# The Chemical Age

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# Notes and Comments

## The Glasgow Meeting

THE Glasgow section of the Society of Chemical Industry will, for the fifth time in its fifty-one years' history, entertain the Society on the occasion of its annual meeting in the first week of next month, and if we may judge from the programme which members have received during the past few days, the meeting will be well in keeping with the traditions of the Society and the hospitality of the fifth oldest of its local sections. Last year in South Wales the Society was the guest of the youngest of the provincial sections, and the Cardiff and Swansea contingents took care to see that the members were not disappointed. There may not be many members who remember the first Glasgow meeting away back in 1888, but those who recollect the meetings there in 1901, 1910 and 1922 will remember something of the cordiality of the reception they received and will go to Glasgow with great expectations which, we are confident, will be fulfilled. It falls to the lot of the local section acting as host to make all the detailed arrangements, and in this connection a word of praise is due to Mr. Thomas Donaldson, the local chairman, and Dr. I. Vance Hopper, the local secretary, who becomes hon. secretary of the conference and does the bulk of the work.

The programme, summarised elsewhere in this issue, shows that both in its technical aspects and on the social side the meeting will present variety and attractiveness. Besides the presidential address to be given by Alderman Thompson and the Medal address by Dr. E. F. Armstrong, there are to be meetings of the Chemical Engineering Group and the Food Group. The works visits will be of particular interest, especially that on the last morning of the week to the explosives factory at Ardeer, while the social engagements include a garden party at the residence of Lord and Lady Weir, apart from the annual dinner, which is invariably productive of good speeches and pleasant intercourse. It only remains for the members to attend in large numbers to make the meeting one of the best in the long life of the Society.

## The State and Chemical Research

RESEARCH over a wide field is summarised in the report of the Chemistry Research Board for the period ended December 31, 1934. This report provides the first complete survey of the work carried out in the chemical research laboratory during the ten years of its existence. Much of the work has proved to be of great industrial importance, and several firms have made arrangements for members of their staffs to be attached to the laboratory to become acquainted with the new methods and technique which are developed there. The work of the Department of Scientific and Industrial Research began in 1915, and during the ensuing ten years the Department had at various times become interested in investigations of a chemical nature, such as the chlorination of methane, the production of formaldehyde and glycerine, the manufacture of chemical products from fish residues, the corrosion of metals, high-pressure reactions (including the reactions between carbon monoxide and hydrogen) and the deterioration of fabrics. These investigations, which were undertaken mainly under the auspices of the Chemistry Co-ordinating Research Board, were carried out by isolated groups of workers, who were often located in widely separated laboratories. One group studied the corrosion of metals at the Royal School of Mines, another examined fish products in the Imperial College of Science and Technology, whereas a third experimented on the chlorination of methane and on the recovery of formaldehyde from waste liquors of wool-scouring at the Royal Naval Cordite Factory. It soon became evident, however, that some increase in economy and efficiency could be attained if these scattered groups of workers became part of a more centralised scientific organisation. A suitable site was therefore chosen on the Bushy Park Estate in close proximity to the National Physical Laboratory, and the building of a chemical laboratory was commenced in 1924.

## Corrosion of Metals

LOSS through the wastage of metals by corrosion costs the world many millions a year, and a study of this problem naturally forms an important section of the work of the Laboratory. In general, the work aims at the investigation of the mechanism of corrosion in its relation to the prevention of rusting, tarnishing and the corrosion of metals in industrial use. Requests from industry for information on special corrosion problems are increasing, and recently inquiries have been received from the building industry and manufacturers and users of pumps, fire appliances and condenser tubes.

The anodic oxidation process, in which aluminium is protected from corrosion by an oxide film produced electrically, was worked out under the Department of Scientific and Industrial Research, and this work has led to the discovery of a means for the colouring of aluminium which is now being taken up actively by industry. The protection of magnesium and its alloys,

which, on account of their lightness, are very attractive to the aircraft, motor-boat and automobile industries, is also receiving attention, more especially against corrosion by sea-water and motor fuels. Other problems dealt with have been the corrosion of locomotive boiler tubes and the rapid production of a green patina on copper as sought after by architects and sculptors. The corrosion of zinc, purified iron and steels is also being investigated. Experiments have shown that corrosion films on polished mild steel surfaces may start spreading from thousands of spots per square centimetre.

## High Pressure Research

THE use of high pressure, in addition to heat, in bringing about chemical action has now become far-reaching in its industrial importance. Methods for obtaining nitrogen fertilisers from the air and the development of the conversion of coal and tar into motor spirit are cases in point. Pioneer work on high-pressure chemistry has been carried out for some time at the Chemical Research Laboratory, where alcohols, including ethyl alcohol, have been produced by the direct interation of carbon monoxide and hydrogen under pressure. In addition, acetic acid, which is of great importance to the artificial silk and other industries, has been obtained by the interaction of ethyl alcohol and carbon monoxide. Equipment has recently been constructed for work at a pressure of 3,000 atmospheres and a temperature of 200° C. The development of high pressure chemistry, however, is still in its early stages, but it is noteworthy that the starting point of the syntheses referred to are materials obtainable from coal.

The dependence of chemical industry upon tar makes it essential that the chemist should know all that can possibly be known about this interesting raw material. New methods of carbonising coal have led to the production of tars which differ considerably from those to which industry had become accustomed. By means of a new method of separation, the Chemical Research Laboratory has been able to identify and classify many of the numerous components contained in tars produced by different methods. During the course of this work it was found that certain tars contained constituents of a phenolic nature, related to the disinfectant carbolic acid, which could be readily separated by distillation. When these are dissolved in caustic soda solution, they have been found to form a very efficient and cheap wetting-out agent for use in the textile industry; the material in question is now on the market. As the result of the application of high pressure technique to coal tars, new compounds have also been formed and these have been tested for their possible use in the dye industry.

## Putting Micro-Organisms to Work

JUST as the Chemistry Research Board have emphasised the importance of high pressure as an aid to chemical research, so, in like manner, they have recognised the possibilities of microbiology in its more chemical aspects. A satisfactory method of preparing acetone alcohol mixtures, useful as a liquid fuel and of importance in many industries, from straws and waste vegetable matter by fermentation has been demonstrated on a semi-commercial scale. Much work has been done on the deterioration of fabrics by micro-organisms, and as a result of this a method has been evolved which increases the resistant properties of cellulose fibres. The decay of ropes and fibres through attack by micro-organisms has been shown to depend on moisture conditions. In 1932-33, for example, it was found that ropes were more likely to be attacked when stored near the Thames estuary than when stored on the south-west coast. As a result of tests conducted with over 160 species of the lower fungi, a fungal substance has been found which is capable of degumming silk more rapidly and thoroughly than the acids usually employed. Another instance of the application of microbiology is afforded by a recent investigation on the cause of earthy taste in salmon taken from a well-known salmon river. Investigation on the spot proved that the earthy taste and odour were due to the tainting of the river by growths of certain organisms, and it was found that the taint disappeared if the fish were kept for five days in clear running water.

## Freedom of the Press

THE unqualified refusal of the Government to countenance anything in the nature of a censored or tied Press deserves to be on record. Debate arose in the House of Lords on a complaint by Lord Kilmaine against an admittedly unfortunate headline in a London daily newspaper. The Government reply was made by Lord Lucan, who would not hear of either Lord Kilmaine's proposal of a Press censorship, or of the only possible alternative, requiring newspaper proprietors to take out licences which might be revoked if they misbehaved. Lord Lucan reminded the peers that this country prided itself on having an absolutely free Press and contended that no case had been made out to justify any Government interference with the present activities of the newspapers. He very properly emphasised the striking fact that there was no newspaper in this country which had any claim to be regarded as the mouthpiece of the Government. The Press from top to bottom is indeed completely independent of Government control and influence. This is a national asset to which even readers of the trade Press cannot attach too much importance when from time to time they feel inclined to join in the easy game of blaming the newspapers.

## A Strong Selling Point

THE editor of "Industria Britanica" informs us that correspondents from Spain and South America, whose inquiries reach "Industria Britanica" in increasing numbers month by month, continue to complain that British exporters, actual or potential, send their letters and catalogues in English. As an example, a correspondent from Spain writes: "All firms write in English and send their catalogues also in that language. This places difficulties in the way of doing business and it would be advisable to tell them that they ought to send their catalogues, particulars and correspondence in Spanish, if they want to do business in this market. . . . I insist on asking that correspondence be sent in Spanish, and I may point out that not a single German firm would think of writing to this country in any other language. It is necessary to spend money on translations."

There is little doubt that foreign exporters secure a big advantage over their British rivals by their attention to this point.

# The Chemical Research Laboratory

## British Industry Benefits from Research of Long Range Character

ALTHOUGH much of the research carried out at the Chemical Research Laboratory is of a "long-range" character, no opportunity is lost of utilising technical results for the benefit of British industry, states the Report of the Chemistry Research Board for the period ended December 31, 1934 (H.M. Stationery Office, 1s. 6d. net). An illustration of such an industrial application is shown by the production of "Shirlacrol," a wetting agent for the cotton industry, produced in collaboration with the Shirley Institute and derived from the phenols of coal tars. This newly-discovered material has largely taken the place of a product which has hitherto been imported at a substantially higher price.

The Chemistry Research Board was first appointed in 1927. Researches appearing in the programme of the Chemistry Co-ordinating Research Board which preceded it were accordingly placed under the supervision of the newly-constituted Board. During the seven years which have since elapsed, some of the researches in this programme have been completed or dropped and others have begun in their place. Work on the corrosion of metals is still carried on with the original idea of investigating the mechanism of corrosion in relation to the prevention of rusting, tarnishing and corrosion of metals in industrial use. On the other hand, the possibilities of the use of high pressures in chemical reactions convinced the Board of the necessity of undertaking researches to develop the technique of high-pressure operations with a view to the synthetic production of industrially-important compounds. The use of high pressures has provided a powerful weapon with which to attack problems arising in the course of other researches, as in the work on low-temperature and other tars. In this field an endeavour is being made to help industry by trying to identify the chemical constituents of the tars in order to develop new uses for tars and to improve their economic value by facilitating the production of that class of technically-important materials known as intermediates from the essential part they play in the manufacture of the more valuable final products such as dyestuffs. As an offshoot of this work a study is being made of the complex aromatic hydrocarbons and amines.

Tars are being studied in order to increase their efficacy and value as road-dressing materials. This work on tars is closely connected with the researches undertaken on synthetic resins, for some types of which coal-tar phenols are an essential raw material. The improvement of the insulating and other properties of phenol formaldehyde resins is being investigated, while experiments are proceeding on the synthesis of new resins and intermediates of technically useful properties. The application of synthetic resins to dental purposes has also been the subject of research.

### Corrosion of Metals

The researches on corrosion were originally started by a committee of the Institute of Metals in the Metallurgical Laboratory of Liverpool University. At the present time the mechanism of corrosion, both in conditions of immersion and atmospheric exposure, is still being studied, together with such technical problems as the protection of magnesium alloys from corrosion by sea water and the fuels used by aircraft, the corrosion of locomotive boiler tubes and the production of artificial patinas for the protection of copper used in architecture and sculpture.

An attempt is being made to put the measurement of corrosion velocities for mild steel in stagnant salt solutions on a systematic basis, so that each determination shall be related in a known manner to any other. The matter is more complicated than is generally realised, and it is now clear that the type of measurement usually described in the literature cannot be strictly interpreted, and therefore has no cumulative value. The necessity for thorough investigation is well illustrated by the fact that the relative corrosion velocities of a sample of steel in two different salt solutions (N/2 sodium chloride and sea water) may be inverted by merely changing the size of the vessels used; such facts are important both in routine works tests and in investigations on corrosion mechanism.

It has also become clear that in the past too rigid a view has been taken of the control exercised by cathodic depolarisation (oxygen type). Whenever corrosion velocity was increased by increase of oxygen supply, the corrosion rate with the lower oxygen supply was thought to be dictated solely by this supply. It has now been found that this is not necessarily true and that other changes, some affecting the anode, may increase the corrosion rate, which is therefore sometimes determined by the nature of the corrosion-cell as a whole, and not by sole control at one electrode.

Work has been commenced on the atmospheric corrosion of mild steel, employing technique similar to that already worked out for copper. Specimens have been exposed to synthetic atmospheres of various relative humidities containing small concentrations of sulphur dioxide. The existence of a critical humidity, below which the attack is insignificant, and above which it increases enormously with increasing humidity, has been established. The influence of contact with particles of hygroscopic salts such as normally exist in suspension in the atmosphere is under investigation.

### High Pressure Research

Work on catalytic reactions with carbon monoxide and hydrogen under high pressure was begun at Teddington in January, 1926, when certain patent specifications and the published researches of G. Patart and E. Audibert, in France, and those of Franz Fischer, in Germany, were the main sources of information on this subject. The immediate object was the acquirement of the technique of high-pressure research, and for this purpose a study of the methanol synthesis was initiated.

A discussion on catalytic reactions under high pressure, which took place at the Royal Society in March, 1930, revealed a diversity of experience in regard to the formation of ethyl alcohol as a product of high-pressure synthesis from carbon monoxide and hydrogen. A series of experiments was therefore made which confirmed completely the earlier observations on the production of ethyl alcohol. Several mixed catalysts were found to induce this synthesis and the presence of ethyl alcohol in such condensations was thus placed beyond reasonable doubt. Subsequent experiments to improve the conversion to ethyl alcohol have led to a catalyst containing copper oxide, manganese oxide and cobalt sulphide which effects a conversion to ethyl alcohol of 20 per cent. of the reacting carbon monoxide. Methane is still, however, the major constituent of the reaction products and experiments are being made to determine if its formation can be reduced or eliminated. Another variation in these carbon monoxide-hydrogen condensations was brought about by addition of potash to the zinc chromate catalyst. With an alkaline catalyst there is an increasing tendency to yield the higher alcohols and comparative experiments were made with all the alkalies from lithia to caesia when the optimum effect was found with rubidia.

In May, 1928, experiments were begun on the polymerisation of ethylene under pressure. Pressure experiments with this olefine were made originally with the object of inducing its condensation with carbon monoxide, but this effort was largely unsuccessful in spite of prolonged search for an efficacious catalyst which would cause an interaction between the two gases. Various hydrogenation experiments have also been carried out under pressure in the presence of catalysts. Examination of the mixture of synthetic alcohols, aldehydes and acetals obtained from carbon monoxide under pressure has been much simplified by hydrogenation in the presence of a nickel catalyst. Experiments on the reduction of acetone under pressure with a copper chromite catalyst impregnated with slaked lime resulted in the formation of methyl*iso*butylcarbinol in addition to *iso*propyl alcohol. This has led to further work on the preparation of higher secondary alcohols from ketones or secondary alcohols.

Following an improvement in the copper-manganese-cobalt series of catalysts (for carbon monoxide-hydrogen condensations) made by introducing cobalt in the form of sulphide, the effect of adding cobalt as phosphate, borate and selenide

has now been tried. The catalyst containing copper manganese and cobalt phosphates gave a conversion to ethyl alcohol rather lower than with cobalt sulphide in the mixture. A series of experiments has been carried out on the effect of varying the relative proportions of copper, manganese and cobalt. Copper oxide, manganese oxide, cobalt sulphide in molecular proportions 1 : 1 : 1/10 respectively gave optimum conversion of carbon monoxide to ethyl alcohol. Increasing the amount of cobalt sulphide to 2/5 molecular proportion decreased slightly the percentage conversion to ethyl alcohol, but increased slightly the rate of output.

The action of a cobalt catalyst on acetaldehyde at 350° and 400° in the presence of carbon monoxide under 150 atmospheres pressure was tested during 1934. While an appreciable portion of the aldehyde condensed to give crotonaldehyde, less than 1 per cent. decomposed to give methane. Higher alcohols obtained by a copper-manganese-cobalt sulphide catalyst consist chiefly of *n*-propyl alcohol with *n*-butyl alcohol next highest in amount. In the case of higher alcohols from a zinc-manganese-chromium-potassium catalyst the chief constituents are *iso*butyl and *n*-propyl alcohols in the ratio three of the former to two of the latter.

## Acetic Acid Synthesis

Preliminary experiments on acetic acid synthesis showed that acetic acid and methyl acetate were produced by the interaction of methyl alcohol and carbon monoxide in presence of phosphoric acid at 300-350° under a pressure of 150 atmospheres. Dimethyl ether in large quantity was also obtained, together with an oil which consisted of hydrocarbons of high boiling point. From this oil, hexamethylbenzene has been isolated and identified. To avoid the excessive formation of dimethyl ether and to increase the output of free acetic acid, subsequent experiments were carried out with a mixture of methanol 80 per cent., water 20 per cent. It was found that addition of copper phosphate to the extent of 1 per cent. to the phosphoric acid not only increased the conversion to acetic acid and methyl acetate but eliminated the production of hydrocarbons.

Systematic experiments on this synthesis of acetic acid were carried out during 1934, when as far as possible only one variable was changed at a time. An optimum temperature for the reaction was found between 330° and 340°, while the conversion improved with increased pressure between the limits of 100-200 atmospheres. The conversion was also favoured by increase in the rate of circulation, the equivalent of decrease in partial pressure of methyl alcohol. Increase in quantity of catalyst resulted in improved output, but, owing to the small capacity of the reaction vessel, full advantage of this fact could not be taken. During the first three hours, conversion steadily increased, then remained substantially constant. This initial increase is attributed to gradual conditioning of the phosphoric acid, during which water is eliminated. After one experiment the catalyst consisted of metaphosphoric acid, but more commonly the dehydration was not carried so far.

## Tar Research

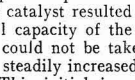
In 1925, low-temperature carbonisation was a prominent feature of the efforts then being made to utilise more scientifically our national resources of coal, and with such developments the Department of Scientific and Industrial Research was closely concerned, through its Fuel Research Station. The necessity for fundamental chemical research on the tars produced by these new methods of carbonisation became apparent and this aspect of the problem was allocated to the Chemical Research Laboratory. At this date there was comparatively little known concerning the chemical nature of the constituents of low-temperature tar, and it was soon found that progress could only be made by a modification of the processes hitherto employed in examining the previously studied high-temperature tars.

This method of examining low-temperature tars by solvent extraction having proved so promising, the Chemistry Research Board recommended that the tar section should undertake a general study of all tars. With this enlargement of the scope of inquiry it became possible to examine tars derived from wood, peat and many types of coal carbonised under a great variety of conditions. Separation of the main constituents into crystalloids and resinoids revealed the fact that all tars contain the latter constituents to a greater or less extent. Wood tar, as might be anticipated, contained only a trace of nitrogenous resinamines. In collaboration with the British Cotton Industries Research Association a new phenolic wetting agent was successfully developed and is now being manufactured under the name of "Shirlacrol" by several tar distillers.

During 1934 considerable quantities of Shirlacrol as required for use in 22.0 and 26.0 per cent. caustic soda solutions have been prepared from vertical retort tar acids supplied by the Lancashire Tar Distillers. Continuation of tests previously reported has shown that Shirlacrol prepared from either vertical retort or low-temperature tar phenols, suffers no loss in wetting power when caustic soda solutions are left for six months in glass vessels protected from carbon dioxide; prepared from wood tar, it deteriorated slightly in six months, whilst the sample derived from peat tar phenols exhibited during this period a marked decline in efficiency. Systematic tests have shown that satisfactory grades of Shirlacrol suitable for concentrations of aqueous caustic soda ranging from 18.0 to 30.0 per cent. of sodium hydroxide may be produced by fractional distillation.

## Autoclave Experiments

As a result of autoclave and other experiments on coal-tar products carried out during 1934 it has been found that *o*-hydroxydiphenyl, when condensed with carbon dioxide (120 atmospheres) at 120° in presence of aluminium chloride, yielded two isomeric monocarboxylic acids melting at 165° and 202° respectively; the former crystallised from water and the latter from petroleum b.p. 60-80° in colourless needles. Diphenylene oxide with 60 atmospheres pressure of carbon dioxide at 100° and in the presence of aluminium chloride produced a monocarboxylic acid crystallising from petroleum b.p. 60-80° in colourless needles melting at 252°. When toluene and aluminium chloride were kept for three days at room temperature in contact with carbon dioxide (60 atmospheres pressure), *p*-toluic acid was formed; yield 0.045 per cent. This small yield was doubled when the pressure was raised to 3,000 atmospheres.

At 200° resorcinol was converted to the extent of 70 per cent. into *m*-aminophenol by aqueous ammonia (d. 0.880) when the pressure was of the order of 15-20 atmospheres. The solution from the autoclave was heated to remove excess of ammonia and concentrated to one half of its volume when 50 per cent. of the *m*-aminophenol crystallised out. By repeating the amination on the mother liquor from this crystallisation with fresh resorcinol and aqueous ammonia a continuous production of *m*-aminophenol may be achieved without loss of resorcinol. Under similar experimental conditions orcinol and aqueous ammonia yield a new base, 5-*amino*-m-*cresol*,  , which crystallises from water in colourless prismatic needles melting at 135°. Condensation of resorcinol with monoethylamine leads to the technically important *m*-ethylaminophenol which was obtained in 67 per cent. yield. Thymol and carvacrol have been separately condensed with ammonium chloride at 350° to yield respectively thymylamine b.p. 229-231° and carvacrylamine b.p. 239-241°.

## Nitration Products

*Sym*-xylidine, on nitration in concentrated sulphuric acid with a theoretical amount of concentrated nitric acid, yields 80 per cent. of *ortho*- and 20 per cent. of *para*-nitro derivatives, but if the acetylated base is nitrated in acetic acid the product is almost exclusively the *para*-isomeride. If the acetic acid is replaced by sulphuric acid the acetylated base is nitrated by excess of nitric acid mainly to the *o* : *p*-dinitro derivative, which is most conveniently hydrolysed by warming to 80° with 10 per cent. aqueous caustic soda. The resulting *o* : *p*-dinitro-*sym*-xylidine separates from petroleum (b.p. 60-80°) in orange needles m.p. 123° (recorded m.p. is 94°). The bromo-derivative, 2 : 4-dinitro-6-bromo-*sym*-xylidine melts at 186° in agreement with the recorded melting point. Accompanying the *o* : *p*-dinitroacetyl-*sym*-xylidine in the crude nitration product is a small amount of the *o* : *o*-dinitroisomeride crystallising from petroleum in colourless needles melting at 236°. By hydrolysis with concentrated sulphuric acid at 60°, this by-product furnishes the corresponding dinitrated base, which crystallises in orange-red needles melting at 96° and forms a bromo-derivative melting at 182°.

*o* : *o*-Dinitroacetyl-*sym*-xylidine in contact with fuming nitric acid at room temperature for 12 hours is converted

into the trinitro-derivative deposited as an orange-red solid when the nitration mixture is poured on to ice. *Trinitro-acetyl*-sym-*xylidine* crystallised from petroleum (b.p. 60-80°) in prisms melting at 110° and when hydrolysed with concentrated sulphuric acid furnishes trinitro-*sym*-xylidine, m.p. 200°. The complete series of *ortho*- and *para*-nitro-derivatives of *sym*-xylidine has thus been obtained.

## Synthetic Resin Research

On the advice of the Chemistry Research Board, work on phenol formaldehyde resins was commenced by the Director in May, 1925, at the University of Birmingham. One aim of this research was the production of readily reproducible resins having high electrical insulation and, with this objective, condensations were first made with phenol and *meta*-cresol and later with tar distillates containing mixtures of these substances with other phenolic homologues. The methods of purification adopted, which included extraction with volatile organic solvents and distillation in steam under reduced pressure, led to resins giving increasingly favourable electrical insulation values, as determined by breakdown voltage tests and by other electrical measurements. These tests showed that resins obtained from crude mixed phenols of low-temperature tars could be adapted to the preparation of moulded and laminated products possessing very favourable electrical qualities comparable with those of resins prepared from individual phenols.

The course of these resin condensations is influenced very considerably by the nature of the catalysts and a systematic study was made on the effects of various alkaline catalysts on the reactivities of phenol and its homologues with formaldehyde. These experiments showed that the time of resinification was inversely proportional approximately to the amount of each alkaline catalyst. This work led to an inquiry into the most favourable methods of preparing mono-, di- and tri-ethylamines by condensations of ammonium salts with ethyl alcohol under autoclave conditions.

During 1934 intermediates from various individual phenols have been prepared and their properties have been studied. Condensation of *m*-2-xylenol with formaldehyde in presence of high concentration of acid catalyst has resulted in resin formation, whereas similar condensations with mesitol have produced substances of presumably dihydroxydiarylmethane type.

## The Influence of Catalysts

A systematic study of the influence of catalysts on resinification times of phenols has led to a method for estimating comparative solubilities of phenolic resins in low-temperature tar neutral oils. Coalite oil has been utilised as a cheap source of phenols for the production of resins of both bakelite and novolak types, and semi-scale quantities of the former variety of resin have been prepared using 11 litres of oil to 5 litres of formalin. Condensation in presence of 500 c.c. of pyridine for 6-10 hours, followed by benzene washing, yielded resins suitable for electrical purposes, while condensation in presence of 20 g. of sodium carbonate for 0.5-1.0 hour, with subsequent vacuum steam distillation, gave products utilisable as impregnating agents.

While it is known that resins prepared from tar acids boiling from 217-225° (xylenol range) are compatible with drying oils, experiments have now shown that phenols boiling up to, and above, 300° are also applicable although oil varnishes prepared from these higher phenols exhibited indifferent drying power. Methods devised to ensure freedom from unattacked phenols, such as steam distillation at temperatures up to 200°, have indicated that this slow drying is at least due in part to the presence of free phenols, which are not entirely removed by steam distillation *in vacuo* below 100°. Of authentic phenols it was found that *p*-ethylphenol and thymol readily yield oil-soluble products. Carvacrol and *o*-ethylphenol condensed very slowly with formalin in the presence of acid, and only the resin from the latter phenol was soluble in oils.

Condensation products formed by the union of successive molecules of formaldehyde with a molecule of acetone have been catalytically hydrogenated in an attempt to elucidate the mechanism of reaction. Methyl ethyl, methyl *iso*propyl and ethyl *iso*propyl ketones were isolated, but no diethyl ketone. A considerable amount of methyl ketobutanol, $CH_3.CO.CH(CH_3).CH_2OH$, was also obtained, identical with the condensation product from methyl ethyl ketone and formaldehyde. These results are evidence in support of the view that in the acetone-formaldehyde condensation the first two molecules of formaldehyde replace hydrogen of the same methyl group of acetone whereas the third molecule of formaldehyde attacks the second methyl group.

It has now been possible to obtain larger yields of methylene ketones, and particularly of methylene methyl ethyl ketone, which should, therefore, become important as a starting material for resins. This compound polymerises somewhat slowly, during a fortnight to six weeks, to an extremely tough, bright resin. This polymeride obtained in pale greenish-yellow, pink and almost colourless varieties is thermo-plastic, and has a refractive index similar to glass.

## Water Pollution

The work of the Water Pollution Section at the Laboratory began in April, 1928, at the request of the Water Pollution Research Board of the Department. It embraces two distinct inquiries, (*a*) the study of the base-exchange process of water softening, and (*b*) plumbo-solvency—an investigation of the reasons why certain types of water used for drinking are liable to dissolve or remove lead from the service pipes.

During 1934 experiments made with magnesium sulphate solutions in distilled water showed that the removal of the magnesium by a typical synthetic base exchange material or zeolite is not equivalent to that of calcium from solutions of calcium sulphate or from hard Teddington tap water. With typical examples of a treated mineral or treated clay the differences between the results with magnesium and calcium sulphate solutions were within the limits of experimental error. When the magnesium content of the solution corresponded to 17.4 pp 100,000 of Ca the exchange value of the synthetic material was only about 66 per cent. of the value with Teddington tap water. By reducing the magnesium content to the equivalent of 8.67 Ca pp 100,000 the exchange value rose to about 75 per cent. On being further lowered to equal 4.34 pp 100,000 Ca the magnesium removal was only about 75 per cent. of the calcium removal.

## Microbiology

Systematic investigations of bacteriological problems of a non-medical nature, other than in the fields of agriculture and dairying, were practically non-existent in this country until after 1914, but when war necessitated the production of acetone for cordite manufacture existing sources of supply were found to be too limited and precarious. Hence there came into existence an alternative method of acetone production by bacterial fermentation and one of the units for this process was built, together with its attendant bacteriological laboratory, at the Royal Naval Cordite Factory at Holton Heath, Dorset. This special demand for acetone ceased with the termination of hostilities, but, in the meantime, other bacteriological problems of an industrial character had presented themselves, originating either directly or indirectly from the work at Holton Heath. Among such researches may be mentioned particularly the bacterial production of lactic acid on an industrial scale, which was worked out in some detail, partly with a view to preparing sodium lactate, required for certain purposes where glycerin had previously been employed.

Arising out of various investigations undertaken by the section into fabrics research an investigation has been made of the micro-organisms which are capable of degumming silk. A report of this work shows that a number of common micro-organisms are able to effect degumming under fairly simple conditions. Over 160 species of lower fungi were tested for this purpose. *Aspergillus niger* was found to be the most efficient, and an enzyme prepared from this fungus effected degumming in one to two hours provided that the reaction of the enzyme solution was kept on the acid side of the neutral point. Although it was found that acids alone are capable of degumming silk it was established that a fungal enzyme at an acid reaction did so more rapidly and more thoroughly.

A beginning has been made with the investigation of the dehydrogenation of glucose by the acetic acid bacteria with a view to a study of the intermediate stages of dissimilation. The transformation of glycerol into dihydroxyacetone by Virtanen and Nordlund's method using *Bact. suboxydans* has been carried out on a laboratory scale. Attention is at present being concentrated on the problem of extracting pure dihydroxyacetone from the fermentation liquid, the method of attack being a trial of different solvents in a special extraction apparatus.

# The Manufacture of Egg Powder

By A. E. Williams, F.C.S.

WITH the coming of the egg marketing scheme attention will be focussed in many quarters more than ever on the possibility of using a larger proportion of filling material in the manufacture of egg powders than has hitherto been the general practice. In addition to British eggs, large quantities of produce of foreign origin have been imported for use in the preparation of these powders. The present tendency, however, is to increase the stability or keeping properties of the product and, incidentally, to lower the cost, by incorporating such edible substances as cornflour, farina, etc., in the egg powder.

Whilst there are several recognised methods of making egg powders, the one most favoured by the confectioners, who are the largest users, is that in which the powder is prepared from the whole egg. At the same time there is a limited demand for the product produced from the egg whites alone; and also for the yolk product without the albumen of the whites. Technically, there is no difficulty in prodncing an albuminous powder from the egg whites. This process is carried out regularly, and also with special purification methods for the production of albumen for scientific use. The production of a powder from the egg yolk only is a more difficult operation, since this contains about 30 per cent. of oil in addition to about 50 per cent. of water. By merely evaporating the water an oily paste results; to produce a powder this paste must either be well loaded with an edible powder or the oil first extracted. Unfortunately, the removal of the oil renders the product of less value to the confectionery trades; so this is commonly allowed to remain, and firmness, with increased stability, is obtained by using a filler, generally one of the cereals.

As already stated, the bulk of the egg powders on the market is prepared from the whole egg, the operation consisting essentially of shelling the eggs and evaporating the water in a special type of evaporator. The eggs are broken by hand on the edge of a conical vessel provided with a wire gauze trap in the base to arrest shell particles, etc., during which the girls employed on the task keep a sharp look out for decomposed produce, as one bad egg would be sufficient to spoil a batch of one ton or more. The evaporator into which the egg liquid flows is generally constructed of steel lined with tin or glass. Aluminium is not suitable as it tends to discolour after a period of use. A small-size single-effect evaporator is commonly used. It is often a cylindrical, vertical vessel 3 to 4 ft. wide and 9 to 12 ft. high. A batch of egg liquid should occupy only about one half of the total volume of the evaporator, to allow space for frothing and foaming. In the construction of the vessel the object is to avoid crevices and corners, wherein dried egg could lodge and decompose. For this reason the heating unit, a calandria, is fitted outside the evaporator itself; the latter being simply an empty vessel, without coils, etc., but with an external steam jacket for low-pressure steam or for hot water.

## The Evaporation Process

By adding a portion of the filling powder to the egg liquid before evaporating the tendency for the albumen of the whites to coagulate is reduced. Thus, the evaporation temperature may be slightly raised, and the process speeded up without risk of damage to the whites. An extensive coagulation of whites prevents the dried material being ground to a powder, for the whites in this condition assume a rubber-like mass. Coagulation also renders the product insoluble for all practical confectionery purposes. Without the shells, eggs normally contain from 72 to 76 per cent. of water, which is reduced to about 34 to 36 per cent. water in the evaporator

In the process of evaporation a rotary pump draws the egg liquid from the base of the evaporator, forces it through a heating unit attached to the side of the evaporating vessel and again into the evaporator. The steam supply on the heater is so regulated to give a temperature of 60° to 65° C. to the egg liquid as it is circulated through. At all other stages of the cycle the egg liquid is at a somewhat lower temperature than the above, and vaporisation of water from the egg product occurs merely at the point where the liquid again enters the evaporator. The greater portion of the batch is therefore maintained at a temperature well below that of water evaporation, which materially assists in preserving the quality of the product The control of the evaporation process is accomplished by taking frequent samples and ascertaining the specific gravity of these, which gives an approximate indication of the moisture content in the egg product. When the required moisture figure has been obtained, the contents of the vessel are cooled to about 25° C. before releasing the vacuum. This cooling operation, while under vacuum, has an important bearing on the physical properties of the product as well as the quality.

From this stage onwards the process of manufacture varies with different factories, but generally one of the following methods of procedure is followed: (1) The evaporated product may be dried in a vacuum dryer without further addition of powder, which, incidentally, produces the best quality product. (2) It may be transferred to a mixer and thickened by adding an edible powder, not previously dried, then the mixture passed to the vacuum dryer. (3) A specially-dried edible powder containing under 1 per cent. of water, such as freshly-prepared dextrin, may be added to the evaporated product, in which case further drying under vacuum is obviated. This latter method is the most economical and cuts production costs considerably, because the installation of a vacuum dryer is not necessary.

## Vacuum Drying

In the case of methods (1) and (2) such a low moisture content cannot be obtained without recourse to vacuum drying. Such drying procedure is commonly carried out in a band type of dryer, in which the product is conveyed slowly, by belts, between a series of hot steam plates. In dropping from belt to belt the product receives a mixing which ensures a uniform drying. The temperature in such a dryer may be 70 C., but not much higher. It is often economical to operate the dryer with the same vacuum equipment as is used for the evaporator; but, generally, the two plants cannot be operated together, so that circumstances, such as throughout required, initial expenditure and other considerations will be the deciding factor. Before packing, these products are always subjected to a thorough mixing and sifting, and sometimes flavouring material is added. In most cases a preliminary grinding in a mill or disintegrator is also necessary. The sifting machines ensure a finely-divided product by eliminating any lumps which may have resulted from coagulation of the whites and which cannot be ground by the mill. The keeping properties of these powders vary with the method of manufacture, but most of them are quite stable for twelve months if stored in air-tight tins.

It has long been known that egg yolk contains lecithin, for which substance several new uses have been found recently. For example, in chocolate manufacturing lecithin has the effect of increasing the fluidity of the chocolate mass when warm, through reducing internal friction of the constituents, and allows the fat content to be cut down by about 5 per cent., so reducing manufacturing costs. Thus, if a chocolate recipe entails using, normally, 35 per cent. of fat, about 30 per cent. would be ample if about 0.4 per cent. of lecithin is incorporated. Lecithin is also used in margarine manufacture and in baking as an emulsifying agent. During the past few months it has been successfully applied in the leather industry in place of egg yolk itself. It is said that lecithin penetrates the fibres of the leather better than egg yolk, and imparts a higher degree of softness to it.

Up to the present time almost all the lecithin of commerce has been produced from the soya bean. Sometimes such lecithin contains impurities from the solvents used in its extraction from the soya-bean meal, and such impurities often detract from the flavour of the chocolate and other foodstuffs with which the lecithin is admixed. It appears, therefore, that its commercial preparation from eggs may be carried out on a much larger scale in the future to meet the new demands on the foodstuffs industry and also the leather trades. Such a development would, no doubt, influence the egg powder industry, in that the tendency would be to prepare such powders from the whites only with the addition of a substitute for the yolk; or the solvent extraction of the lecithin from the yolk, together with the oil, may be attempted.

# Visitors at the Fuel Research Station

## Current Work at East Greenwich

**Dr. F. S. Sinnatt, C. B.,**
**Director of the Fuel Research Station.**

FOLLOWING the precedent created last year, the Fuel Research Station at East Greenwich was visited on Tuesday by between 300 and 400 distinguished guests, who were received by the chairman of the Fuel Research Board (Sir Harold Hartley) and the Director of Fuel Research (Dr. F. S. Sinnatt). The Fuel Research Station is the principal fuel research establishment of the Department of Scientific and Industrial Research, which, together with nine laboratories in the coalfields, is examining the methods of utilising the coal resources of the country to the best advantage.

Experimental work on powdered fuel has been devoted mainly to the problem of burning this type of fuel in water-cooled furnaces such as are found in Lancashire and Scotch marine boilers. Combustion conditions have been studied theoretically and, as a result, a number of new types of burner have been developed. Attempts are now being made with these burners to deal with fuels containing a lower percentage of volatile matter than those usually employed for firing Lancashire or marine boilers, with powdered fuel. One burner has been modified with a view to obtaining the abnormally wide range of loads required in marine practice. Besides developing these burners on more or less conventional lines, an attempt is being made to evolve a new form of combustion chamber in which a radical change is made from the methods previously employed to bring the fuel into contact with the air required for its combustion. The Grid burner has continued to be used in industry and from recent results it would appear that the steam raised in Lancashire boilers may be considerably increased by the use of pulverised coal.

### Sampling Powdered Fuel

Another powdered fuel programme consists of an examination of the accuracy of various methods of sampling the powdered fuel used in the bin and feeder and the unit systems of firing respectively. The work includes observations of the effect of various types of obstruction upon the distribution of fuel particles carried by a stream of air. In connection with the distribution of air-borne fuel to two or more pulverised coal burners, an arrangement has been devised whereby the fuel stream can be subdivided equally, irrespective of the variation of concentration fineness of the fuel in the line prior to the distributor. As a preliminary to an investigation into the grindability of British coals a comprehensive set of tests has just been completed to determine the influence of the type of mill and the type of coal employed upon the physical and chemical characteristics of powdered coal. Plans are actively proceeding to examine bunker coals in a Scotch marine boiler, under conditions comparable with those prevailing at sea.

The coal washery at the Fuel Research Station has been laid out with three main objects in view: (a) Research work in connection with the preparation of coal generally, including the development of new processes and technique; (b) the preparation of special grades and qualities of fuel for other experiments at the station, and (c) co-operation in the survey of the national coal resources. Full-scale plant has been installed wherever possible, and if an intermediate scale has had to be adopted then a capacity of about two tons per hour has been made the minimum. Special attention is at present being paid to the treatment of fine coal by developing new methods of handling the slurry problem and by the development of plant for cleaning fine coal.

Some 77 million tons of coal are washed per annum and the purification of the fine coal is one of the major problems of the coal industry. The vacuum flotation method which is installed at the Fuel Research Station, and which has been investigated there, has aroused great interest in the coal industry, and many tests and investigations have been watched by the coal industry. Some plants are now in operation and others are being erected by large collieries. The station has introduced new methods of dealing with the separation of the solids suspended in the circulating water, a problem which is experienced by practically all wet washing processes. Some of these methods are being adopted by industry and include improved water clarification systems and the application of chemical reagents to the water circuits. A detailed study is also being made of the effects of moisture in fine coal as mined on treatment such as de-dusting, screening and dry cleaning.

A new plant for dry cleaning coal is in operation, capable of treating about 1½ tons per hour. It is of rather special interest because preliminary trials have shown that coal passing ⅛ mesh can be purified by the system. The study of the breaking of coal has been proceeding throughout the year to meet the difficulty the coal industry is beginning to experience owing to the diminished demand for large lump coal for household purposes, and the increased demand for graded sizes. Many factors enter into the question, but the general trend is of greater importance to the coal industry and the consumer, and a study of the questions involved is an urgent matter.

### Hydrogenation of Coal

Researches in the hydrogenation of coal at the Fuel Research Station have not been confined solely to the production of motor spirit from coal, but have been directed towards the examination of the reactions which occur between coal and hydrogen under different conditions. These investigations have included a study of the earliest stages of reaction between coal and hydrogen. This has led to the discovery of a means of improving the coking power of coals. In those experiments permanent liquefaction is not attained. The products are solid. There has been a general study of later stages of reaction leading to the permanent liquefaction of coal under varying experimental conditions and in the presence and absence of a catalyst. The relation of the composition of coal has been investigated, particularly with regard to the possible catalytic effect of its inorganic constituents and ease of hydrogenation, and the products of hydrogenation have been examined with a view to finding industrial uses other than their use as liquid fuels. A continuously operated plant capable of treating 1 kilogram of coal per hour is being used for the study of the effect of experimental conditions and of the behaviour of typical coals.

The low temperature carbonisation of coal produces large amounts of tar for which new industrial outlets are continually being sought. Similarly the whole of the high-temperature tar produced in this country does not always find a ready market. Experimental work has been in progress to determine the conditions and plant necessary for the conversion of these products into materials, such as motor spirit, for which the market is relatively large. The process is one of hydrogenation-cracking at pressures of at least 200 atmospheres of hydrogen and temperatures of about 480° C. in the presence of a catalyst. The most satisfactory conditions and catalysts are being determined by experiment, and continuously-operated plants are in use in which the variables of the process are being studied. The catalyst favoured at present is a sulphide of molybdenum supported on a porous gel.

### Hydrogenation of Low Temperature Tar

It has been found that low temperature tar with no pretreatment other than filtration to remove dust can be hydrogenated satisfactorily. In one passage through the catalyst there is obtained a product which is free from pitch and which contains motor spirit amounting to 45 per cent. of the tar treated. By re-processing the high-boiling oils the total yield of spirit becomes 76 per cent. by weight of the tar and 100 per cent. by volume. Tar fractions can be treated with greater ease than crude tar, and this also applies to the distillates from high temperature tar.

The crude spirit requires very little refining to make it a stable water-clear motor spirit having satisfactory properties. It has a good anti-knock value (octane number 75). The scale of operation has been increased in stages, the latest development being the design and construction of a plant capable of dealing with 1-2 tons of raw material per day. This plant is in operation and already many of the difficulties inherent in any considerable increase in scale of operation have been overcome. Some modification of the process, *e.g.*, a preliminary hydrogenation in the liquid phase, appears to be necessary for the conversion of high temperature tar to spirit by means of a continuous process. Studies of new methods of using tar and its constituents for chemical purposes are proceeding.

Investigations carried out on the horizontal retorts at the Fuel Research Station have shown that by recirculating the heating gases around the retorts the capacity of the plant can be increased by over 50 per cent., and that by a special method of steaming, the yield of gas can be increased by about 10 therms per ton of coal or about 14 per cent. above the normal make. These processes are being tried out in various gasworks and in some cases satisfactory results have been obtained. The more fundamental aspects of the steaming process are receiving special attention. One retort in the setting is isolated so that accurate determinations can be made of the extent of steam decomposition when different amounts of steam are supplied.

### Economic Utilisation of Tar

The greatest interest is being taken in the low temperature carbonisation plant which has been developed at the Fuel Research Station. The hydrogenation programme is of importance in relation to the economic utilisation of the tar. The work done in the plant on the coal seams of the country has shown that a wide range of coals can be successfully treated. This is of the greatest use in considering the developments that are taking place in low temperature carbonisation. At least one setting of this type of retort developed at the Fuel Research Station is being erected commercially. The possibilities of producing free burning cokes suitable for domestic use, by carbonising blends of coals in intermittent chambers is also being investigated. The programme also aims at producing good metallurgical coke from blends of coal and thus is a means of extending the life of our coking coals.

The physical and chemical survey of the coal seams of the country is being carried out with the co-operation of the mine owners in nine principal coal areas covering 96 per cent. of the present coal production of the country.

# Society of Chemical Industry

## Programme for the Annual Meeting at Glasgow

THE Society of Chemical Industry will hold its fifty-fouth annual meeting at Glasgow from July 1 to 6, under the presidency of Alderman Edwin Thompson, of Liverpool. The full programme has been issued this week, the arrangements having been made by the local section, presided over by Mr. Thomas Donaldson, with Dr. I. Vance Hopper, of the Royal Technical College, Glasgow, as hon. secretary. The headquarters of the Society during the meeting will be at the Central Station Hotel, Glasgow.

The week's programme opens with an informal reception at the hotel at 8 p.m. on July 1. Following a meeting of the Council at 10 a.m. on July 2, the annual general meeting will be held at the Royal Technical College at 10.45 a.m., on which occasion the Society will be welcomed by the Lord Provost of Glasgow (Sir Alexander B. Swan) and Professor G. G. Henderson, on behalf of Glasgow University and the Royal Technical College. When the formal business has been disposed of, Alderman Thompson will give his presidential address on "National Water Supplies." Mr. W. A. S. Calder will be nominated as Alderman Thompson's successor in the presidential chair. The members of the Society will be the guests of the Glasgow section at luncheon at the Central Station Hotel.

Dr. W. R. Ormandy will preside at a meeting arranged by the Chemical Engineering Group in the afternoon of July 2, at which Commander J. L Bedale will present a paper on "Some Problems in Chemical Engineering in H.M. Navy." Simultaneously the ladies of the party will participate in a visit to the Glasgow and West of Scotland College of Domestic Science. A civic reception will be held in the evening at the Municipal Chambers by the Lord Provost, magistrates and town council.

The Food Group will meet on the morning of July 3 under the chairmanship of Dr. L. H. Lampitt, and papers on "How Food is Transported by Rail and Sea" will be presented by Brigadier-General Sir Harold Hartley, vice-president of the L.M.S. Railway, and Dr. A. J. M. Smith, of the Low Temperature Research Station, Cambridge. For those who are not vitally interested in food problems there will be a morning visit to the shalefield and oil refinery of Scottish Oils, Ltd., with luncheon by invitation of the directors. Meanwhile the Food Group will hold a luncheon at the Central Station Hotel.

Wednesday afternoon will be devoted to works visits, the following selection being provided: (a) Colville's steel works; (b) glass silk works of Chance Brothers and Co., Ltd.; (c) Glasgow Corporation chemical works, Provan; (d) Shanks works, Barrhead; (e) Dennistoun bakery of William Beattie, Ltd.; (f) works of City Bakeries, Ltd. The annual dinner will be held at the Central Station Hotel at 7.30 p.m.

On the morning of July 4 the Society's medal will be presented to Dr. E. F. Armstrong, who will deliver the medal address on "The Past, the Present and the Future." While this meeting is in progress the ladies will visit Glasgow University. By invitation of Lord and Lady Weir the members will attend a garden party in the afternoon at Eastwood House, and in the evening they will be the guests of the governors of the Royal Technical College at a reception, with facilities for inspecting the chemistry and metallurgy departments.

Friday, July 5, will be devoted to a day's sail to the Kyles of Bute. The new Cunarder "Queen Mary" will be passed en route, and time will be spent ashore at one or more places.

On Saturday, July 6, one party will visit the Ardeer Explosives Factory, by invitation of Imperial Chemical Industries, Ltd., and another party will inspect the Auchincruive Experimental Farm, by invitation of the governors of the West of Scotland Agricultural College.

# Progress at the Imperial College

## Points from the Twenty-Seventh Annual Report

**Professor W. A. Bone, Professor of Chemical Technology, Imperial College.**

THE governing body of the Imperial College of Science and Technology has just issued its twenty-seventh annual report, covering the twelve months ended July 31, 1934 (H.M. Stationery Office, 2s. net). In addition to reviewing the general activities of the College, the report describes in detail the work carried out in the various departments.

The total number of students registered for the year was 1,074, or 83 less than the previous year; while, in addition, 68 full-time research assistants and 42 University of London inter-collegiate part-time students also worked in the College laboratories, making a grand total of 1,184 compared with 1,274 in 1932-33, or a decrease of 90. The total of 1,074 students comprised 1,028 men and 46 women; 977 taking full-time and 97 part-time courses of study, 371 pursuing advanced work, post-associateship or post-graduate in standard, 694 work of associateship or first degree honours standard, and 9 occasional students taking part-time courses; 497 taking courses in pure science, and 577 courses in technology; 565 taking courses in the Royal College of Science, 112 in the Royal School of Mines, and 397 in the City and Guilds College. If the number of research assistants and of inter-collegiate students are included, the respective totals for the three Colleges become 663, 120 and 401. The number of individuals engaged in research, including both students and research assistants, was 330 compared with 309 for the previous year—the number 330 being made up of 68 research assistants, 217 students pursuing research for higher degree and higher diploma purposes and 45 students pursuing research for other purposes. On the results of the research work done at the College, 78 higher degrees of the University of London were awarded and 131 higher diplomas of the Imperial College, a total of 209 compared with 212 for the preceding year.

### Distinctions Gained During the Year

The number of Bachelor of Science degrees awarded to Imperial College students during the same period was 178, including 116 with honours, compared with 207 and 154 respectively for the preceding year, while the number of Associateships awarded was 175 compared with 216 for the previous year. The grand total of distinctions for 1933-34, comprising first and higher degrees and diplomas, was thus 562, compared with 635 in 1932-33, 598 in 1931-32, 528 in 1930-31 and 541 in 1929-30. Of the 977 full-time students, 60 came from foreign countries, 136 from the British Empire outside the British Islands, 306 from the British Islands outside a radius of 30 miles from the Imperial College, and the remaining 475 from within that radius.

Considering the difficulties with which the College has been faced during the present quinquennium the last financial year of the College has been as satisfactory as could have been erpected. In spite of the strictest economy, the year's accounts show a deficit of £2,089.

Thanks are expressed to the Dyers' Company for their sixth annual donation of £100 to chemical research work in the College, to the Council of the Institution of Petroleum Technologists for the continuance of the Institution's Scholarship of £40 for award to a student of the Royal School of Mines, to the Gas Light and Coke Co., and Radiation, Ltd., for the continuance of their respective Fellowships in Chemical Technology, to Imperial Chemical Industries. Ltd., the Royal Society, the Gas Light and Coke Co., Radiation, Ltd., the South Metropolitan Gas Co., and the Iron and Steel Industries Research Council for their continued considerable assistance in aid of research in the department of chemical technology.

During the session 46 persons (including 15 research assistants and Fellows) pursued full-time post-graduate study and research in the Department of Chemical Technology; in addition, special lectures were given (i) on "Fuel and Refractories" to five metallurgical students and (ii) on "High Pressure Gas Research" to 15 post-graduate students, three of whom were from outside the College.

### Systematic Researches

Systematic researches were actively continued in all three sections of the department as follows: upon *A* (i) explosions and catalytic reactions at high initial pressures as well as on gaseous combustion generally, with the aid of grants from Imperial Chemical Industries, Ltd., the Gas Light and Coke Co., the South Metropolitan Gas Co., and Radiation, Ltd., (ii) the photographic analyses of the initial stages and detonation in gaseous explosions at ordinary pressures, with the aid of grants from the Royal Society and Imperial Chemical Industries, Ltd., (iii) blast furnace reactions (under the auspices and at the expense of the British Iron and Steel Federation), and (iv) the chemical constitution and maturing of coals, with the aid of grants from the Fuel Research Board, all these being carried out in the Fuel Section under the direction of Professor W. A. Bone; upon *B* (i) heat transmission, (ii) electric precipitation, (iii) dust separation, (iv) flow-through granular beds, and (v) flow-through woven materials, in the Chemical Engineering Section under the direction of Assistant-Professor S. G. M. Ure; and *C* (i) the electrical condition of hot surfaces during the adsorption of gases, (ii) gaseous combustion in electric discharges, (iii) coil ignition, (iv) the catalytic and electrical properties of thin metal films, (v) the examination of metallic and other surfaces by the method of electron diffraction, with the aid of grants from the Royal Society, the Department of Scientific and Industrial Research, Imperial Chemical Industries, Ltd., and Ferranti, Ltd., in the Electrochemistry Section under the direction of Assistant-Professor G. I. Finch. In this connection nine persons gained the Ph.D. and one the M.Sc degrees of London University, and another one the Ph.D. of Zurich University, as a result of their research work or advanced study in the department. Also, in July last, Dr J. Bell was awarded a Beit Fellowship.

Under arrangements with Imperial Chemical Industries, Ltd., special apparatus was designed and installed in a separate room in the department for the study of certain reactions in organic chemistry at pressures of 5,000 atmospheres. Professor Bone and Dr. Newitt were responsible for the running of the high-pressure apparatus, and Professor Thorpe and Dr. Linstead for both the selection of the reactions and the investigation of the products thereof. The apparatus worked so successfully that, in July, Imperial Chemical Industries, Ltd., provided a further capital sum for the installation of a similar apparatus for the investigation of such reactions at pressures between 10,000 and 20,000 atmospheres.

Professor W. A. Bone gave an experimental lecture before the Chemical Society at the Royal Institution, London, on "The Combustion of Hydrocarbons," in October, 1933, and repeated it at the Cambridge University Chemical Society on

December 6. On March 2, 1934, he delivered the James Watt Anniversary Lecture for 1934 before the Greenock Philosophical Society, his title being "Britain's Fuel Problems," and on the following afternoon lectured at Edinburgh University on "The Photographic Analyses of Explosion Flames."

## Experimental Work on Blast Furnaces

In extension of the researches which for some years past he has been directing in the department upon blast furnace reactions for the British Iron and Steel Federation, a sub-committee of the Iron and Steel Industrial Research Council has been appointed, under his chairmanship, to organise and carry out experimental work on selected blast furnaces in different parts of the country with a view to the better application of the results of the laboratory researches in the interests of fuel economy. This sub-committee held four meetings in the department during the year and on May 31 Professor Bone also addressed a conference of blast furnace managers in London upon the work for which a special research fund has been raised by the Federation.

In February and March last, Assistant Professor G. I. Finch delivered a course of four lectures at East London College on "High Speed Cathode Ray Oscillography." On December 15, 1933, a meeting of the Physical Society was held in the Electrochemical Section of the Department, when the electron diffraction laboratory for the study of surface structures was inspected. During the session, exhibitions of electron diffraction and surface structures were made at the annual exhibition of the Physical Society and at the Royal Society and Royal Institution. Assistant Professor S. G. M. Ure continued to act as a member of council, chairman of the publication committee, member of education committee and board of examiners, as well as hon. editor of the Institution of Chemical Engineers, and has been elected a member of technical committee of the Chemical Engineering Section of the World Power Conference. Dr. G. W. Himus has continued to act as a member of council and member of education committee as well as hon. librarian of the Institution of Chemical Engineers. Dr. D. M. Newitt has been appointed an examiner of the Institution, and its Moulton Medal for 1933 was awarded to a former student in the department, Dr. E. H. T. Hoblyn.

## Inorganic and Physical Chemistry

During the session 1933-4 there were no changes in the personnel of the teaching staff in inorganic and physical chemistry in the Department of Chemistry, but Dr. H. F. Harwood, for many years in charge of the advanced analytical laboratory, was appointed reader in the University of London and Assistant Professor in the College. At the same time, Mr. A. A. Eldridge, a member of the staff for a similar period, was promoted to the position of senior lecturer in the Department. The staff welcomed as an honorary colleague Professor Fritz Paneth, formerly of the University of Königsberg. Laboratory accommodation has been put at his disposal and during the session he has been actively engaged in the prosecution of research.

The number of students at work during the year was again very high, the number of undergraduates proceeding to the Associateship and Degree in Chemistry being 149. Students from other departments taking introductory or subsidiary chemistry courses numbered about 200, while there were 39 engaged either in research work or in post-graduate courses on foods and drugs or agricultural chemistry. The pressure on the available space has been great and it may be necessary to limit, in future, the number of those admitted to the Associateship and Degree course. A new feature of the work in the department has been the acquisition of micro-chemical equipment for purposes both of instruction and research. In this development Dr. Janet Matthews, Pedler Research Scholar of the Institute of Chemistry, has been active throughout the year, and the increasing attention paid in the department to the study of micro-chemical methods has been emphasised by two lecture-demonstrations given at the Institute of Chemistry by Professor Briscoe and Mrs. Matthews.

A series of three advanced lectures on "Helium Researches," under the auspices of the University of London, was delivered in the department by Professor Paneth. Other post-graduate lecture courses on "Thermodynamics" and "Photochemistry" were given by Dr. Ellingham and Dr. Emeléus respectively. Research work in the department proceeded steadily on a variety of lines. In connection with the question of the isotopes of hydrogen, a team of workers under the leadership of Professor Briscoe made a general survey, by a precision method, of the density of water from various sources. The results, some of which have already been published, indicate notable differences in the proportion of "heavy" water in the various specimens. In connection with this work the department has acquired plant for the large-scale electrolysis of caustic soda liquors in a cell of new design.

A promising start was made in developing micro-analytical methods and methods of sampling for the examination of air-borne dusts, with special reference to silicosis. Work has been in hand, with the support of the Tin Research and Development Council, on the electro-deposition of tin alloys, while the fruitful collaboration of the Geology and Chemistry Departments in connection with rock analysis continued throughout the year. Among other lines of research in progress, reference may be made to work on chemical fogs, on the atomic weight of "rock" lead, on adsorption, on thermal and photochemical decomposition, on the electro-deposition of nickel, etc. Special mention is made of the work of the two research workers who hold Senior awards. Dr. J. S. Tapp, who holds an 1851 Scholarship from Canada, is engaged on a study of the remarkable inequalities of density which, according to earlier investigations, are exhibited by a substance in the neighbourhood of the critical point. Mr. S. F. Boys, who was awarded a Beit Fellowship in 1933, has been engaged mainly in a theoretical study of optical rotatory power, and the first instalments of his work have been published in the Proceedings of the Royal Society.

## Organic Chemistry

Owing to the retirement of Dr. M. A. Whiteley, the Assistant Professor in the Organic Chemistry Department, after thirty-three years' service, a reorganisation of the staff had to be effected. Dr. G. A. R. Kon has been recommended to the University for a readership in the Department, and the charge of the main laboratory has been placed in the hands of Dr. R. P. Linstead. Dr. H. L. Rydon, the former temporary demonstrator, has been appointed a full-time demonstrator, and Mr. S. H. Harper has been appointed a temporary demonstrator in his place. The work which the Department has been doing under the grant from the Rubber Growers' Research Association still continues; and the two research students who for the past two years have been working for the Research Council of Imperial Chemical Industries, Ltd., have had their grants renewed. The arrangement by which the British Dyestuffs Corporation provides the Department with an assistant has led to the discovery of a new series of important pigment colours—the Phthalocyanines.

The retirement of Dr. Whiteley rendered it possible for her to devote her whole attention to the production of the two supplementary volumes to the existing edition of Thorpe's "Dictionary of Applied Chemistry," the first of which appeared under the joint editorship of Professor Thorpe and Dr. Whiteley earlier in the year. The continuation of the connection between the dictionary and the College has been rendered possible by the temporary allotment of a room in the disused portion of the old administrative offices. Research work has proceeded smoothly and satisfactorily throughout the year, the number of papers published being 26 as against 21 last year.

## Department of Metallurgy

The general work of the Department of Metallurgy was continued on the same lines as previous years. Mr. E. C. Jarrett resigned the post of demonstrator, and Mr. E. W. Yeoman, a graduate of the College in Metallurgy and Chemistry, was appointed in his place. During the session, 44 students (including 8 research assistants) attended, of whom 26 were metallurgical and 10 were either mining or mining geology students. Of the first mentioned, five were associate students in their third-year, and three in their fourth-year courses; while 18 were engaged on special courses and research work. One student from the City and Guilds (Engineering) College took a special metallurgical course in iron and steel and in metallography.

The Associateship of the Royal School of Mines in Metallurgy was gained by three students, all of whom obtained second-class honours, both in the Associateship and in the B.Sc. Engineering (Metallurgy) degree of the University of London. The degree of Ph.D. of the same University was conferred on Mr. O. A. E. Jackson, B.A.Sc. (British Columbia), Mr. D. R. Dhanbhoora, A.R.S.M., B.Sc. (Bom-

bay), and on Mr. J. H. Watson, A.R.S.M. The D.I.C. was awarded to Mr. O. A. E. Jackson for an investigation relating to the extraction and purification of $V_2O_5$ from the complex PbS-ZnS-$V_2O_5$ ores of Broken Hill, Northern Rhodesia; to Mr. D. R. Dhanbhoora for (1) an investigation of the properties of straight carbon steel, quenched in hot metal and tempered; (2) a research on the brittle range of Armco iron; and to Dr. O. B. Westcott (Beit Fellow for Scientific Research) for an investigation of the conditions under which tin may be deposited in a smooth, bright, compact and adherent form. The Edward Matthey prize was awarded to Mr. Clifford Wilson, A.R.S.M., B.Sc., for his work on the nitriding of iron and steel, with special reference to the microstructure.

The practical work in the Bessemer Laboratory was carried out by the fourth-year students under the supervision of Mr. C. W. Dannatt and his staff, and consisted of (1) the recovery of copper from a copper refinery slag by smelting with a low-grade sulphide ore, and (2) the cyanidation of a gold ore. For the former operation, the students carried out complete analyses of the constituents of the charge and calculated the proportions of ore and fluxes required to give a suitable mixture for the furnace. A trial run on a small charge was carried through to determine the smelting losses and to check the calculations before the final campaign was commenced. The operations were satisfactorily completed with the production of a matte carrying 45 per cent. of metallic copper. The gold cyaniding process was performed on two tons of "Blanket" ore, which were subjected to amalgamation followed by cyanidation by the "all-sliming" process, a satisfactory extraction being obtained.

Mr. S. L. Roberton and Mr. J. E. O. Mayne continued their investigations for the Safety in Mines Research Board. Mr. Roberton's work on the corrosion of steel wire in controlled atmospheres in the laboratory has been augmented by a series of exposure tests designed to find the relationship between the amount of corrosion on a wire and the corresponding loss of strength. The specification of a white metal capping alloy necessitated the construction of a simple apparatus for finding the fluidities of molten white metals and the results obtained were of considerable assistance in enabling a suitable alloy to be selected. Mr. Mayne has continued his researches on the impregnation of the fibre cores of colliery winding ropes, with the object of minimising the internal corrosion. He has also commenced an investigation on the protection against corrosion, afforded by various types of lubricant, under conditions which approximate to those of a winding rope in service.

Dr. M. S. Fisher has completed an investigation of the crystal structure of native gold. Dr. W. Branch Pollard, formerly of the Egyptian Government Laboratory, has continued his investigations in connection with the platinum metals. Mr. J. B. W. Hughes, M.A., has undertaken two investigations: (*a*) The recovery of silver from silver residues; (*b*) the recovery of gold, silver and platinum from waste materials and works residues. In both cases, methods have been devised for the economic recovery of the precious metals, the processes being developed from a laboratory to a commercial scale. Mr. Gerard Letendre, B.A. (Montreal), B.Eng. (McGill), has been successful in securing a coating resistant to corrosion by treating copper and brass specimens with aluminium powder. The actual resistance to oxidation and to corrosion at high temperatures has been measured. The influence of crystal boundaries on diffusion has also been studied by cementing single crystals of copper. It was found that a slightly deeper penetration was obtained in the case of unicrystalline material than in the case of polycrystalline copper. Mr. R. L. Hambridge, A.R.S.M., B.Sc., has nearly completed his research on "Intergranular Corrosion in Austenitic Stainless Steels." Mr. C. Wilson, A.R.S.M., B.Sc., who has obtained a grant from the Department of Scientific and Industrial Research, is studying the process for nitriding steel, with special reference to the changes produced in the microstructure.

# The Quaternary System in Cement

## Building Research Station Investigations

THE need for Portland cements having special properties has caused much attention to be devoted to the constitution of Portland cement and to the content of the various compounds present in it.

Building Research Technical Paper No. 16, "The Quaternary System $CaO$-$Al_2O_3$-$SiO_2$-$Fe_2O_3$ in Relation to Cement Technology" (H.M. Stationery Office, 1s. net), discusses the applications to cement technology of the results of an investigation on the system $CaO$-$2CaO.SiO_2$-$5CaO.3Al_2O_3$-$4CaO.Al_2O_3.Fe_2O_3$. The investigation itself has been described in a paper presented to the Royal Society. The results confirm that the conclusions previously drawn from the study of ternary system regarding the constitution of Portland cement are correct and that the compounds formed are $3CaO.SiO_2$, $2CaO.SiO_2$, $3CaO.Al_2O_3$ and $4CaO.Al_2O_3.Fe_2O_3$, together with small amounts of free $CaO$ or of $5CaO.3Al_2O_3$.

The calculation of the compound contents of Portland cements from the analytical composition is considered in relation to the equilibrium existing in the cement clinker at the clinkering temperature. The errors which arise in the calculated compound content due to the failure of the liquid present at the clinkering temperature to maintain equilibrium with the pre-existing solid on cooling are considered. The extent of these errors is calculated for the two separate assumptions that the liquid crystallises independently on cooling and that it fails to crystallise and forms a glass. The error is shown to vary with the composition of the cement. The compositions of the glass phase in the quaternary oxide mixes of Portland cement composition are derived.

The maximum amount of lime which can be combined in a Portland cement under clinkering conditions is discussed. It is shown that in order that free $CaO$ shall not exist in the solid in equilibrium with the liquid at the clinkering temperature it is necessary that the total lime shall not be in excess of that given by the formula.

$$CaO = 2.80\ SiO_2 + 1.18\ Al_2O_3 + 0.65\ Fe_2O_3.$$

The proportion of liquid formed at various burning temperatures is calculated for some mixes of lime, alumina, silica and ferric oxide of Portland cement composition and the results shown to agree with experimental counts on thin sections of the clinkers burnt at these temperatures. The effect of alkalies and magnesia, when present in small amounts, on liquid formation in $CaO$-$Al_2O_3$-$SiO_2$-$Fe_2O_3$ mixes is examined by means of counts on thin sections of clinkers. It is concluded that at temperatures of 1,350-1,450° the increase in liquid content is very roughly equal to the amount of these constituents present. The amount of liquid formed at 1,400° is then calculated for some 150 commercial cements and shown to lie in most cases between 20 and 30 per cent. Experimental counts on thin sections of well-burnt commercial Portland cement clinkers show that from 25-30 per cent. liquid was formed at the clinkering temperature.

The relation between the amount of liquid formed in a cement mix at 1,400° and the ease with which the cement can be burnt is considered, and data given for the free lime contents and liquid contents at 1,400° of 150 commercial cements. It is shown that conditions of burning vary so widely that no relation exists between the free lime content and the amount of liquid formed at 1,400°, but that under commercial conditions the burning of cements in which less than 22 per cent. liquid is formed at 1,400°, to yield a product with a low free lime content, is difficult. The relation of the total lime content of the mix, together with the 1,400° liquid content to the free lime content is also discussed.

IT is reported that the Japanese concern of Sakai K.K. is to erect plant for the manufacture of titanium white. The initial output will amount to 800 tons a year, and it is expected that the plant will start operation in the autumn. The report further states that the manufacturing firm hopes, by its own patented processes, to produce the pigment at prices lower than for zinc oxide.

# British Standards Institution

## Annual Meeting and Luncheon

THE annual meeting of the British Standards Institution was held at the Institution of Mechanical Engineers on May 28, with Dr. E. F. Armstrong, F.R.S., in the chair. In presenting the report, Dr. Armstrong said the year's work showed marked progress in every section. He laid stress on the fact that over 150,000 copies of the British Standard specifications had been sold and distributed during the year, an increase over last year of 23,000, and that there are now 700 committees holding over 1,000 meetings a year, the total membership exceeding 5,000. The accounts showed that the cost of this national work was no more than £25,000 a year; this remarkably economical figure was only attained by the public service rendered by the thousands of men throughout the length and breadth of the land, who gave freely of their valuable time and experience, often at considerable personal inconvenience and cost, to this great national movement.

### Promoting Harmonious Working

It was good to learn that certain misconceptions and misunderstandings regarding the scope of the Institution's work had been under careful review in the chairman's advisory committee during the past year had been satisfactorily dealt with. The committee had also been able to reconcile divergent views regarding the general procedure and this should do much to promote the harmonious working of the organisation. The machinery of the B.S.I. was such that no section of industry need fear that its considered views would not receive the fullest consideration, or that a British Standard specification would be issued in the face of soundly based objection. Moreover, the Institution did not contemplate setting itself up as a testing authority.

Mr. W. Reavell, a past-president of the Institution of Mechanical Engineers, has been elected chairman for the ensuing year. He was one of the first to recognise the necessity for the co-ordination of the work of mechanical standardisation in which the Institution of Mechanical Engineers is taking a leading part.

One of the most important results of the year's work is the increasing success of the inter-imperial co-operation now firmly established. It is difficult to realise in this country that Australia has a standard organisation with 500 committees manned by over 4,500 individuals, and that during the past year 75 industrial standards have been issued and 20 more are out for public criticism. It is gratifying at the same time to learn that of these new standards a large proportion are British Standard specifications endorsed or adapted for Australian use. Each draft is carefully criticised not only throughout Australia but also in each of the Dominions. The fact that it is now possible to secure agreement upon the adoption of a number of uniform specifications is evidence of the effectiveness of this imperial co-operation.

### Good Trade Propaganda

British Standard specifications are good propaganda for British trade and it is to be noted that over 12,000 copies have been sent to diplomatic and trade commissioners in all parts of the world, so that they may maintain complete sets which may be consulted by those desiring information regarding British products, as represented by British Standard specifications. The Government continues its whole-hearted support of the B.S.I. as the national standardising body in this country.

Dr. E. L. BURGIN, Parliamentary Secretary to the Board of Trade, in a speech at the luncheon held subsequent to the annual meeting, congratulated the B.S.I. on the progress it was making, and commented on the activities and economies resulting from the standardisation carried out under its aegis, and particularly the advantage to manufacturers in being able to manufacture to stock, which gives enormous advantage to administration at a time when it is most desirable to take people off the labour market. He testified to the increasing value of the Institution to the Government Departments and said it was a signal pleasure to him to be allowed to bear testimony, were such needed, to the Government's interest in the work. He also touched on the particular value of the imperial aspect of the B.S.I. activities and ended with a note of caution with regard to the essential necessity of preventing standardisation ever going so far as to interfere with invention or research.

A message was received from the Rt. Hon. Stanley Bruce, High Commissioner for Australia, and one of the leading delegates at the Imperial Conference at Ottawa, who was unable to attend the luncheon, regarding his view of the contribution to inter-imperial trade which the B.S.I. and the Standards Association of Australia were making by the adoption of common standards.

The Rt. Hon. G. W. FORBES, Prime Minister of New Zealand, also spoke, and wished the B.S.I success in the great work it was doing, and hoped that the newly-formed Standards Institution in New Zealand would grow in usefulness and take its place with the other standardising bodies in this great Commonwealth of Nations.

Dr. ARMSTRONG, the retiring chairman, and Mr. W. REAVELL, chairman of the general council for the ensuing year, replied in suitable terms.

# Increased Industrial Production

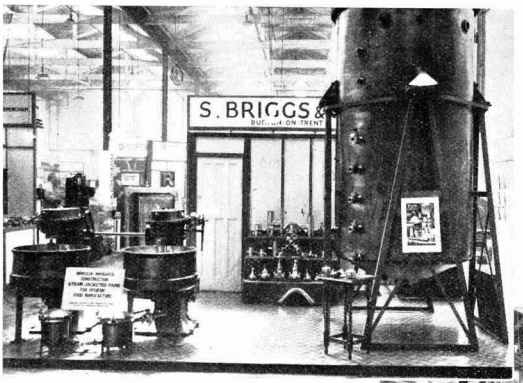
## Higher Index Number for March Quarter

INDUSTRIAL activity in the United Kingdom in the first quarter of 1935, as estimated from the particulars furnished from various sources to the Board of Trade was 1 per cent. greater than in the fourth quarter of 1934 and 6.9 per cent greater than in the first quarter of 1934, the index numbers for the three periods (based on the quarterly average of 1930 =100) being 112.8, 111.7 and 105.5 respectively. According to tables published in the "Board of Trade Journal" of May 23, the figures for chemicals, oils, etc., were 110.2 for the March quarter this year, compared with 105.4 for the whole year 1934. The quarterly figures for chemicals, oils, etc., in 1934 were: March, 107.2; June, 105.3; September, 103.2; December, 105.9.

Manufacturing production, as indicated by the index, was greater in the first quarter of this year than in any preceding quarter, the provisional figure showing an increase of 1 per cent. over that for the fourth quarter of 1934 and an increase of 8.3 per cent. compared with the March quarter of 1934. Each of the group indices for the March quarter of 1935 shows an improvement compared with the corresponding quarter of 1934, with the exception of that for the mines and quarries group, the output of coal being less in the later period by about 2½ per cent. The principal increases were for non-ferrous metals (36 per cent.), engineering and shipbuilding (19½ per cent.), and building materials and building (11 per cent.). The iron and steel group showed an advance of 3.2 per cent., the chemicals, oils, etc., group an increase of 2.8 per cent., and the food, drink and tobacco group an increase of nearly 2 per cent. So far as the information is at present available, the index for the leather and boots and shoes group shows an increase of more than 6 per cent. For textiles, as a whole, production was slightly better in the March quarter of this year than in the corresponding period of 1934, the increased output in the silk and artificial silk trade more than off-setting some slackness in the cotton and woollen industries.

Of the miscellaneous industries not specified in the groups there was an increased output of pianos in the March quarter of 1935 as compared with a year earlier, and considerably larger quantities of rubber were taken by the using industries. In order to publish the results as early as possible, it has been necessary to include certain provisional figures covered by the calculation. It is not, however, anticipated that the replacement of these provisional figures, when definite data become available, will materially alter the index numbers for the various groups; any revision that may be necessary will be made when the figures for the following quarter are published. The sections of industry which are covered by the information at present received represent over 70 per cent. of the total manufacturing and mining activity of the United Kingdom.

# Chemical Plant at the British Industries Fair, Birmingham.

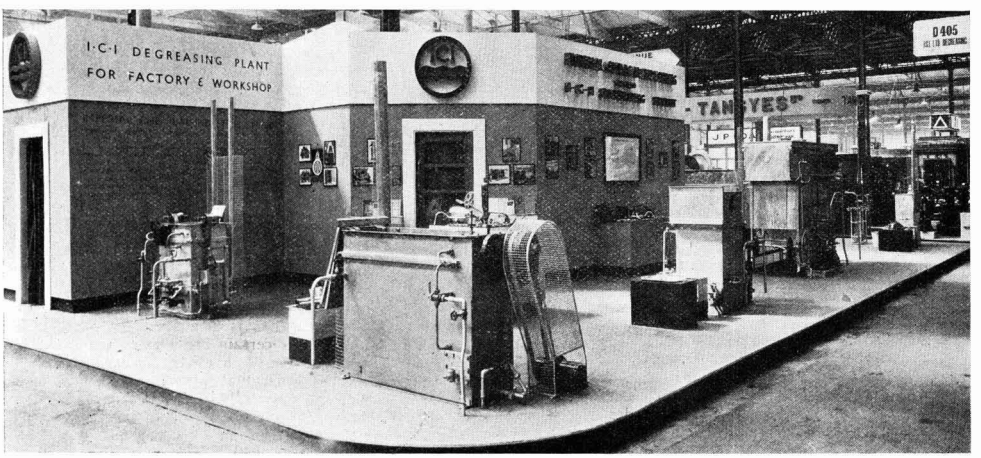



Chemical plant constructed in welded copper and also welded aluminium is a speciality of S. Briggs and Co., Ltd., of Burton-on-Trent, who exhibited vessels equipped with agitating gear.


Counterflow roller-bearing vibratory screens, which are motor driven through Texropes, were an outstanding feature at the stand of Niagara Screens (Great Britain) Ltd., of Enfield, Middlesex.


Equipment for weighing and counting was displayed at the stand occupied by W. and T. Avery, Ltd., of Birmingham, who also make other equipment for chemical works use, such as automatic powder blending machines.

Degreasing plant, in which non-inflammable solvents are employed to remove oil and grease from metal parts prior to the application of enamel or lacquer or electroplating, was displayed by Imperial Chemical Industries Ltd.



# Chemical Warfare

## Four Types of Gases Possible

AN interesting survey of the history of chemical warfare, the dangers of poison gases and methods of protection against gas raids was given by Mr. C. le S. Metcalfe, military instructor on chemical warfare, when speaking at Heswall, Cheshire, on May 29.

In regard to the history of gas in warfare, Mr. Metcalfe said that the Hague Convention of 1899 resulted in the prohibition of projectiles carrying noxious or choking gases, but in 1915, when the Germans used poison gas against us, we, in our stupid interpretation of the Hague Convention, decided that the Germans were not breaking this convention because they were not using projectiles, but were merely liberating clouds of gas from cylinders. It was important to note, too, that it took us five months to retaliate, because our capital industry was not organised. Looking at the post-war history of gas, we found that at the Versailles Conference conditions regarding gas were laid down, and at the Washington Conference in 1921, its use in chemical warfare was prohibited. In 1931 came the Disarmament Conference, and after a series of discussions they came to the conclusion that it was impossible to stop chemical warfare so long as there were countries making lethal gas in the ordinary course of their daily life.

Gases used in warfare were divided into four groups: Choking, tear, nose and blister gases. The first group included such gases as chlorine and phosgene used in cloud form. The tear gas was virtually harmless except that it made people cry and rendered them temporarily inactive. The third type was unlikely to be used as it was difficult to handle and dispersed very quickly; in this group were included the poison smokes which looked something like particles of dust as seen in a ray of sunlight. The fourth group was the worst and included the liquid gases like "mustard gas" and "lewisite." Mustard gas was a dark brown, oily liquid with a smell of garlic, while lewisite had a smell of geraniums, and thirty drops of it would cause death from arsenical poisoning. The only protection against them was to stay indoors, for both liquids would go through the stoutest boots in anything from five to fifteen hours and through the thickest serge coat in fifteen minutes.

# Epsom Salt Manufacture in India

## New Works Opened at Mithapur

NEW works for the manufacture of Epsom salt at Mithapur, near Port Okha, Kathiawad, India, were opened last month by Sir V. T. Krishnamachariar, Dewan of Baroda.

The Okha Salt Works, Ltd., have been manufacturing salt for some eight years, and at the opening ceremony for this subsidiary, Mr. Kapilram Vakil, managing director, pointed out that their works were the first to place Indian salt on the Calcutta market. The Okha Salt Works, he said, were the largest manufacturers of sea salt in India. Their programme for next season was to produce 100,000 tons of salt and gradually to increase the output so that they would be producing at the rate of 300,000 tons inside the next five years. The second stage of development was to be inaugurated that day with the opening of works for Epsom salt.

The first subsidiary industry, the manufacture of magnesium chloride, started by Mr. B. S. Lalkaka and his late partner, Sir Rustom Vakil, had already successfully captured international markets, and regular exports were made to England and other European countries. Manufacture of other marine products would follow the Epsom salt in rapid succession. The ultimate goal of the Okha Salt Works was the establishment of the key industry of soda ash for which Okhamandal was better situated than the Punjab. Every step in Okha was a rational step towards the foundation of the alkali industry in India.

Mr. B. S. Lalkaka, a managing partner of the Magnesium Works, paid a tribute to the great efforts made by Mr. Kapilram Vakil in the establishment of the big salt works, and of the subsidiary works dependent upon, and utilising the waste products from the salt industry.

Sir V. T. Krishnamachariar, in his reply, congratulated the pioneers of the Okha Salt Works on having built up a market in Bengal despite keen competition. Their success, he observed, was due to the excellent quality of the salt turned out in the factory. He was glad to learn that the magnesium chloride works were proving that they, too, could face foreign competition. They had just opened, he said, the second subsidiary works in the programme for the manufacture of Epsom salt. He had no doubt whatsoever that the hopes entertained on behalf of this new enterprise would be realised. In this connection the speaker paid a tribute to the technical knowledge and organising capacity displayed by Mr. Vakil, whose energy and resource, he observed, had won him the appreciation of the Baroda Government. He expressed, in conclusion, the Government's high appreciation of the work for industrial development being done in Okhamandal.

The technical work in connection with the planning of these works has been in the hands of Mr. Kapilram Vakil. Mr. Vakil is an M.Sc. (Manchester University), and a member of the Institution of Chemical Engineers. The English advisor to the company, who has been in close association with Mr. Vakil in this work is Mr. J. Arthur Reavell, M.I.Chem.E., M.I.M.E., of London. The new plant, for which the contracts were placed in England, embodies several unique features and is complete with all the latest automatic recording instruments.

# The Rubber Exhibition

## Transferred from London to Manchester

THE Rubber Exhibition, after a successful run of six months at the Science Museum, London, has been transferred to the Central Library, Manchester, where it was formally opened on Tuesday by Councillor Miss Kingsmill Jones, chairman of the libraries committee, in the absence of the Lord Mayor, Alderman S. Woollam, who was indisposed. Miss Kingsmill Jones, in declaring the exhibition open, said rubber played an important part in Manchester industry and homes. She thought it was true to say that within fifty miles every article of which rubber was a component part was manufactured. In her connection with the public health and libraries departments she had especially been struck by the importance of rubber flooring in eliminating noise. One thing she hoped the exhibition might do was to suggest new opportunities of employment to young people who came to see it.

Mr. Robert Stewart, chairman of the Rubber Growers' Association, who presided at the opening, said it was appropriate that the exhibition should be transferred to Manchester. The collection of the wide range of exhibits had been made possible through the active assistance of the Rubber Research Institute of Malaya, the Ceylon rubber research scheme, and the London Advisory Committee of the Imperial Institute, on behalf of the plantation section. The British rubber manufacturers and a number of leading scientists in the industry had collaborated.

Colonel J. Sealy Clarke, until recently president of the Rubber Research Association, spoke of the close connection of Manchester with the rubber industry. The city was, he said, perhaps the most important centre of the industry, and had made notable contributions to the advancement of our knowledge of rubber. The "Joule effect," a remarkable physical property of rubber demonstrated in the exhibition, was a phenomenon first noticed by a Manchester scientist. Still more recently the work carried out by Mr. S. J. Peachey in the Manchester College of Technology had resulted in the discovery of an important organic accelerator which, in its day, found wide application in rubber manufacture, and had given us also the derivatives of rubber which under the name of "Duroprene" had provided the chemical industry with a material for the protection of plant against chemical corrosion. In education, as in research, the activities of the Newton Heath Technical School and the Manchester public libraries testified to the fact that Manchester was alive to the necessity of using every branch of knowledge in keeping its industries abreast of modern requirements. No more fitting place than the Manchester Central Library could be found for an exhibition dealing with an industry with which Manchester had been so prominently and successfully identified for over a century, and one whose latent possibilities were only now beginning to be visualised.

# Personal Notes

CAPTAIN VICTOR SHEPHERD has been appointed general sales manager of the Triplex Safety Glass Co., Ltd., as from June 1.

MAJOR F. A. FREETH, joint research manager of Imperial Chemical Industries, Ltd., addressed the Liverpool Rotary Club, on May 30, on "Scientists and Mechanisation."

SIR ROBERT HADFIELD celebrated on June 1 the sixtieth anniversary of his association with Hadfields, Ltd. He joined his father in the business on June 1, 1875.

MR. SYDNEY HARVEY, managing director of G. A. Harvey and Co. (London), Ltd., has joined the board of Smith and McLean, Ltd., a subsidiary of Colvilles, Ltd.

THE ENGAGEMENT is announced between Harry Blech, of 20 Marlborough Hill, St. John's Wood, London, and Enid Marion Lessing, daughter of Dr. and Mrs. R. Lessing, of 13 Chesham Place, London.

SIR ALEXANDER GIBB was elected president of the Institute of Welding at the twelfth annual general meeting, in London, on Monday. Sir James Lithgow, Sir William Larke, and Mr. Ralph Freeman have become vice-presidents.

PROFESSOR PETER DEBYE, director of the Institute of Physics, Leipzig, will, according to the "Oxford University Gazette," receive the honorary degree of D.Sc. at the encænia on June 26.

PROFESSOR V. C. ILLING, Professor of Petroleum Technology at the Imperial College of Science, addressed a luncheon of the Oil Industries Club, on Tuesday, on "Prospects of Oil in Great Britain."

LORD MELCHETT revisited his old constituency of East Toxteth, Liverpool, on May 29, when he opened the new Zionist Communal Centre at Princes Road, which he described as an extension of the unbreakable unity of spirit of the Jewish people.

ENGINEER-CAPTAIN J. FRASER SHAW and Dr. J. G. King were presented with the gold medal of the Institution of Gas Engineers on Tuesday for a joint paper on "Recent Experiments at the Fuel Research Station upon the Production of Solid Smokeless Fuel," which they presented at the annual meeting of the Institution last year.

MR. ALBERT HENNING, of Woodford, died on May 23, aged 75. Mr. Henning established the business of Hedley and Co. (Leytonstone), Ltd., makers of anæsthetics and other halogen derivatives of the hydrocarbons, in 1899, and at the time of his death was chairman and managing director. Mr. Henning was well known as the author of various treatises on hydrocarbons.

COLONEL W. MONCRIEFF CARR, engineer, general manager and clerk of the Stretford Gas Board, was elected president at the 72nd annual meeting of the Institution of Gas Engineers, held at the Institution of Civil Engineers on Tuesday. Mr. Stephen Lacey, controller of gas sales, Gas Light and Coke Co., and Mr. H. C. Smith, chief engineer of the Tottenham Gas Co., were elected vice-presidents.

SIR F. GOWLAND HOPKINS, Professor E. P. Cathcart, and Professor E. Mellanby are among those on the new advisory committee which has been appointed by the Minister of Health to inquire into the question of diet and nutrition of the people of this country. Communications on the subject should be addressed to the secretary, Mr. W. J. Peete, Ministry of Health, London, S.W.1.

MR. REGINALD GEORGE MARIUS DELPECH, founder and sales director of the Triplex Safety Glass Co., Ltd., died suddenly in London on May 29, after a heart attack, at the age of 54. He had just returned from a sea trip and was at his office the previous day in apparently good health. He was a pioneer motorist and was the founder of the safety glass industry, which he introduced into this country some 23 years ago by forming the Triplex Safety Glass Co., Ltd. The study of business conditions took him to North and South America and most countries in Europe. He was a liveryman of the Glaziers' Company, a Fellow of the Royal Society of Arts, a keen golfer, and one of the best-known personalities in the motor industry. He was also a director of other companies connected with the motor and glass industries. The funeral was at St. Marylebone cemetery, East Finchley, on June 1.

SIR CHARLES MALLET, upon whom Oxford University is to confer the honorary D.Litt., married Margaret, daughter of Sir Henry Enfield Roscoe, the chemist.

MR. PHILLIP E. WARHURST, divisional manager of I.C.I. (Lime), Ltd., Buxton, died suddenly at his home at Chapel-en-le-Frith, near Buxton, on Monday, at the age of forty-six.

## Death of Sir Harold Boulton

### A Former President of Associated Tar Distillers

SIR HAROLD BOULTON died in a London hotel on June 1, at the age of 75, after a long illness. Sir Harold was educated at Harrow and Oxford. In 1881 he joined his father, Sir Samuel Boulton, in the firm of Burt, Boulton and Haywood, who were tar distilling and creosoting in England and France. The firm had then acquired Perkin's celebrated patent (with the alizarine works of Brooke, Simpson and Spiller) and always retained an interest in this process when sold to the larger firm. Continental creosoting waned as the railways carried on their own work, and in 1886 new tar works were started in Belgium, France and Spain.

In 1903, Sir Harold Boulton started, with his father, the Dominion Tar and Chemical Co., Nova Scotia, visiting there once or twice a year till 1918, when he became chairman, as he also was of the parent company 1917-1924. In 1929 the Canadian works, consisting of six distilleries, eleven creosoting plants, and five depots throughout Canada, were disposed of to a Canadian Group. He was president of the Associated Tar Distillers for several years, a member of council of the Association of British Chemical Manufacturers, and president of the British Wood Preserving Association.

## King's Birthday Honours

### Order of Merit for Sir F. G. Hopkins

A NUMBER of names well known in the world of chemistry appeared in the list of Birthday and Jubilee Honours published on Monday. A barony was conferred upon Sir GEORGE MAY, who has been chairman of the Import Duties Advisory Committee since its appointment in 1932. He was called upon by the Government in 1931 to be chairman of the "Axe" committee, which recommended savings of £96,000,000 in national expenditure..

Sir FREDERICK GOWLAND HOPKINS received the Order of Merit. Sir Frederick is the president of the Royal Society, and has won many distinctions during his career. His name became famous in connection with the discovery of vitamins. He was appointed president of the Royal Society in 1931, and two years later he was chosen president of the British Association. Sir Frederick has been honoured by many universities, and in 1929 he was awarded the Nobel prize for medicine. He is Professor of Biochemistry at Cambridge University.

Dr. FRANK STURDY SINNATT, Director of the Fuel Research Station at Greenwich, was honoured with the C.B. (Order of the Bath) in recognition of his services to the Department of Scientific and Industrial Research.

Professor JOSEPH BARCROFT, F.R.S., Professor of Physiology at Cambridge University, received a knighthood. He once risked his life to test the comparative effects of hydrocyanic gas on man and dog. He went into a lethal chamber, breathed in the gas for about two minutes, and emerged unharmed.

Dr. PATRICK PLAYFAIR LAIDLAW, F.R.S., another new knight, is pathologist to the Medical Research Council, and was honoured for his distinguished service to medical science. He was one of three scientists who succeeded in isolating the germ of influenza in 1933.

Dr. NEVIL VINCENT SIDGWICK, F.R.S., recently elected president of the Chemical Society, received the C.B.E. for his service to science. He is Reader of Chemistry at Oxford University.

Dr. WILLIAM FLEMING BEWLEY, who also received the C.B.E., is director of the research station of the Ministry of Agriculture at Cheshunt.

# Continental Chemical Notes

### Finland

THE FINNISH SPIRIT MONOPOLY is reported to be building a new factory in the province of Viborg.

### Italy

A SUMACH-EXTRACTION FACTORY has been started up at Palermo by the firm of Giorgio Antivalle.

### Estonia

TYPEWRITER RIBBON MANUFACTURE is reported to be contemplated by the "Estotrikoo" concern (tricotage manufacturers).

### Holland

THE BREDA RAYON CONCERN discloses a net profit of 300,000 florins for last year and resumes dividend payments with a distribution of 3 per cent.

### Czecho-Slovakia

THE OSSIG CHEMICAL UNION maintained its share dividend at 10 per cent. for 1934 and proposes to increase its capital from 50 up to 75 million kronen.

### Russia

IT IS PROPOSED TO BUILD a petroleum cracking plant near Ufa, in the Urals, with an initial throughput has been com-

CELLULOSE ACETATE CINEMA FILM MANUFACTURE has been commenced at the Ochta Chemical Combinate

### Poland

IT IS OFFICIALLY ANNOUNCED that paraffin can no longer be freely exported from Poland; exports must go through the "Pen" export organisation.

### Sweden

THE BOLIDEN SMELTERY, at Ronnskar, is isolating pure sulphur from the roasting gases on a moderate scale (at rate of 10,000 tons annually), but expects to increase output to 80 to 100 tons daily.

### Germany

THE STATE ALCOHOL MONOPOLY is undertaking extensive enlargement of the dehydrating plant at Nordhausen in order to cope with the increased demand for alcoholic motor spirit.

DEVELOPMENT PLANS announced by the Salzdetfurth concern include an anhydrous magnesium sulphate plant and an enlarged sulphate factory. Increased sales of bromide are also reported, 92,000 kg. having been sold in the first four months of 1935 as against 64,000 kg. in 1934.

A 30 PER CENT. SAVING IN TIME and much simplification in cuprammonium rayon manufacture can be effected, according to E. Schurz ("Chem. Zeitung," May 29), if copper hydroxide is incorporated with wood pulp during the actual pulping process. The resulting "copper hydroxide-wood cellulose" can be despatched in bale, roll or flake form, and is said to retain its solubility in ammonia for an indefinite period.

# Far Eastern Chemical Notes

### Manchuria

AMMONIUM SULPHATE MANUFACTURE, according to a Japanese process, has been commenced by the Mandshu Kagaku Kogyo K.K., with a commencing daily output of 500 tons.

### Dutch Indies

THE RENAULT CONCERN have opened a new colour factory, bringing the number of works in this branch in the colony up to four.

### China

SIX SULPHUR DYESTUFFS FACTORIES are now operating in Shanghai, Tientsin and the province of Shantung. In place of the phenol hitherto used as the starting point for sulphur black, several firms have gone over to new processes utilising monochlorbenzene.

### French Indo-China

AMMONIUM NITRATE EXPLOSIVE is to be manufactured under a concession granted to the Societé Omnium Indochinois. The declared composition is 84 per cent. ammonium nitrate, 12 per cent. dinitrotoluol and 4 per cent. calcium silicide.

### Japan

OLEUM TO THE EXTENT OF 10 TONS DAILY is now produced at the Takaoka factory of Nippon Soda K.K.

SILK TEXTILE ASSISTANTS to the extent of 30 tons per month are now being turned out by Asahi Glass K.K.

THE NEW OSAFA FACTORY of Empun Toryo K.K. has a monthly output of 500 tons litharge and red lead.

THE HYDROGEN PEROXIDE PRODUCING CAPACITY of Edogawa Kogyosho is to be expanded to 100 tons per month.

INCREASED CAUSTIC SODA PRODUCTION, bringing up the monthly output to 140 tons, is reported by Osaka Sarashiko K.K.

CONCENTRATED SULPHURIC ACID MANUFACTURE (daily output 30 tons) has been taken up at the Otsu factory of the Asahi Bemberg Co.

ARRANGEMENTS FOR PHTHALIC ANHYDRIDE MANUFACTURE by Nippon Senryo Seizo K.K. are not proceeding according to plan, and imports have increased considerably.

BARIUM CHLORIDE MANUFACTURE is now being undertaken by Saito Soda K.K. Other producers of barium chloride are Sakai Kagaku Kogyo and Nippon Kagaku Kogyo.

# Death of Mr. D. N. Dunlop

## His Work for the World Power Conference

MR. D. N. DUNLOP, O.B.E., chairman of the international executive council of the World Power Conference, died on May 30, after a short illness. While he rendered great and enduring services to the British electrical industry, it is chiefly as the founder of the World Power Conference that he will be remembered in wider circles. Not many years after the war, he conceived the idea that the engineers and scientists, whose inventions had been so powerful in destruction, should lend their great talents in the rebuilding of the world. He succeeded in enlisting the support of the Council of the British Electrical and Allied Manufacturers' Association, and they ensured the necessary financial backing. On June 30, 1924, the Prince of Wales opened the first World Power Conference, in the presence of representatives of about forty countries. It was noteworthy that, for the first time at any private international conference of importance since the war, Germany and the U.S.S.R. were invited to attend and fully participated.

The World Power Conference has, under Mr. Dunlop's guidance, become a highly important international body with forty-nine member-countries and a central office in London. From the start, Mr. Dunlop envisaged something much more than a technical organisation of the producers and consumers of power and fuel. He saw in it the meeting-place between scientists and engineers, on the one hand, statesmen and economists on the other. He placed an even higher value upon the opportunities for personal encounters which the World Power Conference provided than upon the great technical results enshrined in more than forty volumes of Transactions.

Mr. Dunlop was chairman of the international executive council and of the British National Committee of the World Power Conference from their formation up to the date of his death. Mr. Dunlop was an officer or member of committees too numerous to mention, including the Permanent Committee on Electric Questions of the League of Nations.

The funeral took place at Golders Green Crematorium, on Monday, in the presence of a large congregation representative of his many interests. He was a widower and leaves a son and two daughters.

# Chemical and Allied Stocks and Shares

## Current Quotations

THE following table shows this week's Stock Exchange quotations of chemical and allied stocks and shares compared with those of last week. Except where otherwise shown the shares are of £1 denomination.

| Name | June 4. | May 28. |
|---|---|---|
| Anglo-Persian Oil Co., Ltd. Ord. | 63/9 | 62/6 |
| ,, 8% Cum. Pref. | 37/3 | 37/6 |
| ,, 9% Cum. Pref. | 38/- | 38/- |
| Associated Dyers and Cleaners, Ltd. Ord. | 1/10½ | 1/10½ |
| ,, 6½% Cum. Pref. | 4/8¼ | 4/8¼ |
| Associated Portland Cement Manufacturers, Ltd. Ord. | 49/- | 49/- |
| ,, 5½% Cum. Pref. | 27/9 | 27/9 |
| Benzol & By-Products, Ltd. 6% Cum. Part Pref. | 2/6 | 2/6 |
| Berger (Lewis) & Sons, Ltd. Ord. | 61/3 | 61/3 |
| Bleachers' Association, Ltd. Ord. | 5/- | 5/- |
| ,, 5½% Cum. Pref. | 6/3 | 6/3 |
| Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.) | 21/3 | 21/3 |
| Boots Pure Drug Co., Ltd. Ord. (5/-) | 48/3 | 48/3 |
| Borax Consolidated, Ltd. Pfd. Ord. (£5) | 96/3 | 96/3 |
| ,, Defd. Ord. | 16/- | 15/6 |
| ,, 5½% Cum. Pref. (£10) | 225/- | 225/- |
| ,, 4½% Deb. (1st Mort.) Red. (£100) | £109 | £109 |
| ,, 4½% 2nd Mort. Deb. Red. (£100) | £103 | £103 |
| Bradford Dyers' Association, Ltd. Ord. | 8/9 | 8/5½ |
| ,, 5% Cum. Pref. | 10/11½ | 11/6¾ |
| ,, 4% 1st Mort. Perp. Deb. (£100) | £83/10/- | £83 |
| British Celanese, Ltd. 7% 1st Cum. Pref. | 26/9 | 27/- |
| ,, 7½% Part. 2nd Cum. Pref. | 20/6 | 19/6 |
| British Cotton & Wool Dyers' Association Ltd. Ord. (5/-) | 5/- | 5/- |
| ,, 4% 1st Mort. Deb. Red. (£100) | £92 | £92 |
| British Cyanides Co., Ltd. Ord. (2/-) | 3/- | 3/- |
| British Drug Houses, Ltd. Ord. | 18/9 | 18/9 |
| ,, 5% Cum. Pref. | 22/6 | 22/6 |
| British Glues and Chemicals, Ltd. Ord. (4/-) | 4/3 | 4/3 |
| ,, 8% Pref. (Cum. and Part.) | 26/10½ | 26/10½ |
| British Oil and Cake Mills, Ltd. Cum. Pfd. Ord. | 47/6 | 46/10½ |
| ,, 5½% Cum. Pref. | 26/3 | 26/3 |
| ,, 4½% First Mort. Deb. Red. (£100) | £108/10/- | £108/10/- |
| British Oxygen Co. Ltd. Ord. | 94/4½ | 95/- |
| ,, 6½% Cum. Pref. | 31/10½ | 31/10½ |
| British Portland Cement Manufacturers, Ltd. Ord. | 85/- | 85/- |
| ,, 6% Cum. Pref. | 29/6 | 29/- |
| Bryant & May, Ltd. Pref. | 67/6 | 67/6 |
| Burt, Boulton & Haywood, Ltd. Ord. | 20/- | 19/4½ |
| ,, 7% Cum. Pref. | 27/6 | 27/6 |
| ,, 6% 1st Mort. Deb. Red. (£100) | £105/10/- | £105/10/- |
| Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5) | 105/- | 105/- |
| ,, 4% 1st Mort. Deb. Red. (£100) | £96/10/- | £96/10/- |
| Calico Printers' Association, Ltd. Ord. | 8/9 | 9/4½ |
| ,, 5% Pref. (Cum.) | 15/7½ | 15/7½ |
| Cellulose Acetate Silk Co., Ltd. Ord. | 13/1½ | 13/1½ |
| ,, Deferred (1/-) | 2/10½ | 2/10½ |
| Consett Iron Co., Ltd. Ord. | 7/3 | 7/3 |
| ,, 8% Pref. | 20/- | 23/9 |
| ,, 6% First Deb. stock, Red. (£100) | £100/10/- | £100/10/- |
| Cooper, McDougall & Robertson, Ltd. Ord. | 36/3 | 36/3 |
| ,, 7% Cum. Pref. | 29/6 | 29/- |
| Courtaulds, Ltd. Ord. | 58/9 | 56/9 |
| ,, 5% Cum. | 26/3 | 26/3 |
| Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre-Pref. | 25/- | 25/- |
| ,, Cum. 6% Pref. | 28/9 | 28/9 |
| ,, 6½% Cum. Pref. | 28/9 | 28/9 |
| ,, 7½% "A" Cum. Pref. | 30/7½ | 30/7½ |
| Distillers Co., Ltd. Ord. | 93/- | 94/- |
| ,, 6% Pref. Stock Cum. | 32/- | 32/- |
| Dorman Long & Co., Ltd. Ord. | 16/10½ | 18/1½ |
| ,, Prefd. Ord. | 16/- | 16/10½ |
| ,, 6½% Non-Cum. 1st Pref. | 20/- | 20/6 |
| ,, 8% Non-Cum. 2nd Pref. | 16/- | 18/1½ |
| ,, 4% First Mort. Perp. Deb. (£100) | £102/10/- | £102/10/- |
| ,, 5% 1st Mort. Red. Deb. (£100) | £105 | £105 |

| Name | June 4. | May 28. |
|---|---|---|
| English Velvet & Cord Dyers' Association, Ltd. Ord. | 4/4½ | 4/4½ |
| ,, 5% Cum. Pref. | 7/6 | 7/6 |
| ,, 4% First Mort. Deb. Red. (£100) | £70 | £70 |
| Fison, Packard & Prentice, Ltd. Ord. | 38/9 | 38/9 |
| ,, 7% Non-Cum. Pref. | 30/- | 30/- |
| ,, 4½% Debs. (Reg.) Red. (£100) | £107 | £107 |
| Gas Light & Coke Co. Ord. | 27/9 | 27/9 |
| ,, 3½% Maximum Stock (£100) | £87/10/- | £87/10/- |
| ,, 4% Consolidated Pref. Stock (£100) | £106/10/- | £106/10/- |
| ,, 3% Consolidated Deb. Stock, Irred. (£100) | £90/10/- | £90/10/- |
| ,, 5% Deb. Stock, Red. (£100) | £117/10/- | £117/10/- |
| ,, 4½% Red. Deb. Stock (1960-65) (£100) | £113/10/- | £113/10/- |
| Goodlass Wall & Lead Industries, Ltd. Ord. (10/-) | 12/6 | 12/6 |
| ,, 7% Prefd. Ord. (10/-) | 13/1½ | 13/1½ |
| ,, 7% Cum. Pref. | 27/6 | 27/6 |
| Gossage, William, & Sons, Ltd. 5% 1st Cum. Pref. | 24/4½ | 24/4½ |
| ,, 6½% Cum. Pref. | 28/9 | 28/9 |
| Imperial Chemical Industries, Ltd. Ord. | 35/3 | 35/3 |
| ,, Deferred (10/-) | 8/7½ | 8/7½ |
| ,, 7% Cum. Pref. | 33/9 | 33/9 |
| Imperial Smelting Corporation, Ltd. Ord. | 15/- | 15/- |
| ,, 6½% Pref. (Cum.) | 23/1½ | 23/1½ |
| International Nickel Co. of Canada, Ltd. Cum. | $28½ | $29¼ |
| Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5) | 95/- | 95/- |
| ,, 4% Mort. Deb. Red. (£100) | £98/10/- | £98/10/- |
| Laporte, B., Ltd. Ord. | 107/6 | 110/- |
| Lawes Chemical Manure Co., Ltd. Ord. (1/-) | 5/7½ | 5/7½ |
| ,, 7% Non-Cum. Part Pref. (10/-) | 10/- | 10/- |
| Lever Bros. Ltd. 7% Cum. Pref. | 32/9 | 32/9 |
| ,, 8% Cum. "A" Pref. | 33/3 | 33/6 |
| ,, 20% Cum. Prefd. Ord. | 78/9 | 78/9 |
| ,, 5% Cons. Deb. (£100) | £109/10/- | £109 |
| ,, 4% Cons. Deb. (£100) | £105 | £105 |
| Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-) | 1/3 | 1/3 |
| ,, 6% 2nd Pref. (5/-) | 6d. | 6d. |
| ,, 6% 1st Debs. (Reg.) | 58/- | 58/- |
| Major & Co., Ltd. Ord. (5/-) | 7½d. | 7½d. |
| ,, 8% Part. Prefd. Ord. (10/-) | 9d. | 9d. |
| ,, 7½% Cum. Pref. | 1/6¾ | 1/6¾ |
| Mond Nickel Co., Ltd. 5½% Mort. Deb. Red. (£100) | £103 | £103 |
| Pinchin, Johnson & Co., Ltd. Ord. (10/-) | 41/6 | 42/6 |
| ,, 7% Cum. Pref. | 33/1½ | 33/1½ |
| Potash Syndicate of Germany (Deutsches Kalisyndikat G.m.b.H.) 7% Gld. Ln. Sr. "A" and "B" Rd. | 64/6 | 64/6 |
| Reckitt & Sons, Ltd. Ord. | 113/9 | 115/- |
| ,, 4½% Cum. 1st Pref. | 25/- | 25/- |
| Salt Union, Ltd. Ord. | 41/3 | 41/3 |
| ,, Pref. | 45/- | 45/- |
| ,, 4½ Deb. (£100) | £111/10/- | £111/10/- |
| South Metropolitan Gas Co. Ord. (£100) | £132/10/- | £132/10/- |
| ,, 6% Irred. Pref. (£100) | £149/10/- | £149/10/- |
| ,, 4% Pref. (Irred.) (£100) | £106/10/- | £106/10/- |
| ,, Perpetual 3% Deb. (£100) | £89/10/- | £89/10/- |
| ,, 5% Red. Deb. 1950-60 (£100) | £115/10/- | £115/10/- |
| Staveley Coal & Iron Co., Ltd. Ord. | 43/1½ | 43/9 |
| Stevenson & Howell, Ltd., 6½% Cum. Pref. | 26/3 | 26/3 |
| Triplex Safety Glass Co., Ltd. Ord. (10/-) | 72/6 | 72/6 |
| Unilever, Ltd. Ord. | 30/7½ | 29/4½ |
| ,, 7% Cum. Pref. | 29/9 | 29/9 |
| United Glass Bottle Manufacturers, Ltd. Ord. | 41/- | 39/6 |
| ,, 7½% Cum. Pref. | 33/- | 33/- |
| United Molasses Co., Ltd. Ord. (6/8) | 20/7½ | 20/7½ |
| ,, 6% Cum. Pref. | 25/- | 25/- |
| United Premier Oil & Cake Co., Ltd. Ord. (5/-) | 5/- | 4/9 |
| ,, 7% Cum. Pref. | 23/9 | 23/9 |
| ,, 6% Deb. Red. (£100) | £102 | £102 |

# Weekly Prices of British Chemical Products

## Review of Current Market Conditions

CONDITIONS in the general chemical market have remained unchanged during the past week, with no variation in prices. Unless otherwise stated, the prices given below cover fair quantities net and naked at sellers' works.

LONDON.—Chemical markets have received a satisfactory volume of inquiry, and the amount of business, considering all the circumstances, has been fairly substantial. Prices continue firm, with lead and copper products quoted at slightly higher prices owing to the increase in the price of ther aw metals.

MANCHESTER.—Reports as to conditions on the Manchester chemical market during the past week have been variable. Whilst some sellers have experienced fair bookings for delivery over the next few months, in other instances buying interest has been restricted and not a great volume of business, either for near or more distant positions, has been reported. To some extent it is believed that this is due to the proximity of the Whitsun holidays, which are likely to have their usual quieting effect on both new business and deliveries to users in this district over a large part of next week, in spite of the efforts that continue to be made to confine the stoppage to Monday. The market for chemicals is steady in most cases. Among the by-products, pitch continues to ease, and somewhat cheaper offers of pyridine are also being made, but in other cases values are steady to firm, with higher quotations being indicated for anthracene oil.

SCOTLAND.—Business has been quite brisk in the Scottish heavy chemical market during the past week.

### General Chemicals

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

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech, 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £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.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—11¾d. per lb. less 5%. MANCHESTER: 11¾d.

ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 9d. per gal.; 98/100%, 2s. to 2s. 2d.

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

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

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

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

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £54 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. 0¾d. per lb.

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

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

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

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

AMMONIUM BICHROMATE.—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.—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, 6¾d. to 1s. 3d. per lb.; crimson, 1s. 5½d. to 1s. 7½d. per lb., according to quality.

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

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

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

BARYTES.—£6 10s. to £8 per ton.

BISULPHITE OF 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.—3s. 4d. to 3s. 8d per lb.

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.—3¾d. to 4⅞d. per lb. LONDON: 4½d. to 5d.

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

CHROMIUM OXIDE.—10¾d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3¼d. 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.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £4 2s. less 2½%.

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 10s.; 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.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

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

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.

PHENOL.—7¾d. to 8¼d. per lb. to June 30; 6¾d. to 7¼d. from July 1 to December 31.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £38 to £41.

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. less 5% d/d U.K. Discount according to quantity. Ground, 5¼d. 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: 99¾/100%, powder, £37. MANCHESTER: £38.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

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

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

POTASSIUM PERMANGANATE.—LONDON: 10¼d. per lb. SCOTLAND: B.P. crystals, 10d. to 10½d. MANCHESTER: B.P., 11¼d. to 11¾d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 8¼d. to 8¾d. per lb. SCOTLAND: Yellow spot, 8¼d. ex store. MANCHESTER: Yellow, 8¼d.

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

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

SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

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

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

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

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

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1-cwt. iron drums for home trade.

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

SODIUM CHLORATE.—£32 10s. per ton.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

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

SODIUM META SILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.

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

SODIUM PHOSPHATE.—£13 per ton.

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

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

SODIUM SILICATE.—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 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d.

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

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

SULPHATE OF COPPER.—MANCHESTER: £14 10s. per ton f.o.b.

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

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

VERMILION.—Pale or deep, 4s. 5d. to 4s. 7d. 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, 7¾d. to 8¼d. per lb.; crude, 60's, 1s. 1¼d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7½d. per lb.; crude, 2s. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 5d. to 1s. 6d.; 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, 9½d to 10d. per gal.; standard motor, 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 3½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 5½d. to 5¾d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4¼d. f.o.r. North; 5d. London. MANCHESTER: 5d. to 5¾d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4¼d. to 4¼d.

NAPHTHA.—Solvent, 90/100%, 1s. 5d. to 1s. 6d. per gal.; 95/160%, 1s. 6d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4½d.; 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, 40s. per ton. LONDON: 45s. per ton, f.o.b. East Coast port. MANCHESTER: 32s. 6d. to 35s. f.o.b. East Coast.

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

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

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

## Nitrogen Fertilisers

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

CYANAMIDE.—£7 5s. per ton delivered in 4-ton lots to farmer's nearest station.

NITRATE OF SODA.—£7 12s. 6d. per ton for delivery 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 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 in 6-ton lots carriage paid.

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

## Latest Oil Prices

LONDON, June 5.—LINSEED OIL was firmer. Spot, £24 per ton (small quanties); June, £21 10s.; July-Aug., £21 12s. 6d.; Sept.-Dec., £21 15s.; Jan.-April, £22 2s. 6d., naked. SOYA BEAN OIL was quiet. Oriental (bulk), June-July shipment, £19 10s. per ton. RAPE OIL was steady. Crude extracted, £32 10s. per ton; technical refined, £34, naked, ex wharf. COTTON OIL was quiet. Egyptian crude, £24 per ton; refined common edible, £28 10s.; and deodorised, £30 10s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was quiet. American, spot, 44s. 6d. per cwt.

HULL.—LINSEED OIL.—Spot quoted £22 7s. 6d. per ton; June, July-Aug., and Sept.-Dec., £21 17s. 6d. COTTON OIL.—Egyptian, crude, spot, £24 10s. per ton; edible, refined, spot, £27 5s.; technical, spot, £27 5s.; deodorised, £29 5s., naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £21 per ton, naked. GROUNDNUT OIL.—Extracted, spot, £33 10s. per ton; deodorised, £36 10s. RAPE OIL.—Extracted, spot, £31 10s. per ton; refined, £33. SOYA OIL.—Extracted, spot, £24 per ton; deodorised, £27. CASTOR OIL.—Pharmaceutical, 41s. per cwt.; first, 36s.; second, 33s. COD OIL, f.o.r., or f.a.s., 25s. per cwt. in barrels. TURPENTINE, American, spot, 46s. per cwt.

# New Chemical Trade Marks

Compiled from official sources by Gee and Co., patent and trade mark agents, Staple House, 51 and 52 Chancery Lane, London, W.C.2.

Opposition to the registration of the following trade marks can be lodged up to June 15, 1935.

**"Abco."** 554,983. Class 1. Chemical substances for use in refining metals. Leonard Maurice Edward Kent, trading as A. B. Products Co., Coventry House, South Place, London, W.C.2. October 24, 1934.

**Firefly.** 557,141. Class 1. Lagging, sheeting, and cloth all made wholly or principally of asbestos, asbestos compositions, asbestos and magnesia compositions, all specially prepared for preventing the radiation of heat. Turner Brothers Asbestos Co., Ltd., Clod Mills, Spotland, Rochdale, Lancashire. January 16, 1935.

**Igedur.** 558,451. Class 1. Chemical substances used in manufacture photography, or philosophical research, and anti-corrosives. I. G. Farbenindustrie Akt.

**Glycocete.** 559,306. Class 1. Solvents, softeners and plasticisers, being chemical substances for use in manufactures. The Geigy Colour Co., Ltd., National Buildings, Parsonage, Manchester, 3. April 4, 1935.

**Nivalisan.** 558,698. Class 2. Chemical substances used for agricultural and horticultural purposes. British Dyestuffs Corporation, Ltd., Imperial Chemical House, Millbank, London, S.W.1. March 11, 1935.

**Firefly.** 557,142. Class 4. Raw or partly-prepared asbestos. Turner Brothers Asbestos Co., Ltd., Clod Mills, Spotland, Rochdale, Lancashire. January 16, 1935.

Opposition to the registration of the following trade marks can be lodged up to June 22, 1935.

**Polysolvan.** 557,747. Class 1. Chemical substances used in manufactures, photography, or philosophical research, and anti-corrosives. I. G. Farbenindustrie Akt., Gruneburgplatz, Frankfurt-on-the-Main, 20, Germany. February 6, 1935.

**Setegard.** 558,393. Class 1. Chemical substances for steeping, colouring, and brightening textile fabrics and leather in the course of their manufacture. H. Th. Bohme, Akt., 29 Moritzstrasse, Chemnitz, Saxony, Germany. February 28, 1935.

# Forthcoming Events

**June 8.**—Institute of Chemistry. Manchester and District Section. Annual Summer Meeting.

**June 12.**—Electrodepositors' Technical Society. "Further Studies in Nickel Deposition." A. W. Hothersall. 8.15 p.m. Northampton Polytechnic Institute, St. John Street, Clerkenwell, London.

**June 12.**—British Science Guild. Annual general meeting. "Gas Defence." J. Davidson Pratt. 4.30 p.m. Lecture Theatre of the Royal Society of Arts, John Street, Adelphi, London.

# 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.

### Aqueous Cellulosic Solutions

A SOLUTION obtained by mixing viscose with rubber latex in the proportion of 10 per cent. of viscose calculated on the dry rubber content of a 40 per cent. solution of latex is extruded and coagulated with formation of threads which may then be vulcanised. The rubber latex and viscose may be mixed in a container adjacent the spinneret. See specification No. 419,021 of R. Pickles and J. Pickles.

### Dyes

Colouring matters are prepared by reacting on aromatic acid nitrile or amide carrying in *o*-position to the nitrile or amide group a chlorine or bromine atom with cuprous cyanide. In examples *o*-chlorbenzonitrile is heated with cuprous cyanide in presence of pyridine in a closed vessel and *o*-chlorbenzamide is heated with cuprous cyanide in presence of pyridine. Specifications 322,169, [*Class* 2 (iii)], 389,842, 390,149, and 410,814 are referred to. See specification No. 418,367 of Imperial Chemical Industries, Ltd., R. P. Linstead, A. R. Lowe, I. M. Heilbron, and F. Irving.

### Hydrogenated Secondary Naphthylamines

Hydrogenated secondary aryl- and alkyl-naphthylamines are used as antioxidants for rubber. They may be prepared by catalytic hydrogenation of the corresponding naphthylamines at pressures of 100-200 atmospheres, using, *e.g.*, a nickel catalyst at 100-150° C. or a chromite catalyst at 250-300° C. For example, phenyl-β-naphthylamine yields a mixture of phenyl-aryl-tetrahydro-β-naphthylamine and phenyl-alicyclic-tetrahydro-β-nephthylalmine which may be separated by fractional distillation. See specification No. 418,374 of Goodyear Tire and Rubber Co.

### Applications for Patents

**(May 16 to 22 inclusive.)**

DEWAXING HYDROCARBON OILS.—Alco Products, Inc. (United States, June 29, '34.) 14633, 14634.

CADMIUM BASE BEARING METAL.—Bohn Aluminium and Brass Corporation. (United States, May 16, '34.) 14331.

RUBBER LATEX, concentration.—J. Brandwood. 14769.

COMPRESSED CARBIDE BODIES, manufacture.—F. G. Brettell (Wiede's Carbidwerk Freyung). 14954.

ALIPHATIC ACIDS, purification.—Carbide and Carbon Chemicals Corporation. (United States, June 13, '34.) 14442.

ACID WOOL DYESTUFFS, manufacture.—A. Carpmael. 14351.

VAT DYESTUFFS, manufacture.—A. Carpmael. 14512.

SULPHAMIC ACID FLUORIDES, manufacture.—A. Carpmael. 14856.

KETONES, conversion.—A. Carpmael. 14857.

PREGNENDIONE, production.—A. Carpmael. 14858.

CELLULOSE ESTER EMULSIONS, manufacture.—Distillers Co., Ltd., H. A. Auden and H. P. Standinger. 14526.

ANIMAL FIBRES, dyeing.—A. E. Everest. 14397.

INSECTICIDE, ETC., PRODUCTS.—C. de Gendre and P. Bary. 14926.

METALS, ETC., production.—W. V. Gilbert. 14748.

DECOMPOSITION OF HYDROCARBONS in chemical processes.—Goerig and Co., A.-G. (Germany, May 28, '34.) 14366.

DYEING ACETYL CELLULOSE.—W. W. Groves. (Aug. 3, '34.) 14823.

TETRAHYDRO-3-OXYQUINOLINE-DERIVATIVES, manufacture.—I. G Farbenindustrie. (Germany, May 16, '34.) 14369.

OLEUM, manufacture.—I. G. Farbenindustrie. (Germany, May 24, '34.) 14584.

ACID DYESTUFFS, manufacture.—I. G. Farbenindustrie. (Germany, May 19, '34.) 14711.

VANILLIN, preparation.—JeMac A.-G. 14471.

ALKALI METAL, decomposition.—J. Y. Johnson. 14359.

VINYL DERIVATIVES, production.—Kodak, Ltd. (France, May 23, '34.) 14736.

NITRO-BENZENE, purification.—Lonza Elektrizitätswerk und Chemische Fabriken A.-G. (Germany, June 2, '34.) 14544.

ACETIC ANHYDRIDE, production.—H. E. Potts. 14594.

LIQUID HYDROCARBONS from gases, production.—D. de Ros, E. Cresswell and J. Sackett. 14831.

INDIGOID DYESTUFFS, manufacture.—Soc. of Chemical Industry in Basle. (Switzerland, May 23, '34.) 14371.

# New Companies Registered

**Agden Salt Works (1935), Ltd.,** 57 High Street, Kingsland, E.8.—Registered May 15. Nominal capital £10,000. Manufacturers and dealers in salt and other chemical products. Director: Herbert A. Manger.

**Aspro, Ltd.**—Registered May 20. Nominal capital £1,000,000. Manufacturers of and dealers in all kinds of medicines, medical preparations and drugs. A subscriber: Dorothy B. Thomas, 28a Davenport Road, Catford, S.E.6.

**Argonaut Varnish and Chemical Works, Ltd.,** Factory 33, Chase Estate, Acton, W.—Registered May 23. Nominal capital, £1,000. Mnanufacturers of varnishes, paints, etc.

**Boots Pensions, Ltd.,** 37 Station Street, Nottingham.—Registered May 25. Nominal capital, £100. To promote schemes for the benefit of persons employed by Boots Pure Drug Co., Ltd., and associated companies, etc.

**British Energised Fuels, Ltd.**—Registered May 16. Nominal capital £100,000. To acquire interests in the production of fuel or artificial fuel; dealers in oils; manufacturers of chemicals and manures; distillers, etc. A subscriber: Collingwood Failes, 1 Baylie Street, Stourbridge.

**Denman Products, Ltd.,** 169 Regent Street, W.1.—Registered May 24. Nominal capital, £1,500. Manufacturers of and dealers in emulsifiers, etc. Directors: F. A. Howorth and J. Denman Dean.

**Denton & Lowe, Ltd.**—Registered April 27. Nominal capital £100. Manufacturers and merchants of chemicals, drugs, polishes, paints, varnishes and chemists' sundries. A subscriber: Frederick A. Smith, 73 Basinghall Street, London. Directors: Charles H. Denton, James Lowe.

**Frutella, Ltd.**—Registered May 22. Nominal capital, £2,000. To acquire from P. Ingenlath, of Monument Buildings, E.C., the benefit of the trade mark "Frutella" and the goodwill of the business connected therewith, and manufacturers of glues, gelatines, essences, etc. A subscriber: S. H. Marshall, 56 The Crescent, Belmont, Surrey.

**Ferguson Edwards & Co. (Luton), Ltd.,** 1a Wood Street, Cheapside, London.—Registered May 1. Nominal capital £500. Manufacturers of and dealers in paints, varnish, enamel, polish, lacquer, shellac. Directors: Ray Edwards, Lionel Edwards, Leslie G. Bowles, Eric P. Fridage.

**Fuel Holdings, Ltd.,** 437 Grand Buildings, Trafalgar Square, London.—Registered May 2. Nominal capital £7,500. To acquire the undertaking of Fuels Development, Ltd., to acquire wet or dry carbonising processes, processes for heating or drying or for extracting and removing water and moisture, processes for separating, extracting or depositing solids from liquids, gas, etc. Directors: Mervyn Brown, Thomas Bratt, John C. J. Lonsdale, Alfred C. Hargrove, Major William C. Hepburn.

**Moll Spring Dyeing Co., Ltd.**—Registered May 2. Nominal capital £1,000. Dyers, colourers and printers of woollens, cottons, linens, silks and other fibrous substances. A subscriber: Geo. H. Oldham, Bleak House, Honley, Huddersfield.

**Pharmaceutical Specialities (May & Baker), Ltd.**—Registered May 4. Nominal capital £10,000. Manufacturing, wholesale, retail and analytical chemists, smelters and refiners of ores, manufacturers of and dealers in drugs and chemicals. Subscriber: J. M. Fisher, 42-43 St. Paul's Churchyard, London.

**Southern Chemicals, Ltd.**—Registered May 6. Nominal capital £10,000. Manufacturers of and dealers in chemicals of all kinds. A subscriber: Timothy O'Hanrahan, 38 St. Stephen's Green, N. Dublin.

**Stanley Elmore Co.**—Registered May 29. Nominal capital £200,000. Metallurgists, electro-metallurgists and industrial chemists. A subscriber: John A. Stocker, 791 Salisbury House, E.C.2.

**Thomson, Skinner and Hamilton, Ltd.,** 137 Sauchiehall Street, Glasgow, C.12.—Registered May 15. Nominal capital, £3,000. Chemical manufacturers and merchants. Directors: William Skinner, Henry Clift.

# From Week to Week

THE MANUFACTURE OF CHEMICAL PLANT by Cannon Iron Foundries, Ltd., shows a pleasing upward tendency in sales, according to Sir Francis H. Pepper, who presided at a meeting of the company on June 4.

AN APPLICATION HAS BEEN MADE to the Import Duties Advisory Committee for a heavy duty of £5 a ton on sulphate of ammonia, which sells in this country at about £7 5s. a ton; the existing duty is 30 per cent. *ad valorem*.

L. OERTLING, LTD., have issued a new catalogue of British chemical balances and weights. Included in the list, which comprises a loose leaf list to which other sheets will be added, are new aperiodic and micro balances. A similar catalogue of assay balances is in course of preparation.

AWARDS FOR LONG SERVICE were presented to about a hundred employees of the Broughton Copper Co. at a dinner given by the directors on Wednesday. A few of the guests with records of fifty years' service were presented with clocks; gold watches were given to employees who had completed 35 years with the firm, and silver watches to those with 25 years to their credit.

PRESENTATIONS WERE MADE on May 29 to 334 drivers of the Gas Light and Coke Co. for safe driving during the past year. Sixteen of these men have completed 10 to 15 years without a single accident, and 27 other drivers have completed five consecutive years without accident. The awards amounted to more than £500.

BARROW, HEPBURN AND GALE, LTD., tanners and leather goods manufacturers, announce that they have acquired control of the old-established firm of tanners, Thomas Holmes and Sons, Ltd., of Hull. Barrow, Hepburn and Gale, whose issued capital amounts to about £1,250,000, of which £350,000 is in ordinary shares, was registered in 1920.

ACCORDING to the "London Gazette" a petition for reduction of the capital of Imperial Chemical Industries, Ltd., from £95,000,000 to £89,565,859 will be heard before Mr. Justice Eve, at the Royal Courts of Justice on June 24. The petition is the result of the scheme of reorganising the capital structure and amalgamating the ordinary and deferred capital, approved by shareholders on May 2.

AN ADVANCE IN GERMAN NITRATE PRICES is now under consideration. When German nitrate prices were cut on February 1, 1935, by 7 per cent., in order to stimulate domestic consumption, it was agreed that the original prices should again come into force on July 1 next, unless the domestic consumption for the year ended June 30, 1935, had increased to about 500,000 metric tons of pure nitrate. This total, it is understood, will not be reached.

A PROGRESS REPORT issued by the British Cyanides Co. states that since the beginning of April the demand for Beetle moulding powder has been so great as to put the Oldbury plant to a severe test. April sales show a 55 per cent. increase on last year, and May sales are up by 40 per cent. Sales of the new Scarab powder have reached the point where the plant erected for its manufacture is fully occupied for one shift per day for seven days a week.

THE HYDROMETER SUB-COMMITTEE of the British Standards Institution has prepared a draft specification for British standard density hydrometers and tables for use with the hydrometers. The draft specification and tables are now being circulated to interested bodies by the Institution for criticism prior to their final publication. The Institution would welcome comments on the proposals from as wide a circle as possible, and a copy of the draft specification and tables will be forwarded to any one interested on application to the Director, British Standards Institution, 28 Victoria Street, London, S.W.1.

THE 6TH INTERNATIONAL CONGRESS FOR SCIENTIFIC MANAGEMENT, to be held in London from July 15 to 20, will be opened by the Prince of Wales. This is the first time that the Congress has been held in Great Britain. It will discuss papers illustrating the best management practice in all parts of the world, and the references to actual technique will relate to specific problems and how they have been met. A paper by a director of Imperial Chemical Industries, Ltd., will describe the methods adopted in the management of that undertaking. The chairmen of the various sections include Sir Robert Hadfield (manufacture), Sir Kenneth Lee (distribution), and Sir Christopher Clayton (development).

CRUDE STEEL PRODUCTION increased considerably in March as compared with the shorter month of February in the majority of countries. The production in the United Kingdom was higher than in any month since October, 1929. Measured in percentages, the increases were as follows:—France, 9.1; Saar, 1.5; Belgium, 7.4; Germany, 7.0; the United States, 3.2; and the United Kingdom, 9.4. In Luxemburg a decrease of 6.3 per cent. was recorded. Compared with the previous year the March, 1935, outputs were higher in Germany, the United States and the United Kingdom by 22.6, 2.5 and 0.9 per cent., respectively, while there were decreases in France, the Saar, Belgium and Luxemburg of 4.8, 1.6, 2.3 and 7.8 per cent., respectively.

THE IMPORT DUTIES ADVISORY COMMITTEE announces that it has decided not to make any recommendation in respect of the application previously advertised for a reduction of the import duty on primary battery air depolarising carbon blocks.

THE CANADIAN DEPARTMENT OF NATIONAL REVENUE has reduced the requirement regarding the British content of antimony oxide admitted to Canada under the British preferential tariff from one half to one quarter, as from May 11.

A REPORT ON RECENT INVESTIGATIONS regarding the tannin content of mangrove barks from Tanganyika is published in the "Bulletin of the Imperial Institute," April, 1935. Other articles deal with "Cinchona in Aman, Tanganyika," and "Scientific Aspects of Cacao Fermentation." As usual, the "Bulletin" concludes with a bibliograph of recent literature and new books.

EMPLOYMENT FOR NEARLY 6,000 PEOPLE is likely to become available by the erection of works by Courtaulds, Ltd., at Ribbleton, Preston, it was announced at a meeting of the Preston Town Council, on May 30. The Council passed a recommendation that sanction be sought for a loan of £148,254 for sewering the Ribbleton district and dealing with the affluent from the proposed works.

IMPERIAL CHEMICAL INDUSTRIES, LTD., announces that its subsidiary company, I.C.I. (Fertiliser and Synthetic Products), Ltd., Billingham, proposes, in pursuance of the power given to it under its trust deed, to redeem the whole of its outstanding 5 per cent. guaranteed debenture stock at par on December 15, and that the necessary notices will be posted to the stockholders before June 15. The amount of stock outstanding is £1,244,900.

BRITISH RAYON PRODUCTION in April was 9,800,000 lb., against 10,700,000 lb. in March and 7,000,000 lb. in April last year. For the four months it was 40,250,000 lb., against 31,200,000 lb. for the corresponding period of last year. The April decline is entirely due to the Easter holidays and the shorter month, as the actual output rate was higher than in March. At present it is slightly lower.

THE ELEVENTH INTERNATIONAL WOOL CONFERENCE met in Berlin from Thursday to Saturday. It was attended by delegates from the United Kingdom, Australia, United States, France, Germany, Belgium, Holland and Italy. The main problems discussed included monetary and credit questions, international raw wool regulations, revision of the Australian selling seasons, artificial fibres, and ratification of the convention on raw wool imports concluded in April last in Paris.

A FATAL ACCIDENT INQUIRY was held at Kilmarnock Sheriff Court on June 3 in connection with the explosion on January 18 last at the Imperial Chemical Industries explosive works at Ardeer, which resulted in the deaths of Michael Fitzpatrick and David Telford, laboratory assistants, and Robert Edwin Hargreaves, analytical chemist. A formal verdict was returned, the theory being advanced that an electric light wire had snapped, causing a short circuit and that pieces of molten metal had exploded the gunpowder pellets in the room.

MEMBERS of the Manchester and District Golfing Society of the Institute of Chemistry spent an enjoyable day on the occasion of the competition for the "Chairman's Cup" on the links of the Stockport Golf Club at Torkington, on June 2. The Society's star golfer, Mr. J. C. Law, just missed the first prize (and cup) by a single stroke (77—1=76). The winner was Mr. R. Owen Jones with the score of 75 nett (93—18). The cup, to be held for one year and competed for annually, has been presented to the Society by its past chairmen. Prizes to the winner and runner-up were presented by the present chairman, Mr. C. J. T. Cronshaw.

THE ENFIELD ROLLING MILLS, in an interim report for the six months to March 31, state that the company has entered into a contract to become the sole proprietors of the business of the London Zinc Mills on amalgamation terms. For the last fifty years the London Zinc Mills has been under the joint ownership of Frederick Braby and Co., of London and Glasgow, and the Vieille Montagne Zinc Company of Belgium. Mr. S. Hunn, who has been associated with the London Zinc Mills for over twenty-five years, and is now managing director, will be joining the board of Enfield Rolling Mills. Production will be gradually transferred to the new works of Enfield Rolling Mills at Brimsdown, and additional plant is already being installed.

# 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).**

**Sweden.**—An agent established at Stockholm wishes to obtain the representation of United Kingdom manufacturers of all classes of articles (perfumery excepted) suitable for sale to dealers in paint and chemicals, soaps, patent medicines, etc. (Ref. No. 510.)

# Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

## Mortgages and Charges.

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

DRUG AND CHEMICAL CORPORATION, LTD., London, W. (M., 8/6/35.) Reg. May 27, £559 2nd charge, to George Shaw (Builders), Ltd.; charged on 41 and 41b Lower Kennington Lane, S.E. *£12,373. Jan. 12, 1934.

### Satisfactions

CLEVELAND MAGNESITE AND REFRACTORY CO., LTD., Middlesbrough. (M.S., 8/6/35.) Satisfaction reg. May 27, £1,500, reg. Sept. 20, 1928.

## County Court Judgments

(NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court Judgments against him.)

JOSEPH, E., AND CO. (firm), Chemical Works, Cwmavon, chemists. (C.C., 8/6/35.) £24 18s. 10d. April 8.

# London Gazette, etc.

## Companies Winding-up Voluntarily

BRITISH THORIUM CO., LTD. (C.W.U.V., 8/6/35.) By special resolution May 24. Mr. Henry Walter Edwards appointed liquidator.

DEFIANCE RUBBER CO., LTD. (C.W.U.V., 8/6/35.) By reason of its liabilities, May 21. Mr. G. Vincent Symmons, Hambro Arcade, Hayes, Kent, nominated liquidator. At a subsequent meeting of creditors, the voluntary liquidation was confirmed, and Mr. Harry Sharp, of 30 Brown Street, Manchester, was nominated as liquidator.

BLOOMDALE CHINA CLAY CO., LTD. (C.W.U.V., 8/6/35.) By special resolutions May 23. for purpose of reconstruction. Mr. Henry Charles Bound, 11-13 Dowgate Hill, London, E.C.4, appointed liquidator.

DAYBORN MEDICAL PRODUCTS CO., LTD. (C.W.U.V., 8/6/35.) By reason of its liabilities, May 20.

## Partnership Dissolved

SKYNNER AND HIGSON (Charles Reginald Skynner and Reginald Charles Augustus Skynner), china clay merchants, Saint Austell, Cornwall. By mutual consent, April 15, 1935. All debts received and paid by Charles Reginald Skynner, who will continue to carry on the business alone under the style or firm of Skynner and Higson, at No. 1, Market Street, St. Austell.

## Reduction of Capital

BRITISH MANNESMANN TUBE CO., LTD. (R.C., 8/6/35.) Order of the High Court of Justice, Chancery Division, dated May 14, 1935, confirming the reduction of the capital of the above named company from £2,000,000 to £500,000. Registered on May 30, 1935.

# Company News

**Midland Tar Distillers.**—The payment of a dividend of 3 per cent., tax free, is announced on the 6 per cent. (tax free) cumulative preference shares.

**I.P. Bemberg Co.**—A net profit of Rm.1,044,000 is reported for the past year by the German Rayon company, and a dividend of 5 per cent. is to be paid.

**Canadian Celanese.**—A quarterly cumulative preference dividend has been declared on the 7 per cent. cumulative participating preferred stock, of $1.75 per share for the three months' period from April 1 to June 30, 1935, payable on June 29.

**Turner and Newall.**—An interim dividend has been declared on the ordinary shares at the rate of 2½ per cent., the same as a year ago. The usual half-yearly dividend on the preference stock will be paid on June 15; the ordinary interim will be paid on July 27.

**Shawinigan Water and Power Co.**—The statement for three months to March 31 last shows gross revenue $3,118,975, against $2,916,779; less expenses, etc., leaving net operating revenue, $1,746,160; surplus before depreciation and tax, $722,686.

**Yorkshire Dyeware and Chemical Co.**—The report for the year to March 31 last shows a profit, after depreciation, fees, etc., of £26,751 (against £23,914 in the previous year), add £7,331 brought in, making £34,082; debenture interest, £3,976; final dividend 7½ per cent., making 10 per cent. and bonus of 5 per cent., leaving £6,856 to be carried forward.

**British Cyanides Co.**—A progress report just issued states that no interim dividend will be declared, but the dividend for the current year will be announced in November. The report for the fifteen months to September 30 last, showed a net profit of £26,257 and a total dividend of 9 per cent. on the ordinary was paid, including an interim of 4 per cent.

**Cape Asbestos Co.**—A profit of £58,720 is reported for the year 1934, compared with £53,836 for 1933. Expenses were approximately £3,000 higher at £27,030, while depreciation and fees absorb £8,186. Total dividends on the participating preference and ordinary shares are maintained at 11 per cent. and 6 per cent. respectively, and the amount carried forward is raised from £10,478 to £12,732.

**Anglo-Persian Oil Co.**—A profit of £3,183,195 is reported for 1934. The ordinary share dividend is raised from 7½ per cent. to 12½ per cent., less tax. After providing £1,071,234 for preference dividends and £459,107 for extra depreciation, the carry-forward is £485,674. The company proposes to change its name to "the Anglo-Iranian Oil Co." The change is considered desirable owing to "the Government of the Shah having decided that the ancient name of 'Iran' should be substituted for 'Persia.'"

**W. J. Bush and Co.**—The net profits for 1934 amounted to £87,858 (against £70,391 in the previous year), plus £91,928 brought in. After deducting the amount required for dividends on the 5 per cent. preference and £11,411 provisions for income tax and exchange, there remains £162,125. A final ordinary dividend of 8 per cent., making 13 per cent. is to be paid; to reserve is placed £25,000; to writing down goodwill £10,000, leaving to be carried forward, £94,625.