; 4d. LONDON. MANCHESTER: 4½d. to 4½d. 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. 7d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; 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, 48s. per ton. LONDON: 47s. 6d. per ton, f.o.b. East Coast port.

PYRIDINE.—90/140, 6s. 9d. to 2s. 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.

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.—3s. 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 NAPHTHONATE.—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, £12 10s.; grey, £17 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 CRESOTE.—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.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Jan., £7 2s.; Feb., £7 3s. 6d.; Mar./June, £7 5s.; for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.

CYANAMIDE.—Jan., £7 1s. 3d.; Feb., £7 2s. 6d.; Mar., £7 3s. 9d.; 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, for delivery up to June, 1935, in 6-ton lots carriage paid.

Latest Oil Prices

LONDON, Jan. 9.—LINED OIL was quieter. Spot, £21 (small quantities 30s. extra); Jan., £19 7s. 6d.; Jan.-April, £19 12s. 6d.; May-Aug., £20 12s. 6d.; Sept.-Dec., £21, naked.

SOYA BEAN OIL was steady. Oriental (bulk), Jan.-Feb. shipment, £19 10s. per ton. RAPE OIL was steady. Crude, extracted, £29 10s.; technical refined, £31, naked, ex wharf.

COTTON OIL was firm. Egyptian, crude, £24; refined common edible, £29; and deodorised, £30 10s., naked, ex mill (small lots 30s. extra). TURPENTINE was dearer. American, spot, 47s. 6d. per cwt.

HULL.—LINED OIL.—Spot, quoted £20 12s. 6d. per ton; Jan., £20 2s. 6d.; Jan.-April, £20 7s. 6d.; May-Aug., £20 12s. 6d.; Sept.-Dec., £21 2s. 6d., naked. COTTON OIL.—Egyptian, crude, spot, £25 10s.; edible, refined, spot, £27 10s.; technical, spot, £27 10s.; deodorised, £29 10s., naked. PALM KERNEL OIL.—Crude, f.m.g., spot, £18, naked. GROUNDNUT OIL.—Extracted, spot, £30 10s.; deodorised, £33 10s. RAPE OIL.—Extracted, spot, £28 10s.; refined, £30. SOYA OIL.—Extracted, spot, £21 10s.; deodorised, £24 10s. per ton. CASTER OIL.—Pharmaceutical, 39s. 6d.; first, 34s. 6d.; second, 31s. 6d. per cwt. TURPENTINE.—American, spot, 49s. 9d. per cwt.

From Week to Week

AN INDEX TO VOLUME XXXI of THE CHEMICAL AGE is published with this issue. It will be found inside the back cover, whence it can readily be detached for binding purposes.

CHILEAN NITRATE EXPORTS for 1934 are double those of the previous year.

ASSOCIATED PAPER MILLS are stated to be negotiating for the acquisition of an old-established company engaged in the paper industry.

THE DEPARTMENTS OF MINING AND FUEL TECHNOLOGY in the University of Sheffield have issued a report dealing with their investigations during 1933-34.

SHEARMAN BROS., LTD., have removed from Field House, Brems Buildings, E.C.4, to Grand Buildings, Trafalgar Square, W.C.2. Telephone: Whitehall 7260. Telegrams: "Shearchem Rand London."

THE GERMAN TRADE DELEGATION now in Dublin is seeking to negotiate a trade agreement leading to the supply of German machinery for the industrial alcohol plants which are to be established in the Irish Free State.

A FIRE occurred on January 5 at the Wolverhampton factory of Courtaulds, Ltd., artificial silk manufacturers. The borough brigade turned out with two engines and was engaged for over an hour, but little damage was done except to one machine.

BRITISH CELLOPHANE, LTD., has just been registered as a private company: this is regarded as a further step in the development of the plans of Courtaulds and the French Cellophane Co., for the production and marketing of transparent paper in this country.

MUREX SHAREHOLDERS have received a circular stating that the directors are in a position to proceed with the proposals regarding the capitalisation of £270,000, part general reserve fund, and the issue by way of bonus of one fully-paid ordinary share of 10s. for every ordinary share held on January 28.

CUSTOMS DUTIES at the rate of 25 per cent. *ad valorem* have been from January 9 imposed on the following products of vitreous enamelled or stove enamelled iron or steel: Signs of all kinds and hearth plates and other plates and sheets (not being hollow-ware) of a description commonly used for domestic purposes.

FIRE DESTROYED large portions of Stourport-on-Severn vinegar works, owned by Holbrooks, Ltd., on January 7, when damage estimated at £30,000 was done. The engine-room, a grain store and part of the brewery were destroyed, but the flames were prevented from reaching the offices and vinegar vats, which are among the largest in the world.

FIRE BROKE OUT on January 6 in a naphthalene still at the works of British Tar Products, Ltd., Cadishead. Iriam and Eccles brigades were called, difficulty at first being experienced in obtaining an adequate supply of water. The jets were ultimately connected to the Ship Canal, however, and damage was confined to the still.

BRITISH INDUSTRIAL SOLVENTS, LTD., are moving their head office to-day (Saturday) to 50 Charing Cross, London, S.W.1. Mr. F. W. Clark, who until recently was manager of the company's solvents factory at Carshalton, will be in charge of the technical developments department, and will have his office at the new address. The new telephone number is Whitehall 9561.

IRON AND STEEL PROSPECTS for the first quarter of the year are regarded as satisfactory. A considerable amount of inquiry is in circulation, and deliveries against contracts in hand have been resumed on a heavy scale. The demand for pig-iron has developed, and, although stocks were added to over the holidays, the accumulations were less than usual in most districts. Many of the important consumers have entered into forward contracts, in some cases for delivery up to the end of June, and the producers have a heavy tonnage of orders on their books. In the semi-finished steel branch business is not expected to recover the activity ruling before the holidays for a time. The makers, however, report that deliveries against contracts in hand are substantial. In most of the finished branches trading is more active than is customary so early in the year.

LOCAL INTEREST HAS BEEN RUNNING HIGH in a series of table-tennis matches between the works staffs of Wailes Dove Bitumastic, Ltd., Hebburn-on-Tyne, and Robert Bowran and Co. (1934), Ltd., Pelaw-on-Tyne. A silver cup had been presented by Mr. James Stuart, proprietor of James Stuart and Co., Sunderland, with whom both firms enjoy business relationships. The cup is to be held for one year by the winner of two out of three matches. Wailes Dove's team was R. Robertson, E. G. Tumlily, G. Potts, G. C. Hutchings and R. McGuinness, the last two being replaced by T. Adamson and A. Robinson in the last match. The team representing Robert Bowran was W. N. Bowran (works manager), H. B. Craggs, R. Fraser, G. E. Crabtree and W. J. Craggs. The first match was won by the Hebburn team, 15 games to 10; the second by the Pelaw team, 18 games to 7, and the final by Robert Bowran and Co. (on a neutral table in Newcastle) 14 games to 11.

THE FIRST HEAT OF STEEL was made recently in the basic Bessemer department of the new Corby works, Northamptonshire.

THE BRITISH SILK RESEARCH ASSOCIATION, it is stated, may be transferred from the University of Leeds to the Shirley Institute, Manchester.

BOWMANS (WARRINGTON), LTD., have increased their nominal capital by the addition of £12,891 4s. beyond the registered capital of £17,108 16s.

THE CHEMICAL AND ALLIED TRADES SECTION of the Manchester Chamber of Commerce held its annual meeting on January 9, and re-elected Mr. Forrest Hewitt chairman.

THE BENZOL ASSOCIATION, which has been established by the Ruhr coal mines to sell their benzol output, is on the point of buying from the Soviet the Rm.10,000,000 share capital of the Derop Oil Co., of Berlin, for about Rm.12,000,000.

IMPERIAL CHEMICAL INDUSTRIES, LTD., are to manufacture oxalic acid at the Widnes works of their General Chemical Group. It is expected that production will begin towards the end of the summer and that supplies will be available about September next.

A BIBLIOGRAPHY of the more important heavy metals occurring in food and biological material (30 pages) has been compiled by the Society of Public Analysts and has been published for them by W. Heffer and Sons, Ltd., price 3s. It contains approximately 600 references.

"THE CHEMICAL STRUCTURE OF DRUGS in relation to their Physiological Action," is the subject of the first of a course of six public lectures to be given by Dr. R. H. Ing on February 11, 18, 25, and March 4, 11, and 18 at University College, University of London, at 5.0 p.m.

THE PROGRESS OF THE USE OF PEAT AS FUEL for power stations in Soviet Russia was described by Mr. Alan Monkhouse, of Metropolitan-Vickers, Ltd., in a paper on "Electrical Developments in the U.S.S.R.," read before the North-Western Branch of the Institution of Electrical Engineers in Manchester on Tuesday.

AT AN EXTRAORDINARY GENERAL MEETING of the shareholders of the Electro Chemical Development Syndicate, Ltd., held at 14-15 Coleman Street, London, on December 31, it was agreed that the company be wound up voluntarily under the provisions of the Companies Act, 1929. Mr. E. D. Davies, 14-15 Coleman Street, London, E.C.2, was appointed liquidator.

ETHYLENE GLYCOL, when imported into Canada by manufacturers of anti-freezing compounds, for use in the manufacture of such anti-freezing compounds in their own factories, is now, under Canadian Tariff Item No. 816, entitled to enter free of duty of customs, under all tariffs. The Order will remain in operation until June 30.

THE IMPORT DUTIES ADVISORY COMMITTEE has received an application for an increase in the import duty on tubes of all sections manufactured wholly of copper or of alloys containing more than 50 per cent. by weight of copper. Representations by interested parties should be addressed to the Secretary, Import Duties Advisory Committee, Caxton House (West Block), Tothill Street, London, not later than January 31, 1935.

THE SOUTH SUBURBAN GAS CO. has deposited a Bill for introduction into Parliament this session for power to raise additional capital not exceeding £500,000 including premium. The present authorised ordinary and preference capital is £2,627,302, of which £2,369,348 has been issued and on which borrowing powers have been exercised to the extent of £1,072,108. The Bill proposes that the borrowing powers on the capital already issued shall be raised to £1,184,674, without further authority, and to the extent of 75 per cent. of any authorised but unissued capital. Provision is made in the Bill for re-defining differential prices in areas which have been altered under orders made by the Ministry of Health, and the company is placed under statutory obligation to promote a Bill, not later than 1942, proposing a revision of the basic price for gas as fixed in 1928.

Compliments of the Season

More Calendars Received

IN addition to the calendars and diaries mentioned last week we have received a novel desk diary from Venesta, Ltd., mounted on a piece of bent plywood. The history of the firm is told in the diary with the help of numerous illustrations, and plywood is shown in many of its uses, which vary from cabinet-making to barrels and from aeroplane construction to coach-building. Tin foils and collapsible tubes which are being used increasingly for the packing of goods, are also illustrated.

From the Premier Filterpress Co., Ltd., we have received re-files for the company's framed desk calendar, together with a convenient pocket calendar.

Forthcoming Events

LONDON

- Jan. 14.**—Institution of the Rubber Industry (London Section). "Thixotropy and Plasticity in the Rubber Industry." Professor H. Freundlich. 7.30 p.m. 12 St. James's Square, London, S.W.
- Jan. 16.**—Society of Chemical Industry (Chemical Engineering Group and Road and Building Materials Group.) "Some Properties of Fillers intended for Bituminous Road Construction." Professor E. Neumann. 8 p.m. Burlington House, London.
- Jan. 16.**—Royal Society of Arts. "Colour and Colour Nomenclature." Robert Francis Wilson. 8 p.m. John Street, Adelphi, London.
- Jan. 16.**—Imperial College of Science and Technology. Inspection of the Research Laboratories and Work of the Department of Chemical Technology. 3 p.m. South Kensington, London.
- Jan. 16.**—Institute of Chemistry (London Section). Joint meeting with Oil and Colour Chemists' Association. "Limitations of Chemical Analysis as Applied to Paint." C. A. Klein. London.
- Jan. 16.**—Society of Glass Technology. 2 p.m. London.
- Jan. 16.**—Electrodepositors' Technical Society. "Suspension Methods in Electrodeposition Practice." C. F. J. Carter. 8.15 p.m. Northampton Polytechnic Institute, St. John Street, Clerkenwell, London.
- Jan. 17.**—The Chemical Society. Ordinary scientific meeting. 8 p.m. Burlington House, Piccadilly, London.
- Jan. 17.**—Institute of Fuel. "The Removal of Smoke and Acid Constituents from Flue Gases by a Non-Effluent Water Process." Messrs. Pearson, Nonhebel and Ulander. 6 p.m. Lecture Theatre of the Institution of Electrical Engineers, London.

BANGOR

- Jan. 18.**—The Chemical Society (North Wales). "Alchemy and the Alchemists." Professor J. Read. 6 p.m. Chemistry Lecture Theatre, University College, Bangor.

BIRMINGHAM

- Jan. 15.**—Midland Metallurgical Societies. "The National Smelting Works, Avonmouth." S. Robson. 7 p.m. James Watt Memorial Institute, Birmingham.

GLASGOW

- Jan. 14.**—Institute of Metals (Scottish Section). "Some Aspects of the Corrosion of Non-Ferrous Metals." Professor C. O. Bamister. 7.30 p.m. 39 Elmbank Crescent, Glasgow.
- Jan. 18.**—Society of Chemical Industry (Glasgow Section). "Glass Silk." By staff of Chance Bros. 7.30 p.m. Royal Technical College, Glasgow.

HUDDERSFIELD

- Jan. 15.**—Institute of Chemistry (Huddersfield Section). Joint meeting with Huddersfield Technical College. "Fifty Years of Chemistry." Dr. A. E. Everst. Huddersfield.

HULL

- Jan. 15.**—Hull Chemical and Engineering Society. "Food from the Point of View of the Public Analyst." A. R. Tankard. 7.45 p.m. City Laboratories, High Street, Hull.

LANCASTER

- Jan. 17.**—The Lancastrian Frankland Society. "As it should be to-morrow." Professor H. E. Armstrong. 8 p.m. Storey Institute, Lancaster.

MANCHESTER

- Jan. 17.**—Oil and Colour Chemists' Association (Manchester Section). Presidential Address—"Properties of Pigment Powders." G. A. Campbell. 7 p.m. College of Technology, Manchester.
- Jan. 18.**—Society of Dyers and Colourists (Manchester Section). "Dermatitis." Professor B. A. McSwiney. 7 p.m. 36 George Street, Manchester.

NEWCASTLE-ON-TYNE

- Jan. 15.**—Society of Chemical Industry and Institute of Chemistry (Newcastle Sections). "In Quest of Colour." C. J. T. Cronshaw.

STOKE-ON-TRENT

- Jan. 14.**—The Ceramic Society (Pottery Section). "The Manufacture of General and Domestic Stoneware." N. D. Wood. 7.30 p.m. North Staffordshire Technical College, Stoke-on-Trent.

WORKINGTON

- Jan. 18.**—West Cumberland Society of Chemists and Engineers. "Some Aspects of Electric Arc Welding." Dr. L. Reeve. 7 p.m. Workington.

Company News

Deutsche Babcock and Wilcox Dampfkesselwerke, A.G. of Oberhausen.—This company, a subsidiary of Babcock and Wilcox, has reduced its dividend from 4 per cent. to 3 per cent. for the year to September 30, 1934. The net profits were down from *Rm.*343,422 to *Rm.*254,476 after writing off *Rm.*543,292, against *Rm.*666,000 a year ago. It is also announced that the Officine Italiane Babcock and Wilcox, of Milan, has lost part of its share capital of lire 5,000,000.

Canada Cement.—The annual report for the year ended November 30, 1934, shows, after providing for bond interest, \$1,000,000 set aside for depreciation and \$105,699 carried forward to surplus; earnings were not sufficient during the year to justify any payment on preferred stock. The balance-sheet shows current assets, including loans, securities, bonds and cash \$4,604,990, investments in subsidiary companies \$3,488,944, other investments \$611,783. Current liabilities \$507,394. Reserves, \$1,385,800. Earned surplus for the year \$105,699, balance of surplus, November 30, 1933, \$839,595, totalling \$945,294.

Electrolytic Zinc of Australasia.—The report to June 30, submitted in Melbourne on November 1, states that the gross profit, after debiting all costs and maintenance charges and carrying usual £145,000 to reserve for amortisation, depreciation, etc., was £285,732; net profit after general charges, including £32,337 (£49,706) to income-tax, was £234,797, plus £78,283 brought in; dividends Nos. 22 and 23 on preference absorb £240,000, thus clearing off arrears. The amount carried forward is £73,081; since close of year 8 per cent. participating preference dividend No. 24 has been paid, absorbing £104,000; this covered dividend for half-year to June 30 and a dividend on ordinary of 4 per cent. for the year ended June 30, 1934; appropriation of £22,000 for debenture sinking fund has been made from general reserve.

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).

Siam.—The British Consul-General at Bangkok reports that the Stores Department of the Royal State Railways of Siam is calling for tenders (Tender No. P.260-22/3/35), to be presented in Bangkok by March 22, for the supply of 2,500 gallons of black bituminous solution in five-gallon drums. (Ref. B.Y. 7947.)

Brazil.—A commission agent established in Rio de Janeiro wishes to obtain the representation of United Kingdom manufacturers of chemical and pharmaceutical products. (Ref. No. 50.)

New Companies Registered

Ashbee and Toeman, Ltd., 25-7 Oxford Street, London.—Registered January 3. Nominal capital, £1,000. Chemists, druggists, drysalter, oil and colour men, manufacturers, importers and exporters of and dealers in essences, essential oils, natural and synthetic perfumes, toilet preparations, etc. Directors: Joseph Toeman, Robert D. Ashbee, Rudolph Toeman.

Dayborn Medical Products Co., Ltd.—Registered January 2. Nominal capital, £500. Manufacturers of and dealers in pharmaceutical preparations, proprietary articles, chemicals, gases, drugs, medicines, etc. Director: Gordon G. H. Thorburn, 29 The Parade, Cardiff.

Milton Bleaching and Chemical Co., Ltd., Milton Mill, Chapel-en-le-Frith, Derby.—Registered January 1. Nominal capital, £500. Manufacturing chemists and druggists, chemical engineers, sterilisers, dyers, cleaners, makers of chemical plant and materials, etc. Directors: Wm. H. Harlow, John Davies.

National Chromium and Engineering Co., Ltd.—Registered January 4. Nominal capital, £1,000. Electro-platers, electro-galvanisers, chemists, electrical and mechanical engineers, electricians, tool-makers, manufacturers of bolts, nuts, washers, screws, nails, springs and parts for machinery generally, etc. Directors: Anthony E. Smith, Phoenix Dairy, Black Horse Road, Dublin, John Boyle, Frank O'Boyle.

Books Received

The Romance of Exploration and Emergency First-Aid from Stanley to Byrd. London: Burroughs Wellcome & Co.

Official Publications

Water Pollution Research. Summary of Current Literature. London: H.M. Stationery Office. Pp. 36. 2s.

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HYDRAULIC PRESSES AND PUMPS. Large stock in London. Price quoted for adapting and erecting.—THOMPSON AND SON, Maria Street, Millwall.

TO DYERS and Artificial Silk Manufacturers.—Special Yarn Poles for Cotton, Wool and Silk Dyers, also Stove Poles, Dye Boxes, Bobbins, Rollers, Bogies, Yarn Barrows, etc. Special Lancewood Poles and Canes, superfine finish for Mercerisers. Prices on application. CRAWFORD'S TURNING MILLS, Paisley, Scotland.

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York House, 12 York Street, Manchester.

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KINGS PATENT AGENCY, LTD. (B. T. King, C.I.M.E., Regd. Patent Agent. G.B., U.S.A., and Can.). Advice, Handbook, and Cons. free. 49 yrs. refs. 146a Queen Victoria Street, London, E.C.4. 'Phone: City 6161.

PATENTS obtained, trade marks and designs registered, at home and abroad.—GEE AND CO. (Patent and Trade Mark advisers to THE CHEMICAL AGE), 51-52 Chancery Lane, London. W.C.2. Telephone: Holborn 1525. Established 1905.

REGINALD W. BARKER & CO. (Estab. 1886.) Patent and Trade Mark Agents, 56 Ludgate Hill, London, E.C.4. Booklets sent gratis. Phone: City 5140.

WORKING NOTICES

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THE OWNERS of Patent No. 348,792 are desirous of arranging by way of licence or otherwise on reasonable terms for the commercial development in Great Britain of this invention which concerns Improvements in the Electrolytic Manufacture of Chlorine.—For particulars, address H. Douglas Elkington, 20 to 23 Holborn, London, E.C.1.