The Chemical Age

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Notes and Comments

Faraday Triumphs

THE first Friday evening of the new season at the Royal Institution was given on November 2 by Dr. Aston. The lecture was a departure from custom—without "expuriments." A generous port wine discourse, straight off polished mahogany, clearly outspoken, aided by only a few notes, a piece of chalk, two small hanging blackboards, a large number of good slides—and the usual floodlighting effects. The lecturer told his amazing tale well and fluent. The audience listened reverently: probably a few understood and marvelled. The story was of "Up Faraday and Atom!" Just a century ago, this year in June, Faraday finished publishing the account of his immortal electrolytic studies, having already laid the foundations of inductive electricity and electro-magnetising relationship. Dr. Aston has fought a long battle with the elements with the strangest of Faraday pistols, one in which molecules are forced forward along the barrel, urged by a high potential discharge, then as they emerge from the muzzle laid hands upon and directed by electric and magnetic currents operating at right angles, opened out in their mass order and directed along parabolic orbits, finally hitting a photographic target. Hits are duly recorded along a scale. The bullets diffusing in mass are in this way placed in ordered line. Molecules are broken up electrolytically; the pieces are urged forward and finally put in their places electro-magnetically—it is affirmed by some that they are in substance electricity. Faraday weapons alone are used. The Royal Institution has it! The forces have been directed, however, from Cambridge, with consummate skill and judgment, by Commander Aston. The work is free from hypothesis—sheer electrical gunnery. A great intellectual and practical feat. Professor Soddy was the first to insist that the so-called elements might be mere mixtures—to show that ordinary lead was two leads: one 206, mothered by Uranium; the other 208, mothered by Thorium: two Helides of lead. A prophet with so strange a message necessarily was looked at askance. Beyond a paltry few thousands, as a Nobel prize, he has not had the honour he deserves. His views on economics are disturbing and he has the unpardonable vice of being an individualist, not a time server. His prophesy has been more than justified. The presence of variants in Neon and even in Hydrogen was announced at the Royal Institution in 1917, by Sir J. J. Thomson. He was aided by Dr. Aston, who has greatly developed the method they used in range and accuracy. Moseley first gave certainty to the search by establishing the existence of 92 distinct families or species, with ordinal numbers from 1 to 92. Each of these may have variants; Dr. Aston, in the course of years, has discovered a great assortment. The 92 families now number 247 members. It is significant that those with odd weights have few homologous variants, whilst those with even weights have many. In fact, the chemistry of elements to-day is on the lines of the Nicene Creed and of Petroleum. Even hydrogen is not one but three, at least, just as methane is followed by ethane and propane. In a cooling past, inorganic nature has evidently striven to set an example to an organic world that was to be; or the latter has worked to the model it found. Petroleums are doubtless formed by much cracking and many interactions; so may well have been the elements "up above the world so high!" Some day we shall have diagrams of their structure, maybe comparable with those of phenoid hydrocarbons; betting is already in favour of a helium unit. Having no vision of method, a neo-physical school is now playing ducks and drakes with them, much as Berthelot did in early days with organic vapours: seeing what can be got out of them. At present the adventure is not for chemists: the less they allow themselves to be disturbed by sensational rumblings the better. Occasionally they may visit the pictures with profit, as some did—very few—Dr. Aston's show! The Bishop of Croydon would have licensed the piece for Sunday performance as free from all sexual excitement, although the double motherhood of lead is a little suggestive of paternal irregularity, perhaps. It is worth thinking back to what Davy did to extract sodium and calcium by means of electricity from soda and lime—to the vast increase in knowledge!

Food Canning and Bottling

NO individual branch of industrial chemistry has shown greater progress since the opening of the twentieth century than that concerned with the canning and bottling of fruit and vegetables. Outside the purely fruit classes the most noteworthy display at the fourteenth annual Imperial Fruit Show and Canners' Exhibition, which opened at Leicester on November 2 and closed yesterday, was that devoted to these modern methods of preserving perishable foodstuffs. In this issue of THE CHEMICAL AGE, pp. 417-419, we print a special article on the chemical aspects of food canning. To-day the canning industry is run with magnificent

research institutions behind it, with equipment and formulæ and precautions that have been scientifically established. Cleanliness and freshness are the essential characteristics of every modern canning factory. If occasionally—and it is very rarely nowadays—any deterioration has started in the contents of a can, it is readily seen, and the consumers are not deceived.

Those who have made an intimate study of the scientific side of food canning claim to-day that canned foods are the safest and freshest that are available to large sections of the population. Who can calculate the total value to the health of modern populations in the provision all round the year of fruit and vegetables, fish, meat, and milk that would otherwise be available only for a few weeks in the year? Some people think that it is only the cheap or second-grade food that is used for canning. This is a fundamental error. The very best pick of any fruit or vegetable, fish, milk, or meat is selected to-day for the canning industry, and in certain varieties the public are only able to obtain in the raw state what is left over after the canner has selected the best. It is a pity that young children who in many districts go through the winter months without fresh fruit and vegetables are not regularly supplied with canned fruit and vegetables, so that they may obtain the vitamins necessary for their health, especially in the winter months. Let us abandon prejudice and combine to produce more food, which can be preserved in bulk and distributed and sold at a cheap price to the consumer after yielding the producer a satisfactory return. Not the least significant feature of the growing popularity of canned foods is the fact that British industry has nothing to fear from foreign competition. Not many years ago a large proportion of our canned fruits and vegetables were imported from foreign countries, but ingenious machinery has now been invented and installed in Great Britain, and many examples of up-to-date plant were shown at Leicester.

A Problem for Lancashire

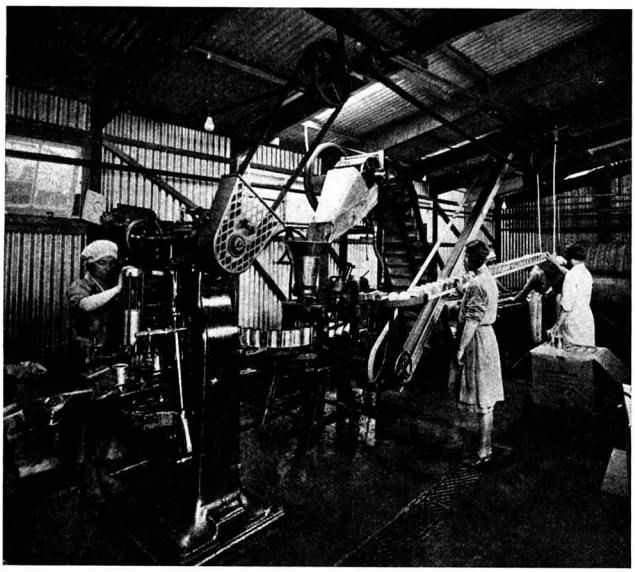
ACCORDING to the " Manchester Guardian " the fall in the number of students taking courses in textile technology at various institutions in Lancashire has been so marked during recent years as to menace the future well-being of our cotton trade. In the last nine years fourteen spinning class-centres and eight weaving class-centres in the county have had to close for lack of support, whilst most of those institutions which are still conducting courses in spinning and weaving are doing so for the benefit of a very small number of students. The reasons for this state of affairs are not far to seek. The vast majority of the young men for whom the classes are organised are living in the area where many of the cotton factories have been closed down for a number of years and where not a few highly skilled and scientifically trained textile workers are unemployed. They have learned at first hand something of the parlous condition of the industry. It is not surprising, therefore, that they are loath to spend a considerable amount of their leisure over a period of several years in preparing themselves for posts which, they feel, they will never be called on to fill. In taking this view they are, perhaps, unduly pessimistic, for in spite of the difficulties under which the Lancashire cotton industry is labouring, even if there is a further contraction in the volume of our textile trade, the industry will continue to be a great industry and will need a more and more efficient personnel.

A more valid reason for the dearth of textile students is to be found in the scant recognition which has been given by employers to the technical knowledge of their employees. Even at the present time, when the industry is so depressed that little short of the miraculous can resuscitate it to its former degree of prosperity, nepotism, rather than ability, is the order of the day. Only too frequently is the experienced and technically trained man at a discount, compared with the less efficient son or nephew of the employer, when a managerial post is to be filled. That kind of charity spells inefficiency.

In view of the great efforts which are being put forward in certain directions to revive our textile trade, notably in the carrying out of fundamental research, the situation is almost Gilbertian. As our contemporary points out, not until the trade unions and the employers agree to remove the anomalies can it be expected that adolescents will readily attend the courses of instruction offered in the textile departments of our technical schools and colleges; and the best encouragement that could be given to those potential students would be a definite statement that no employee will be considered for promotion to a higher position within the mill unless he holds the National Certificate in Textiles.

Economic Nationalism

THE wave of economic nationalism that has swept the world during the last few years has had its uses, and those successes in again starting trade on the move that can be ascribed to increased internal business have been apt to lead many to suppose that the world is on the right track. From the humblest shopkeeper to the greatest industrialist the cry " Buy British," or " Buy German "—in a word, " Buy nationally "—serves to assist internal trade and to perpetuate the great game of taking in one another's washing. The policy of economic nationalism, however, is wrong and it is not the way that true business recovery lies. The sugar position is an illustration. The price falls because of over-production; growers cannot agree among themselves to limit production to the world's needs and they must, therefore, strain every nerve to enlarge their markets. Whilst the cane sugar growers are wilting for the lack of markets and therefore cannot buy goods from the manufacturing countries, these same countries are subsidising beet sugar, the only real justification for which in the same world is the fear of war. As one writer put it " What door is there open to the tropical producer? The only door is that into Great Britain and it is rapidly closing. All entrants are carefully scrutinised and if their credentials do not bear the Empire stamp they are only admitted on payment of the duties demanded. The consumption of sugar in the United Kingdom is estimated at 2,000,000 tons annually. At a cost to the taxpayer of some £40,000,000, we can now point with pride to an annual production in this country of some 500,000 tons of beet sugar." We progress steadily along the road to economic self-sufficiency, but if the wider view be taken that the maintenance of world prosperity is essential to this country as an exporting nation exploiting the maritime routes of the world, then there is little cause for self-satisfaction.



These can filling machines are in operation at one of the British canneries. Monel metal has been used for the hoppers and for certain parts of the machines which come in contact with the fruit. Monel metal has been adopted on account of its good mechanical strength, its resistance to abrasion, and small risk of metallic contamination.

Recent progress in food canning was strikingly demonstrated at the Imperial Fruit Show and Canners' Exhibition which closed at Leicester yesterday (Friday).

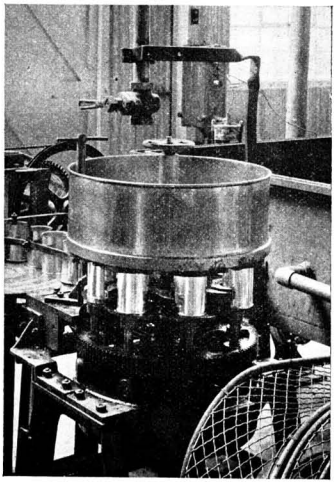
Recent Progress in Canning and Bottling

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

FIGURES published by the Empire Marketing Board show that of the total quantity of canned fruit consumed in this country about 80 per cent. is imported, the balance coming from British canneries. This seemingly low proportion of British produce is not quite so insignificant when one considers that as recently as 1926 over 95 per cent. of canned fruit consumed here was imported. For in that year only a few canning factories existed in Great Britain; now there are over eighty. Of this number the greater proportion is confined to the canning of fruit and vegetables, in connection with which, despite the vast amount of research that has been carried on in the United States and more recently in this country, the problem of corrosion is still very much to the fore.

Tin dissolved by the acids in the produce is usually well below the permissible limit of 2 grains per pound of produce, and some of this dissolved tin ultimately combines with the can contents to form insoluble compounds that have no derogatory action on the body. Therefore the greatest concern is not the potential toxicity of the tin, but how to prevent its corrosion—and that of the iron it protects—by the acidity of fruits. Strangely enough, it is not always the produce with the greatest acidity that has the most action on the tin. Gooseberries, for example, generally contain over 2 per cent. of acid (calculated as crystallised citric), but seldom cause

This small Monel metal kettle is one of a battery in use at the Lady Dane Cannery, Faversham, Kent.



Small can filling machines incorporating certain parts which are made of Monel metal, are also in use at the Lady Dane Cannery.

corrosion; whilst cherries, with less than one-half of this acidity (as malic acid), give much trouble. This cannot be attributed to malic acid exerting a greater action than citric, because apples also contain about 1 per cent. malic acid, but usually exert little corrosive action. The maximum action, in most cases, appears to be exerted when the syrup in which the fruit is immersed has a *p*H value of about 4.0.

Effect of Air in the Cans

Numerous researches have shown that the presence of oxygen in the can acts as an accelerator. According to J. M. Bryan ("Trans. Faraday Soc.," *27*, 606) tin is not appreciably attacked by dilute aqueous citric acid in the absence of oxygen; when this is present the corrosion slowly decreases as the *p*H rises from 3.1 to 5.5 as the result of oxygen being rendered unavailable for corrosion through being taken up by the tin and acid. The rate of attack is considerably enhanced by iron citrate, which, apparently, acts as an oxygen carrier by alternate oxidation and reduction. In practice sufficient oxygen (air) is always present in the can to accelerate corrosion, for the present methods of "exhausting" the filled cans before sealing do not entirely eliminate air. The removal of this residual air is not an easy matter, for it is often dispersed throughout the tissues of the produce itself. F. Hirst ("Food Manufacture," 1930, 326) investigated the possibilities of expelling air from the filled cans by placing them in a vacuum chamber and sealing while under vacuum, but found the process much too slow for practical operation.

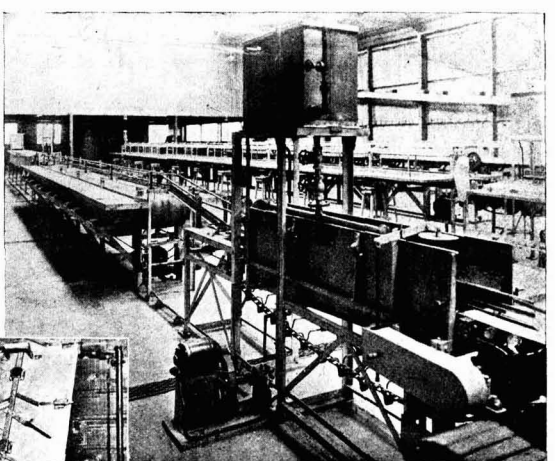
The present practice of lacquering cans to contain certain coloured fruits, in order to prevent loss of colour, frequently leads to corrosion trouble, the cause of which does not yet appear to be found. Although it is not unlikely that as these lacquers often contain one or more oxides, these latter are converted—either by water or through the hydrogen liberated from the action of the fruit acids on the tin and iron—into hydroxides. Research has established that when iron becomes coated with a thin film of hydroxide the diffusion of hydrogen is impeded and the pressure of hydrogen on the iron surface is raised, in which state the iron is more vulnerable to attack by the acids.

The present tendency in some canneries is towards the use of beet sugar syrup instead of the cane product, because the former, apparently, contains some substance which retards the action of the fruit acids on the metal. A similar effect is noticeable when a mixture of cane syrup and glucose syrup is employed. This beneficial substance is probably in the form of a colloid, which, however, is not simply adsorbed by the metal to form a protective coating, but is the result of the deposition of a film of colloid on the iron by coagulation caused by iron ions. It is likely that variation in the nature of the can contents changes the specific action of these colloids, and also that of the iron-tin couple. Observations have shown that in acid and non-acid solution the potential of tin is lower than that of iron, whilst in less acid solutions the behaviour of the iron-tin couple conforms with the position in the electro-chemical series.

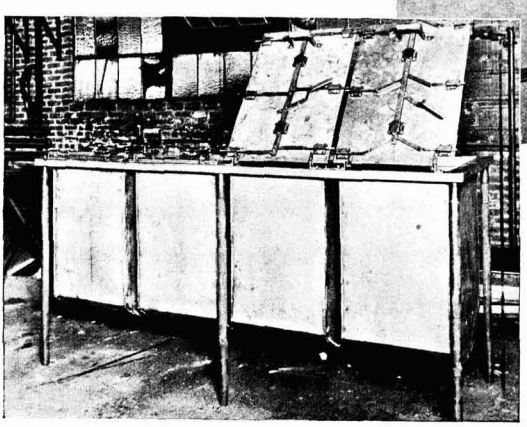
Efficient Sterilisation

The proportion of canned produce spoiled by moulds or bacteria becomes lower as more efficient sterilisation systems are brought into use. In the older type of steriliser the filled and sealed cans were caused to rotate on their horizontal axes while passing through a vessel of hot water at a specific temperature, followed by a similar movement through a tank of cold water. The rotation of the cans being necessary to ensure a quick and uniform heating and cooling of the can contents. With delicate commodities this treatment often resulted in breaking up the produce.

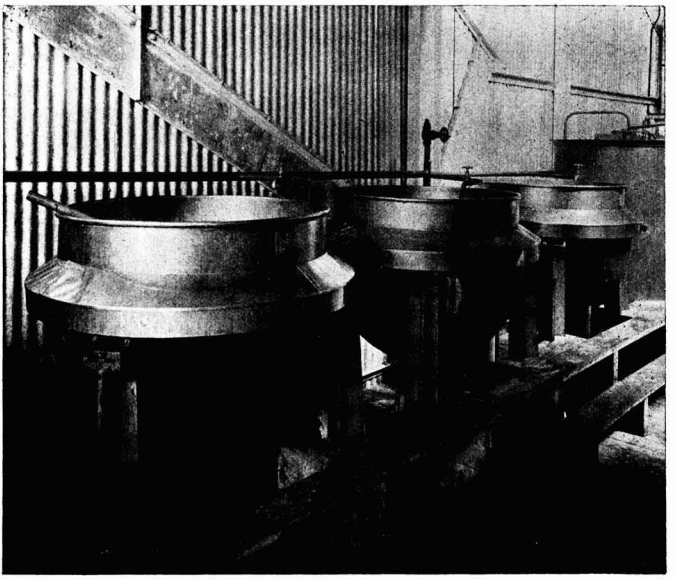
A notable improvement in both sterilising and cooling has recently been introduced in the form of a pressure steriliser and cooler combined in one unit, and in which the cans are made to revolve about their *vertical* axes, instead of the horizontal. It has been demonstrated that, by this means, no breakdown of the produce occurs, and that the time required to bring the centre of the can contents to the required temperature is considerably less, which is due to the continuous verti-



Right: General view of a modern cannery, showing can conveying system and Monel metal dispensing tank for fruit syrups.



Left: Mushroom blancher with quick closing covers. An all-welded Monel metal construction has been adopted, because mushrooms are very susceptible to discoloration.



Monel metal has been used for this battery of kettles at the Lady Dane Cannery, Faversham, Kent, where British Fruits, Ltd., are packing a wide variety of fruit and vegetables. Monel metal offers exceptional resistance to abrasion as well as corrosion, and this permits the easy removal of kettle encrustation.

cal rotation of the cans. A further advantage is that the head-space in the top of each can remains in an unchanged position, and though the syrup (or brine) is in constant motion about the fruits or vegetables, the latter are not rubbing on each other, whereas in revolving on a horizontal axis the head-space is alongside the can and its position in relation to the contents is constantly changing. The fact that the vessel works under pressure—about 25 lb. per sq. in.—enables a higher temperature to be obtained than in the older type using hot water, which is of particular advantage for the complete sterilisation of many products.

Cooling Problems

The problem of cooling is not quite so simple as it may appear. At normal room temperature a sealed can of produce has a partial vacuum, which is changed to a relatively high internal pressure during sterilising, due to the elevated temperature producing steam within the can. As long as the can remains in the steriliser the pressure on the outside of the can counteracts its internal pressure and bulging or leaks are avoided. To continue to avoid such occurences it is necessary to maintain the external pressure roughly equivalent to the internal pressure, and to reduce these two independent pressures at approximately the same rate. An ingenious method of doing this which is now being adopted by many canneries in this country. By means of a special transfer valve the hot sterilised cans are withdrawn from the sterilising vessel and inserted into the base of a tall cylindrical tank of cold water, through which they are propelled upwards, meanwhile revolving on their vertical axis. As the heat of the can is transferred to the cooling water, its internal pressure is progressively reduced, and, simultaneously, the external pressure is correspondingly reduced by the constantly diminishing head of water above the can. When the can reaches the top of the column of water its internal pressure has changed to that of a partial vacuum, whilst the external water pressure has vanished. In this way not only is "panelling" of cans avoided when they assume their vacuum state, but the possibility of non-sterile water being sucked into a can of produce is prevented.

The problem of corrosion and its avoidance is probably the greatest *bête noire* of the fruit cannery; it is natural therefore that a container less chemically vulnerable should be sought. It does not appear unreasonable to assume that in a few years hence the ideal container will be made of bakelite or similar synthetic resin product, for such material has already proved its efficiency under conditions far more rigorous than those obtaining in the canning industry. That its cost would not be an appreciable item is obvious from the fact that numerous intricate moulded containers of various commodities are now on the market.

Glass Containers Gaining Favour

Meanwhile, there are signs that glass containers are gaining favour as a rival to cans. Until quite recently the main objection to glass bottles was their fragile nature, which did not permit of machinery being used to the same extent as with cans. However, most of the latest canning equipment can be adapted for the handling of bottles. Another objection was that cheap glass could not withstand the quick changes of temperature necessary to maintain a good output of produce, so in bottling the heating and cooling had to be done slowly. Glass makers have now obviated this by improving the quality of the glass, in which connection the use of boric oxide has played an important part. The tendency now is to make glass jars for fruit bottling on the lines of Pyrex glass (containing nearly 12 per cent. B_2O_3). Low co-efficient of expansion is an essential feature of glass required to withstand rapid changes of temperature and physical shocks. Investigations have shown that boric oxide definitely reduces this co-efficient, and in addition it increases elasticity. Tests have demonstrated that boro-silicates have a greater degree of thermal endurance and tolerate more severe physical shock than other glasses. Boric oxide also increases resistance to steam and hot water.

Some fruits, as strawberries and cherries, lose much of their natural colour if exposed to light for prolonged periods, and when bottled in white glass this fading detracts from their appearance. This is overcome either by packing the bottle in opaque paper wrapper, or by using bottles of coloured glass, as are commonly used for some laboratory reagents. Bottled goods have the advantage of being visible to the prospective purchaser, whilst much prejudice against canned goods still exists from the opposite cause.

It was reported in Santiago early in September that Germany will grant an import license for 80,000 tons of Chilean nitrate for the year 1934-35, free of duty. German statistics show imports of 95,043 tons of sodium nitrate during the first 7 months of 1934. No receipts were recorded for the corresponding months of 1933. German exports of sodium nitrate during the same periods were 21,431 tons and 25,828 tons, respectively.

Spontaneous Oxidation of Organic Substances

A Study of Coal, Hay, Sawdust and Linseed Oil

IT is well known that coal, when exposed to air at ordinary temperatures, oxidises, and that the heat produced by this oxidation may lead to spontaneous firing when the mass of coal is large enough, or its insulation effective enough, to prevent the heat from being lost too quickly, said Dr. J. S. Haldane, F.R.S., and Dr. R. H. Makgill, in a joint paper on the "Spontaneous Oxidation of Coal and Other Materials," read before the London Section of the Society of Chemical Industry, on November 5.

This oxidation process in coal has been studied at the Doncaster Coal-owners Laboratory. At a constant ordinary temperature it was found that with pulverised coal oxidation was comparatively rapid at first, but quickly diminished until it became almost inappreciable after several days, and it was only a very small proportion of the coal which had oxidised. With coal in lumps, however, the oxidation was far slower and continued for a much greater time. Coal always contains a certain amount of iron pyrites, and this substance may oxidise very readily. A separate study of pyritic oxidation showed that pyrites in coal varied greatly in its liability to oxidation.

When spontaneous heating occurs in the coal the proportion of carbon monoxide formed to the oxygen which disappears is much increased, and by determining this proportion in the air coming from a suspected area the presence or subsidence of heating, as was shown by Ivon Graham, can be detected independently of any other sign, such as odour or smoke.

Hay and Sawdust

It appears that hay, apart from fermentive action, undergoes an oxidation which falls very rapidly in rate after the first few hours and is accompanied by the formation of carbon monoxide. The latter gas in the absence of fermentation does not disappear, although the hay is moist. The oxidation thus differs from that of moist coal in this respect, as also in the non-formation of carbon dioxide after all the free oxygen is absorbed.

Sawdust from decayed wood, or the crumbling wood from the centre of a dead tree, absorbed oxygen very rapidly with free production of carbon dioxide, and, to a lesser extent, of hydrogen; moistening the sawdust hastened the process. Freshly cut sawdust made from green timber, but free from decay, showed a considerable degree of oxidation even though not moistened, probably a result of moisture naturally present. Dry shavings from sound seasoned wood, when examined by the aspiration method in a bath at 100° absorbed oxygen much more slowly than an equal weight of dry hay. When the shavings were wetted the rate was nearly doubled, but was still only about half that of dry hay. There was also a noticeable difference in the oxidation of wetted sawdust according to whether it was from seasoned or from green timber.

Linseed Oil

Whilst unboiled linseed oil at ordinary room temperature does not appreciably absorb oxygen, when boiled, as is well known, the oil oxidises freely, and the rate becomes very rapid as the temperature is raised. From the remarkable increase in oxidation with each rise in temperature it is evident how easily spontaneous combustion can occur, as when oily waste or sawdust is placed in warm confined spaces —for example, near a steam pipe in a ship's hold. With this rapid oxidation the production of carbon dioxide is comparatively small.

When freshly cut grass, more especially actively growing grass in spring, is placed in a heap a considerable rise in temperature occurs quite rapidly. This is due to the physiological activity of the living grass. The same thing is experienced in a ship's hold when it is loaded with apples or like fruit, and is a cause of difficulty in the carriage of cold-stored fruit, unless the cargo is pre-cooled.

For the various types of oxidation which have been studied, one common feature has been the production of carbon monoxide when oxidation by living organisms is absent. It was only in the case of wetted coal that this carbon monoxide disappeared subsequently in the absence of life. Spontaneous combustion is, of course, always due to non-living oxidation, though living oxidation may produce the initial rise of temperature which makes non-living oxidation sufficiently active to produce combustion. Combustion starts when non-living oxidation has raised the temperature sufficiently to produce a focus of oxidation so rapid that it can spread locally.

Dole Wangling and Tax Dodging

Sir Ernest Benn on our Loss of Liberty

SIR ERNEST BENN, chairman of Benn Brothers, Ltd., publishers of THE CHEMICAL AGE, addressing members of the Manchester Publicity Association at the Midland Hotel, Manchester, on November 1, said our troubles to-day were due to the loss of the spirit of liberty, and not to details like the price of herring, the rate of wages in this trade or the other, the exchange value of the dollar, or exactly how many spindles should be destroyed to make Lancashire more wealthy. The winning of liberty through democracy would prove, in his judgment, more difficult than any of the previous battles with tyrant kings, but he suggested—as liberty was worth having in itself apart from the details—that we might be able to raise politics beyond "the sordid, materialistic, Socialistic level of the 9d. for 4d. party." Instead of an occasional individual robbing another in the "good old nineteenth-century manner" we had reached the stage when whole classes robbed whole nations, whole nations robbed other nations, and all were engaged in robbing the world. A simple thought like honesty was wholly incompatible to the conception of a State, the sole sovereign keeper of its own conscience and judge of its own actions. We were a people of dole wanglers and tax dodgers, and many of us were both.

Where Failure Pays Better than Success

Life was one long series of chits, forms, licences, permits, certificates, quotas, percentage formulæ, and other bankruptcy balderdash until all sane men were praying: "Give us back our nineteenth-century capitalism and our liberty." Planning, as we were now discovering to our cost, he said, made things worse: the standard of life of the world went down lower and lower as the experts and the bureaucrats did more for us. We had long suffered from Government interference; now we were afflicted with a far worse ill—Government help. Modern politics was becoming the art of looking for trouble, finding it whether it existed or not, diagnosing it, and applying the wrong remedy. This arrangement suited the politician, because politics was the only trade where failure paid better than success.

In the nineteenth century, which he claimed to represent, they talked of "co-operation in freedom," a proverb which left the Imperial Parliament and even the Town Council out of the matter, but with the most charitable view of twentieth-century social reform politics they could not escape the conviction that good works divorced from liberty and married to force had produced the present chaos from which the world was suffering. We had forgotten our responsibility to the world and that whenever we did anything in the way of governing a hundred other countries proceeded at once to adopt every one of our silly laws.

CANADIAN INDUSTRIES, LTD., have announced construction of a plant for production of industrial hydrogen peroxide by an electrolytic process at Shawinigan Falls. The company had previously acquired distribution rights for the British peroxide producer, B. Laporte, Ltd., of Luton, and it is understood that the new plant will be erected by special arrangement with the British firm.

The Chemical and Allied Industries of Great Britain

Census of Production Statistics, 1930

THE final report on the Fourth Census of Production (1930), now published by H.M. Stationery Office, price 8s. net, gives particulars relating to the Chemical and Allied Trades. The main particulars obtained for the Censuses of 1930 and 1924 are set out in Table I.

All particulars relating to Great Britain, for both 1930 and 1924, are confined to firms employing more than ten persons, but those relating to Northern Ireland apply to firms employing more than five persons. Subject to the absence of separate record for 1930 of the small production of matches in Northern Ireland, the results shown for the two years are comparable for each trade except the Fertiliser, Disinfectant, etc., Trades, the gross output value of which is slightly understated for 1930 in relation to 1924 as the result of a change in the method adopted of valuing certain manufactures; the net output and employment totals are not affected by this change.

Taking the chemical group as a whole, 11,053 persons were stated to have been employed by firms employing not more than ten persons, at the 1930 Census, and 8,246 (including a small number in Northern Ireland) in 1924. Thus, of the aggregate number of employees recorded by firms of all classes, the proportion employed by the smaller firms was 5.9 per cent. in 1930 and 4.4 per cent. in 1924. Some part of this apparent increase for 1930 is probably due to the inclusion of employees required more for distributive than for productive operations. In addition, 111 firms to which schedules were sent furnished no information at the 1930 Census, but these outstanding cases are known to have consisted either of small businesses or of businesses that were in operation for only a part of the censal year. The number of firms that furnished no particulars at the previous Census was about 350.

Firms were given the option of making returns for the calendar year 1930 or for their period of account most closely corresponding thereto, provided that the ending date of that period was not later than March 31, 1931. The mean terminal date of the returns was about the end of the third week of December, 1930, and the aggregates for the group as a whole may thus be taken to be fairly representative of the calendar year. This result is not invariably true as regards the production figures shown in the various reports for individual commodities, some of which (*e.g.*, fertilisers) were manufactured principally by firms whose accounting year was a period of twelve months other than the calendar year. Nearly two-thirds of the total number of returns received were for the calendar year and the firms concerned employed about three-fourths of the total number of employees recorded for the whole group. Table II shows the number of returns and the number of persons employed in each trade in respect of these firms.

As between one trade and another the money value of the gross output (column 2 of Table I) is largely dependent on the intrinsic value of the materials from which the products are manufactured, while as between one year and another the figure for the same trade is influenced by changes in the prices of those materials and in manufacturing costs and profits. Further, in certain trades duplication in the gross output value leads to a considerable overstatement of the value of the products as finally delivered, this factor affecting each trade to a different extent. For these reasons the gross output figure does not provide a satisfactory representation of the position either of different trades in relation to each other in a given year or of the same trade in different years.

The net output reported by a given trade for different years is affected by fluctuations in the various items which the figure comprises, *viz.*, wages and salaries, rent, sales expenses, etc., as well as depreciation and profits. Measurement of production by net output is therefore only a rough guide and the important qualifications to which the results are subject should not be overlooked. Net output per head eliminates the variable factor of the numbers of persons employed, but the use of figures of net output per head for purposes of comparison is also subject to the qualifications mentioned.

The recorded value of the total net output in the chemical group of trades was greater in 1930 than in 1924 by £7,116,000, or by 11 per cent. The principal advance occurred in the Oil and Tallow Trade, the 1930 total for which was more than double that of 1924, while an increase of 65 per cent. was shown for the Petroleum Refining Trade; among other trades recording increases for 1930 may be mentioned the Ink, Gum and Sealing Wax (30 per cent.) and the Paint, Colour and Varnish Trades (17 per cent.). The only cases in which substantially lower figures were recorded at the 1930 Census were the Seed Crushing and the Match Trades, in which the net output declined by 38 per cent. and 14 per cent. respectively.

The average net output per person employed in the group was £409 in 1930, an increase of nearly 11 per cent. over that shown for 1924 (£369). These averages are unusually high when it is borne in mind that the charge of Excise duty is excluded and that one-fourth of all employees in these trades were females. Exceptionally high figures were shown for the Petroleum Refining Trade (£1,016) and the Oil and Tallow Trade (£613), both in relation to the corresponding

Table I.

Principal Results of the Chemical and Allied Industries as revealed by the Census of Production, 1924 and 1930

Trade.		Gross output (selling value of goods made and value of work done). (2)	Cost of materials used and amount paid for work given out. (3)	Net output (excess of col. (2) over col. (3)). (4)	Average number of persons employed (except out-workers). (5)	Net output per person employed. (6)	Power available (7)
		£'000	£'000	£'000	No.	£	Thous. H.P.
Chemicals, Dyestuffs and drugs* ..	1930	52,653	26,528	24,985‡	70,475	355‡	536.9
	1924	54,472	29,776	23,267‡	66,962	347‡	231.7
Fertiliser, disinfectant, Glue, etc.*	1930	5,717	3,116	2,601	8,548	304	35.2
	1924	7,695	4,921	2,774	9,661	287	34.2
Soap, candle and perfumery* ..	1930	29,105	16,200	12,905	27,010	478	57.8
	1924	32,073	19,738	12,335	29,166	423	34.1
Paint, colour and varnish* ..	1930	19,528	10,895	8,633	21,292	405	52.1
	1924	16,948	9,598	7,350	18,502	397	36.5
Seed crushing ..	1930	21,824	19,407	2,417	10,992	220	67.6
	1924	36,122	32,512	3,610	14,027	279	73.5
Oil and tallow*	1930	16,446	11,496	4,950	8,081	613	14.6
	1924	11,757	9,325	2,432	6,303	386	9.7
Petroleum refining	1930	16,087	8,321	5,716‡	5,626	1,016‡	43.2
	1924	14,196	10,733	3,463	6,905	502	47.1
Explosives and fireworks ..	1930	5,227	2,224	3,003	9,486	317	16.3
	1924	5,306	2,503	2,803	8,553	328	14.9
Starch and polishes	1930	6,997	2,997	4,000	7,962	502	10.4
	1924	7,545	3,510	4,035	9,289	434	8.8
Match	1930	4,264	761	1,483‡	4,017	369‡	4.9
	1924	4,388	914	1,724‡	4,876	354‡	5.4
Ink, gum and sealing wax ..	1930	3,468	1,464	2,004	4,029	497	11.1
	1924	2,823	1,274	1,549	3,212	482	5.7
Unclassified chemical trades (Northern Ireland)†† ..	1930	436	212	224	633	354	2.2
	1924	437	274	163	638	255	1.6
TOTAL:							
England and Wales ..	1930	165,450	93,812	66,993	161,679	414	788.7
	1924	173,617	111,013	59,539	160,141	372	436.9
Scotland ..	1930	15,730	9,504	5,661	15,618	363	61.1
	1924	19,849	13,679	6,056	17,058	355	64.5
Northern Ireland ..	1930	572	305	267	854	313	2.5
	1924	596	386	210	895	235	1.8

* Great Britain.

‡ Exclusive of Excise duty estimated as follows :—

	1930. £'000.	1924. £'000.
Chemicals, dyestuffs and drugs	1,140	1,429
Petroleum refining	2,050	—
Match	2,020	1,750

†† Includes the chemicals, etc., fertiliser, etc., paint, etc., and oil and tallow trades. In the other trades (except the soap, candle and perfumery trades and the match trade) there was no production in Northern Ireland.

Table II.—Returns for Twelve Months to December 31, 1930.

Trade.	Number of Returns.		Persons Employed.	
	Number.	Per cent. of total.	Average number.	Per cent. of total.
Chemicals, dyestuffs and drugs ..	374	70	55,932	79
Fertiliser, disinfectant, glue, etc. ..	46	33	2,185	26
Soap, candle and perfumery	114	66	21,311	80
Paint, colour and varnish	229	72	15,027	71
Seed crushing	17	53	9,599	87
Oil and tallow	109	65	5,863	73
Petroleum refining	13	52	3,240	58
Explosives and fireworks	40	89	9,055	95
Starch and polishes	39	55	6,469	81
Match	14	45	685	17
Ink, gum and sealing wax	42	66	2,670	66
TOTAL	1,037	65	132,036	74

Table III.—Total Production in Great Britain.

Kind of Goods.	1930.	1924.		1930 as a percentage of 1924.
	As returned.	As returned.	At 1930 average values.	
	£'000	£'000	£'000	Per cent.
Chemicals, dyestuffs and drugs ..	52,406	55,891	50,126	105
Fertilisers, disinfectants, glue, etc. ..	9,843	11,731	8,635	114
Soap, candles and perfumery	27,701	29,791	26,935	103
Paint, colours and varnishes	18,781	17,242	15,516	121
Seed oils, oil cake, etc.	25,804	41,032	31,448	82
Animal and fish oils, etc.	14,293	11,920	10,513	136
Petroleum refined	14,332	13,548	11,938	120
Explosives and fireworks	5,764	5,648	5,000	115
Starch and polishes	7,243	7,730	8,729	83
Matches	4,253	4,371	4,299	99
Ink, gum and sealing wax	3,670	2,982	2,370	155
TOTAL	184,090	201,886	175,509	105

Table IV.—Separate Establishments.

Trade.	1930.		1924.
	Number of establishments.	Number of returns.	Number of returns.
Chemicals, dyestuffs and drugs	604	534	613
Fertiliser, disinfectant, glue, etc.	155	140	183
Soap, candle and perfumery	189	174	189
Paint, colour and varnish	379	318	289
Seed crushing	59	32	49
Oil and tallow	186	168	178
Petroleum refining	26	25	31
Explosives and fireworks	49	45	41
Starches and polishes	79	71	72
Match	34	31	36
Ink, gum and sealing wax	74	64	55
TOTAL	1,834	1,602	1,736

Table V.—Net Output per Person Employed.

Size of firm (average numbers employed).	Chemicals, Dyestuffs and Drugs.	Fertiliser, Disinfectant, Glue, etc.	Soap, Candle and Perfumery	Paint, Colour and Varnish.	Seed Crushing.	Oil and Tallow.
	£	£	£	£	£	£
11–24 ..	384	251	317	309	114	337
25–49 ..	397	308	450	356		463
50–99 ..	390	318	480	393	167	354
100–199 ..	460	327	565	424	190	1,003
200–299 ..	351		411	480		
300–399 ..	398	282	549	482	326	900
400–499 ..	304			403		—
500–749 ..	347	—	425			—
750–999 ..	371	—		—	203	—
1,000–1,499 ..	301	—	480	—		—
1,500 and over	284	—		—		—
TOTAL ..	355	304	480	405	220	613

Table VI.—Average Number of People Employed (Excluding Outworkers).

Trade.		Operatives.		Administrative, technical and clerical staff.		Total.
		Males.	Females.	Males.	Females.	
Chemicals, dyestuffs and drugs	1930	46,192	9,594	10,205	4,484	70,475
	1924	46,365	9,259	8,147	3,191	66,962
Fertiliser, disinfectant, glue, etc.	1930	5,889	1,153	1,124	382	8,548
	1924	6,711	1,388	1,225	337	9,661
Soap, candle and perfumery ..	1930	10,784	8,405	5,134	2,687	27,010
	1924	11,971	9,809	4,975	2,411	29,166
Paint, colour and varnish ..	1930	12,450	1,973	5,039	1,830	21,292
	1924	10,812	1,857	4,385	1,448	18,502
Seed crushing	1930	9,044	247	1,347	354	10,992
	1924	11,726	335	1,506	460	14,027
Oil and tallow	1930	4,145	651	2,454	831	8,081
	1924	3,992	271	1,564	476	6,303
Petroleum refining ..	1930	4,777	31	738	80	5,626
	1924	5,982	55	776	92	6,905
Explosives and fireworks ..	1930	4,241	4,154	698	390	9,486
	1924	3,587	4,031	638	297	8,553
Starch and polishes ..	1930	2,787	3,352	1,252	571	7,962
	1924	3,086	4,439	1,233	531	9,289
Match	1930	1,359	2,235	307	116	4,017
	1924	1,552	2,919	290	115	4,876
Ink, gum and sealing wax ..	1930	1,835	795	946	453	4,029
	1924	1,479	742	674	317	3,212
Unclassified chemical trades (Northern Ireland)	1930	551	4	61	17	633
	1924	552	7	69	10	638
TOTALS :—						
England and Wales	1930	92,831	30,132	27,275	11,441	161,679
	1924	95,244	32,576	23,359	8,962	160,141
Scotland	1930	10,564	2,399	1,925	730	15,618
	1924	11,904	2,447	2,003	704	17,058
Northern Ireland	1930	662	63	105	24	854
	1924	667	89	120	19	895

Table VII.

Trade.		Operative staff employed. During week ended October 18th.		Average during year.		Net output. Gross output.	Amount.		Wages paid. Amount.	
			Proportion of trade.		Proportion of trade.			Proportion of trade.		Proportion of net output.
		No.	Per cent.	No.	Per cent.	£'000	£'000	Per cent.	£'000	Per cent.
Chemicals, dyestuffs and drugs	1930	39,610	73.8	42,799	76.7	36,349	17,022	68.1	6,372	37.4
	1924	37,734	67.6	§	—	§	14,449	62.1	5,396	37.3
Fertiliser, disinfectant, glue, etc.	1930	4,598	67.8	4,840	68.7	3,859	1,747	67.2	618	35.4
	1924	3,793	49.2	§	—	§	1,478	53.3	514	34.8
Soap, candle and perfumery	1930	14,037	77.4	14,707	77.3	23,939	9,984	77.6	1,929	19.3
	1924	15,882	72.7	§	—	§	9,292	75.6	1,953	21.0
Paint, colour and varnish ..	1930	7,620	53.5	7,669	53.2	10,060	4,375	50.7	1,040	23.8
	1924	6,868	54.1	§	—	§	3,982	54.2	942	23.6
Seed crushing	1930	7,741	84.9	7,933	85.4	17,166	1,853	76.7	1,093	59.0
	1924	11,726	98.1	§	—	§	3,826	97.9	1,728	45.2
Oil and tallow	1930	2,156	44.9	2,054	42.8	6,147	1,572	31.8	279	17.7
Petroleum refining	1930	2,285	46.8	2,217	46.1	7,764	2,070	40.7	416	15.6
Oil, tallow and petroleum refining	1930	4,441	45.8	4,271	44.5	13,911	4,242	39.8	695	16.4
	1924	6,887	65.4	§	—	§	3,728	63.2	1,112	29.8
Explosives and fireworks ..	1930	5,054	61.5	5,234	62.3	3,708	2,270	75.6	643	28.3
	1924	6,200	76.9	§	—	§	2,322	82.8	627	27.0
Starch and polishes	1930	3,581	59.6	3,672	59.8	3,690	2,286	57.1	421	18.4
	1924	5,375	71.8	§	—	§	3,018	74.8	579	19.2
Match	1930	3,234	89.2	3,249	90.4	4,081	1,431	96.5	360	25.2
	1924	4,203	94.6	§	—	§	1,693	98.2	474	28.0
Ink, gum and sealing wax ..	1930	1,358	52.3	1,372	52.2	1,809	1,020	50.9	203	19.9
	1924	1,522	67.6	§	—	§	1,151	74.3	211	18.3
TOTAL	1930	91,874	69.2	95,746	70.4	118,572	46,230	63.6	13,374	28.9
	1924	100,190	70.2	§	—	§	44,939	67.8	13,536	30.1

§ Details not available.

figures for 1924 and to the group average for 1930, and the figures for the Starch and Polishes, Soap, Candle and Perfumery, and Ink, etc., Trades were also much in excess of the average. These results may probably be associated with the development of advertising, the cost of which, with other selling expenses, forms a charge on net output. Only in the case of the Seed Crushing Trade was the average net output in 1930 lower than £300 per employee.

Table III shows for each *principal class of commodities* produced by the Chemical and Allied Trades, the total output value recorded for the year 1930, and the result of a revaluation of the output of similar classes of goods in 1924, based on the average factory values shown by the returns for 1930. This calculation eliminates the factor of price changes, and provides a measure by which the output in the two years may be compared directly. The figures for both years represent the total recorded output, whether returned by firms in the trade chiefly concerned in the production of the specified goods, or by firms in other trades. In order to complete the calculation it has been necessary to make estimates in respect of output aggregating about £15 million in value in respect of which particulars of quantities were not obtained. The comparatively small production in Northern Ireland is excluded from the particulars for both 1930 and 1924.

Volume of Production

The figures given in Table III represent the gross output value and no allowance for duplication is made for either year. On the assumption that no considerable change occurred in the proportion of the output that was duplicated, the aggregate volume of production was about 5 per cent. greater in 1930 than in 1924; as the total number of employees in these trades was substantially the same in the two years, this increase is also the measure of the variation in the volume of production per employee. If owing to the absorption of smaller units there was less duplication in 1930 than in 1924 the increase in the volume of production, and the volume of production per employee, would have been greater than that recorded. The increase in 1930 in the value of the net output per employee amounted to 11 per cent., so that without allowing for any change that may have taken place in the general level of the charges included in the net output (*e.g.*, in wages and salaries or selling expenses), the volume of production was lower in relation to the net output by about 6 per cent. The relatively greater output of chemical products made in 1924 by trades not included in this group was not sufficient to affect this result by as much as 1 per cent.

Table IV shows the number of separate establishments covered by the results for 1930, and the total number of returns received for 1930 and 1924. In the case of a firm owning more than one establishment situated in the same Census area and engaged in the same Census trade, a combined return covering all such establishments was usually accepted provided the number of operatives employed at each establishment was shown separately. The number of establishments reported was thus greater than the number of returns received.

Average Net Output per Person

The average number of persons recorded in each return was 111. Only 354 returns, or 22 per cent. of the total number, related to establishments employing 100 persons or more, but these establishments contributed 77 per cent. of the total net output of the group and employed about three-fourths of the total personnel.

The figures of average net output per person employed show little significant tendency and the nature of the manufacturing processes carried on by the firms included in each size group was probably a more important factor in determining these averages than the scale on which production was carried on. As Table V shows, this factor may also be of importance among individual trades which are concerned with products of varied kinds.

The considerable diversity in the figures shown for the Chemicals, Dyestuffs and Drugs Trades may be attributed to the large and varied range of manufactures covered by these trades. In the Fertiliser, etc., Trades, the Paint, etc., Trade and the Seed Crushing Trade, net output per employee increased progressively up to the group containing the largest firms, which recorded a figure lower than the average for all firms in each trade.

The principal producing areas in 1930 and 1924 were, in order of importance, Lancashire, Greater London and the "rest of England," these three areas covering in 1930 over 75 per cent. of the total net output and over 70 per cent. of the total number of employees. The two largest areas showed a decline in employment between 1924 and 1930 but there was an increase in employment in the "rest of England" and a very marked increase from 6,817 to 13,208 in the North-East Coast area. Each of the areas in Scotland showed lower employment figures in 1930. The largest number of returns was received from firms in the Greater London area.

Table VI shows the average numbers of male and female operatives and administrative, technical and clerical staff in each of the chemical group of trades in the two censal years.

A decline of 6,276 in the total number of *operatives* in 1930 was counterbalanced by an increase of 6,333 in the number of *administrative, technical and clerical staff*, there being a net increase of 57 persons. Operatives formed 76.7 per cent. of all employees in 1930 and 80.3 per cent. in 1924. Of the 11 specific trades shown in the table, the number of operatives increased in 5, the principal advances being in the Ink, Gum and Sealing Wax Trades (18 per cent.) and the Paint, Colour and Varnish Trade (nearly 14 per cent.); among the 6 trades recording a smaller number of operatives in 1930 may be mentioned the Seed Crushing and the Petroleum Refining Trades, which showed totals lower by 23 per cent. and 20 per cent. respectively. With the exception of the Seed Crushing, Petroleum, Refining and Fertiliser, etc., Trades, each of the trades distinguished in Table VI recorded larger numbers of administrative, technical and clerical staff in 1930. In the important Chemicals, Dyestuffs and Drugs Trades, the increase was particularly marked, amounting to 30 per cent. of the numbers recorded at the previous Census.

The Wages Bill

In the group as a whole the wages bill formed a slightly lower proportion of the total net output in 1930 than in 1924 but substantial changes are shown in individual cases, notably those concerned in the production of oil. In the Seed Crushing Trade, the proportion of wages increased from 45.2 per cent. of the net output in 1924 to 59 per cent. in 1930, being higher in both years than in any other of the specified trades; in the combined Oil and Tallow and Petroleum Refining Trades there was a relatively heavy decline in the wages proportion, but the sample covered by the wages inquiry in 1930 was small and may not have been representative. The proportionately lower wages costs indicated in the Oil and Tallow and Petroleum Refining Trades and also in the Soap, Candle and Perfumery and certain other trades may be associated with the relatively higher selling expenses, including advertising costs, which have already been referred to.

The average earnings per operative in the case of the firms covered by the table amounted to £140 in 1930. In 1924 the number of operatives employed in the week ended October 18 by all firms in this group approximated very closely to the average for the year and, on the assumption that there was a similar agreement as regards the firms furnishing wages returns, the average earnings per operative in 1924 may be estimated as about £135. In the Chemicals, Dyestuffs and Drugs Trades the figures given for net output may be affected to some extent owing to the absence of information which would enable the amount of medicine stamp duty paid by each of the firms manufacturing drugs to be estimated with precision. In the other trades affected by excise duties, the figures for net output may be taken as substantially correct.

Increased Electrical Equipment

There was a substantial increase in the electric motor equipment in this group of trades in 1930, the capacity being greater by 77 per cent. than in 1924 in the case of all motors in use and by nearly 120 per cent. for motors in reserve. The more than four-fold increase in steam turbines in use is due in the main to the marked increase in electric generators and in the capacity of motors driven by the electricity so generated. On the other hand, the total horse-power of reciprocating steam engines in use declined in 1930 by one-third.

Table VIII.—Power Available in 1930 and 1924.

Trade.		Prime movers.	Electric generators.	Electric Motors. Driven by electricity. Generated in same works.	Generated in other works under same ownership.	Purchased.	All electric motors.
		Th. H.P.	Th. kW.	Th. H.P.	Th. H.P.	Th. H.P.	Th. H.P.
Chemicals, dyestuffs and drugs*	1930	389.8	162.5	131.0	2.1	147.1	280.2
	1924	165.4	69.4	50.7	—	66.3	117.0
Fertiliser, disinfectant, glue, etc. *	1930	11.8	4.1	7.1	0.1	23.4	30.6
	1924	15.6	3.7	4.2	†	18.6	22.8
Soap, candle and perfumery	1930	41.4	25.1	18.9	—	16.4	35.3
	1924	24.3	9.0	8.2	3.0	9.8	21.0
Paint, colour and varnish* ..	1930	12.9	3.1	3.9	—	39.2	43.1
	1924	13.5	3.0	2.9	—	23.0	25.9
Seed crushing	1930	34.8	11.3	15.2	3.4	32.8	51.4
	1924	50.5	15.0	18.0	—	23.0	41.0
Oil and tallow ..	1930	6.8	3.4	2.6	1.6	7.8	12.0
	1924	5.7	0.9	1.0	—	4.0	5.0
Petroleum refining ..	1930	34.3	20.0	25.9	0.3	8.9	35.1
	1924	42.5	23.9	21.0	—	4.6	25.6
Explosives and fireworks	1930	12.7	7.8	14.4	—	3.6	18.0
	1924	13.7	6.6	10.7	—	1.2	11.9
Starch and polishes ..	1930	1.8	0.5	0.1	1.3	8.6	10.0
	1924	2.7	0.4	0.5	—	6.1	6.6
Match	1930	4.5	2.5	3.3	—	0.4	3.7
	1924	5.0	2.5	2.6	—	0.4	3.0
Ink, gum and sealing wax	1930	2.7	0.8	1.0	†	8.4	9.4
	1924	1.7	0.3	0.2	—	4.0	4.2
Unclassified chemical trades (Northern Ireland)	1930	1.9	1.0	1.8	—	0.3	2.1
	1924	1.4	0.9	1.2	—	0.2	1.4
TOTAL :—							
England and Wales	1930	514.1	222.1	197.2	8.8	274.6	480.6
	1924	292.6	111.8	98.4	3.0	144.3	245.7
Scotland	1930	39.1	19.0	26.2	†	22.0	48.2
	1924	47.8	22.9	21.5	—	16.7	38.2
Northern Ireland ..	1930	2.2	1.0	1.8	—	0.3	2.1
	1924	1.6	0.9	1.3	—	0.2	1.5

* Great Britain. † Less than 50 H.P.

At the 1930 Census, firms were definitely informed that obsolete engines should not be recorded in their returns, and as no similar instruction was given at the previous Census, the figures for reserve or idle plant in the two years may not be precisely comparable. In any case, however, the proportion of reserve or idle plant does not furnish a reliable measure of the activity of trade, since all engines that were in operation during the greater part of the period in which production was carried on were recorded as "ordinarily in use," irrespective of intermittent working.

Table IX.—Electricity Used.

Trade.	Electricity purchased.	Electricity generated. In same works.	Electricity generated. In other works owned by the firm.	Number of units generated per kilowatt of generators. in use.
	B.T.U. (Kw.-hrs.) '000	B.T.U. (Kw.-hrs.) '000	B.T.U. (Kw.-hrs.) '000	B.T.U. per Kw.
Chemicals, dyestuffs and drugs ..	240,451	359,050	20,894	3,778
Fersiliser, disinfectant, glue, etc.	15,112	5,139	420	1,591
Soap, candle and perfumery ..	9,102	21,490	—	1,397
Paint, colour and varnish ..	23,061	3,168	—	1,619
Seed crushing	30,480	21,529	3,627	2,928
Oil and tallow	6,200	3,051	10,429	980
Petroleum refining	2,325	42,533	22	3,532
Explosives and fireworks	2,074	11,087	—	2,826
Starch and polishes	5,755	697	1,300	2,492
Match	249	2,240	—	1,258
Ink, gum and sealing wax ..	4,160	383	13	710
TOTAL	338,969	471,276	36,705	3,253

The particulars furnished at the two Censuses by each of the trades included in the chemical and allied group, in respect of prime movers, electric generators and electric motors installed, are shown in Table VIII.

An increase in the power used per operative is shown for each of the trades in this group, amounting for the group as a whole to over 50 per cent.

On the basis of the particulars received, it may be estimated that the total consumption of coal and coke for power purposes in 1930 was about 1,340,000 tons of coal and 22,000 tons of coke. No particulars of oil, gas or other fuel used were ascertained for the year 1930.

Table IX shows the quantity of electricity used in 1930. No separate record of the purpose for which current was used was obtained.

Safety Problems in the United States

President Roosevelt's Message

SAFETY problems received the earnest attention of enthusiastic throngs gathered at the 23rd annual safety congress and Exposition at Cleveland, Ohio, during the first week of October. From the standpoint of attendance the congress this year was the largest since 1930; the capacities of three hotels were taxed to overflowing and attendance at many of the industrial sessions was unexpectedly large. While official attendance figures are not yet available, it is estimated that at least 8,000 persons attended one or more of the sessions.

The chemical section was organised by the following committee: A. L. Armstrong, general chairman (Eastman Kodak Co.); H. L. Miner, vice-chairman in charge of programme (E. I. du Pont de Nemours and Co.); C. L. Jones, vice-chairman in charge of engineering (Hercules Powder Co.); Ralph O. Keefer, secretary (Aluminium Co. of America); E. L. Root, news letter editor (Celluloid Corporation); Dr. Leonard Greenburg, occupational disease committee chairman (Yale Medical School); S. D. Kirkpatrick, membership and publicity committee chairman (Chemical and Metallurgical Engineering); R. C. Stratton, statistics committee chairman (Travellers Insurance Co.); F. E. Clancy, Junior (Mathieson Alkali Works, Inc.); F. W. Dennis (Hooker Electrochemical Co.); Ira V. Kepner (Pennsylvania Salt Manufacturing Co.); E. F. King (Lever Brothers Co.); H. P. Lewis (E. I. du Pont de Nemours and Co.); John Roach (Deputy Commissioner of Labour, Trenton); C. E. Sevrens (Merrimac Chemical Co., Inc.); Plummer Wheeler (American Cyanamid Co.); S. E. Whiting (Liberty Mutual Insurance Co.); Carl G. Wyder (Textile Dyeing and Printing Co. of America).

The keynote of the congress was sounded by President Franklin D. Roosevelt, whose letter was read at the opening session. The President's message said, in part: "I am greatly impressed and pleased with the constructive steps already taken toward the elimination of accidents, especially highway disasters, which, because avoidable, are doubly tragic. This is a problem which we must attack with the utmost energy and persistence. Ultimately we may expect to reach the solution of highway safety provided complete co-operation on the part of all citizens is given to concerted efforts of groups such as yours. . . . I assure you of my keen personal interest in your efforts and commend your splendid programme to induce co-operation among every citizen in our nation with the movement looking to the prevention of needless fatalities—a drain upon our most precious natural resource which must be ended."

Following the general meeting the congress broke up into a score or more of sectional programmes which ran concurrently during the week. Among the specific industries which carried on separate programmes were: Cement; chemical; commercial vehicle; food; meat packing, tanning and leather; metals; mining; paper and pulp; petroleum; power press; public utilities; refrigeration; rubber; textile; and wood products.

There were also separate sessions for public officials and traffic authorities, and programmes on school safety and home safety. Periodically during the week delegates of allied groups met for a series of subject sessions, planned and sponsored by the American Society of Safety Engineers. Among the subjects discussed were fusion welding and cutting, mechanical methods of handling materials, the safe use of electricity in industry, dust in industry, the safe use of chemicals in industry, new workers, and the causes of falls.

The congress ended with prospects that President Roosevelt will call a meeting of Governors early in the new year to resume the study of measures to reduce the country's rising toll of road fatalities.

Unity in the Gas Industry

Inaugural Dinner of the British Gas Federation

LORD MACMILLAN, president of the British Gas Federation formed by the governing bodies of the Institution of Gas Engineers, the National Gas Council, the British Commercial Gas Association, and the Society of British Gas Industries, without alteration of their respective constitutions and work, presided at the inaugural dinner of the Federation at Grosvenor House on Monday evening.

Sir DAVID MILNE-WATSON, who proposed the toast of the guests, said the gas industry could now, for the first time in its history, speak with one national voice. Under stress of competition from all sides, and with the help of research and the growth of scientific knowledge, the industry had grown to be a vast national public utility service serving the community in countless ways—domestic, commercial, and industrial. Nowhere did modern engineers, chemists, and physicists co-operate more usefully than in a 1934 gasworks. Gas production, of course, still remained their first concern. There was no substitute for gas. No other fuel gave so flexible and so handy a means of heat. Gas and gas alone could be stored ready to be of service at a turn of the wrist.

The next and suceeding decades would be periods of great advancement and prosperity for the industry. No one need, however, be fearful lest it would be permitted to distribute excessive dividends. They recognised that, as a public utility service, the needs of the public came first. Indeed, Parliament had ensured that the industry must pay regard to those needs. The law forbade them to raise the price of gas without lowering their dividends, and, in the alternative, limited their power of raising dividends at the expense of the public.

Lord LONDONDERRY, Secretary of State for Air, who responded, said there was a tremendous field of opportunity in front of the coal industry.

Dr. LESLIE BURGIN, Parliamentary Secretary, Board of Trade, proposed "The Federation," and Lord Macmillan, in reply, said that the industry was an admirable combination of private enterprise and public control.

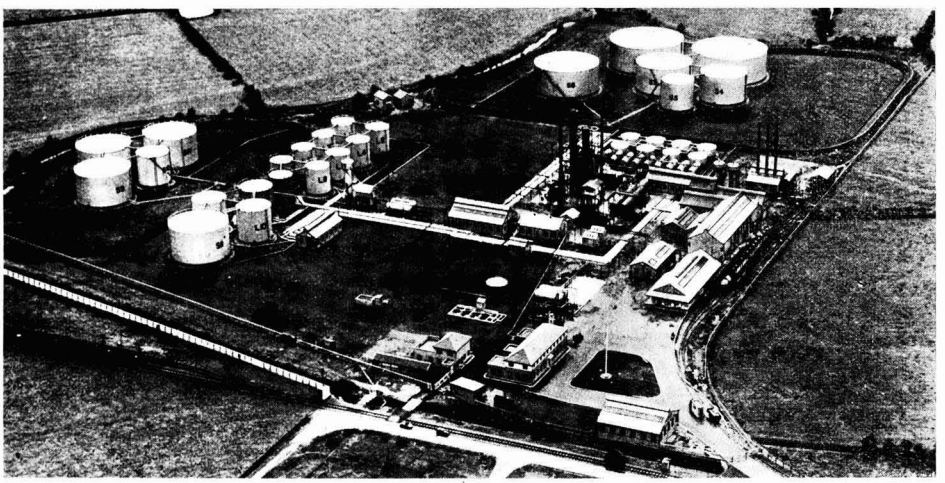
Mr. C. VALON BENNETT, president of the Institution of Gas Engineers, proposed the health of the chairman.

A New British Oil Refinery

THE new oil refinery which has been built for Lobitos Oilfields, Ltd., at Ellesmeré Port, was formally opened on October 24, the occasion being celebrated by a luncheon which was attended by a large gathering of representatives of the oil industry from all over the country.

Ellesmere Port Refinery, as the establishment is to be known in future, occupies a site of twenty acres within easy reach of the Manchester Ship Canal. Its present output capacity is estimated at 100,000 tons of oil a year. The refinery is considered by its designers to be the finest in Europe. An attempt has been made to embody in its equipment and layout every improvement in oil-refining technique which the chemist and engineer have evolved in recent years. It is a full range, straight distillation unit. In one operation benzine, kerosene, gas oil, lubricating oils, and bitumen residue are obtained. The plant is in two interconnected sections. One half, from which the benzine, kerosene, and gas oil are obtained, works under atmospheric pressure. The other half, which picks up the residue from the first half and produces from it lubricating oils and bitumen, works under a vacuum. The two sections can be run together or independently. Special blending equipment has been installed so that straight or blended oils may be supplied as demanded by the trade.

This enterprise is entirely British. The company and its associated concerns operate in Peru upon a total area of 205 square miles, on which 552 wells are producing. Production during the year 1932-3 amounted to 266,210 tons. In Ecuador the company and its associates are at work upon a field of about 150 square miles, on which 391 wells are producing, and the crude oil obtained from these wells in 1933-4 amounted to 202,155 tons. The great bulk of this 468,000 tons of oil is shipped in crude state in the company's own tankers for refinement overseas. Hitherto the oil trade of Great Britain has been largely dependent for supplies upon refineries which, whether in British ownership or not, are situated abroad. The importance of the new enterprise at Ellesmere Port is that it establishes in this country an up-to-date refinery owned by a completely independent company which has assured sources of high-grade crude oil.



The New Oil Refinery for Lobitos Oilfields, Ltd., Ellesmere Port.

New Technical Books

THE PROGRESS OF SCIENCE: AN ACCOUNT OF RECENT FUNDAMENTAL RESEARCHES IN PHYSICS, CHEMISTRY AND BIOLOGY. By J. G. Crowther. pp. 304. Kegan Paul, Trench, Trubner and Co., Ltd. 12s. 6d. net.

This book gives a popular account of several recent triumphs in experimental physics. The artificial disintegration of atoms is described, together with the discovery of the neutron, and the vast and active research on cosmic rays, which has led to the discovery of the positive electron, is reviewed at length. Besides giving an impression of the atmosphere of research in the Cavendish Laboratory, the author has described the famous Institute of Theoretical Physics, at Copenhagen, and the Physico-Technical Institute of the Ukraine, at Kharkov. In the biological sections, there are reviews of recent work in chemical embryology. The book is concluded with an account of the discovery of the liver treatment for pernicious anæmia, as an example of the success of the application of scientific method to medical research.

* * *

LUBRICATING OIL TESTS AND THEIR SIGNIFICANCE. By J. E. Southcombe, M.Sc. Third edition, revised. pp. 85. Germ Lubricants, Ltd. 2s. 6d. net.

The first edition of this book was published in the early part of 1932. The author has now carefully revised the text and has added some further material on cylinder wear in automobiles, the consumption of lubricating oil in engines, and recent developments in the refining of lubricating oils. After a brief description of the manufacture of lubricating oils, the author discusses the testing of such oils in the laboratory—specific gravity, flash point, fire test, volatility, cold test, cloud point, pour point, viscosity, effect of temperature on viscosity, coke test, sludging and oxidation, demulsification number, oiliness, impurities and colour. He then deals with the general principles of lubrication and extraneous factors which influence the behaviour of lubricants. Further sections are devoted to the reclaiming of used lubricating oil, specifications and the consumption of lubricating oil in engines. His remarks on the subject of specifications are very much to the point, for it is quite true that such specifications "are very rarely drafted by people with accurate knowledge and experience on both sides of the question," whilst in no business has the amateur dabbler had greater scope than in lubricating oil.

* * *

THE PRINCIPLES OF MOTOR FUEL PREPARATION AND APPLICATION. By Alfred W. Nash and Donald A. Howes. Vol. I. pp. 538. Chapman and Hall, Ltd. 30s. net.

There are probably few branches of technology which can show so much progress in the past few years as that covering the production of fuels for internal combustion engines. It is therefore the more remarkable that so few authoritative text-books have been devoted to this subject. The authors of the book under review, however, appear to have presented a very complete description of present-day technique, and have also discussed problems that will undoubtedly arise in the future. The present volume covers the production of benzole, various synthetic fuels (including alcohols), and general storage and distribution. Volume II will deal with the properties of motor fuels, including analysis, sulphur content, gumming properties, volatility requirements, etc. The chapters on the distillation of petroleum to produce motor spirit, the refining of this to market demands, and the development of the cracking and hydrogenation processes, whereby the crude oil is made to yield even more spirit than it originally contains, by conversion of the heavier oils, will serve no small purpose if they only emphasise the vast amount of work and capital expenditure involved in maintaining a constant and reliable source of motor fuel throughout the country. The position and significance of benzole is not treated at any great length, but alcohol fuels (which derive importance in many countries where intensive nationalisation is the order of the day) and synthetic motor fuels are covered somewhat fully. The chapters describing the analysis of motor spirit (Volume II) are to show the modern trend in this subject. The collection of motor fuel specifications will also prove of considerable value to many, as such information is usually very scattered. The requirements of aviation fuels will be given the special consideration which they merit and much of this information has also been collected from widely divergent sources.

* * *

RUBBER: ITS ANTI-OXIDANTS AND PRESERVATIVES. A bibliography compiled by the Science Library and the Research Association of British Rubber Manufacturers (Science Library Bibliographical Series No. 151). pp. 82. The Science Museum, London. 5s. net.

As the Science Library has had the valuable help of the Nederlandsch Instituut voor Documentatie en Registratuur, Imperial Chemical Industries and the Rijks Rubberdienst, in addition to the advantage of collaboration with the Research Association of British Rubber Manufacturers in the compilation of this work, it is assuredly the most complete bibliography of its subject that has been issued. Anti-oxidants and preservatives for rubber are of special interest at the moment, and the bibliography is also opportune on account of the Rubber Exhibition at the Science Museum, South Kensington, which opened to the public on November 2, and is to remain open for six months. The scope of the bibliography comprises such subjects as the theory of anti-oxidants, storage of rubber, corrosion and deterioration, absorption of water and other liquids, action of light, preservation in general, oil-, acid- and liquid-resistant rubber, and anti-oxidants. The work forms part of a series of bibliographies, now numbering 151, on various branches of science and technology, which are prepared by the Science Library in response to individual demand, or on the occasion of special exhibitions. These publications are issued in mimeographed form.

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A TEXT-BOOK OF QUANTITATIVE CHEMICAL ANALYSIS. By Alex. Charles Cumming, D.Sc., F.I.C., and Sydney Alexander Kay, D.Sc. Sixth edition, revised by Francis Clint Guthrie, M.A., F.I.C., and John Trengove Nance, M.A. pp. 482. Gurney and Jackson. 15s. net.

This book is intended primarily for university and college students, and is arranged in such a manner that some knowledge of the general principles of quantitative analysis (volumetric and gravimetric) may be acquired by a practical study of the first three sections, whilst the further requirements of those who are making a special study of chemistry will be met by the remaining sections (colorimetric analysis, systematic quantitative work, ores and alloys, gas analysis, water analysis, and the quantitative analysis of organic substances). Several new volumetric methods have been incorporated, including the use of zinc amalgam and titanous sulphate as reducing agents, and of boric acid as an absorbent in the determination of ammonia. Methods of calibrating volumetric apparatus have been brought more into line with those recommended by the National Physical Laboratory. Owing to the increasing importance of electrometric titrations, it has been thought advisable to add a new section on this subject; here the aim has been to show how these methods may be used in the simplest possible way, all unnecessary theoretical treatment being excluded. A number of new reagents have been described in the section on colorimetric methods.

The Five-Day Week

Success of Nottingham Experiment

BOOTS PURE DRUG CO., LTD., notified its employees at its Nottingham works and offices on Monday that the experimental five-day week without reduction of pay, introduced on May 1 for the summer months, had proved so successful that it will be continued indefinitely. The board's decision was made after consideration of a report by Sir Richard Redmayne, who was nominated by the Minister of Labour as an independent investigator towards the close of the five-month period.

In the notice to employees Lord Trent, chairman of the company, said:—"It is generally agreed that the five-day week has been an unqualified success, and the directors have decided that, so long as co-operation continues to be given, there will be no need to revert to the 5½-day week."

Personal Notes

SIR HENRY SUTCLIFFE SMITH was re-elected chairman of the Colour Users' Association for the fourteenth time, at a meeting of the Council on November 2.

M. GASTON MENIER, director of the well-known firm of chocolate manufacturers of that name and Senator for Seine-et-Marne, has died in Paris at the age of 79.

MR. ARTHUR J. GILLIAN, general secretary of the Chemical Workers' Union, was elected a Labour member of the Southwark Borough Council in the triennial elections on November 1.

MR. WILLIAM WHERRY, who from his early days was employed at the Blackpool china clay works of Parkyn and Peters, has died at his home at Bittaford, near Plymouth, at the age of eighty-four.

LIEUTENANT COLONEL HENRY ERNEST HANSON, D.S.O. (61), of Willow Garth, Rolston, near Hornsea, Yorkshire, formerly of Hull, in business as a chemical broker, lately a director of Major and Co., Ltd., petroleum importers, of Hull, left £26,641 (net personalty £21,569).

DR. FRIEDRICH BERGIUS, whose work on the hydrogenation of coal is so well known and highly regarded in this country and whose more recent work has been on a technical process for wood saccharification, celebrated his fiftieth birthday on October 11. Dr. Bergius, a Nobel Prize winner of 1931, has frequently visited the United States, most recently in connection with the International Coal Conference held at the Carnegie Institute of Technology in Pittsburgh, has made many friends there, and has contributed to American technical literature. He now makes his home in Heidelberg, Germany.

MR. PETER MCINTYRE, of Montrose, has sailed for Trinidad, where he has received an appointment at Woodford Lodge, Chauguanas, in connection with the sugar trade.

MR. BORIS DVORKOVITZ has resigned from the board of Motor Fuel Proprietory, Ltd., and, subject to confirmation at the annual meeting on Wednesday next, Mr. Jose A. Dodero has been elected to take his place.

SIR BERNARD SPILSBURY will be the guest of the evening at the annual chemical dinner and dance, to be held at the Wharncliffe Rooms, Hotel Great Central, on December 18. Brigadier-General Sir Harold Hartley will preside.

MR. RICHARD BREERTON, of the mechanical rubbers department of Redfern's Rubber Works, Ltd., Hyde, has been re-elected a member of the Hyde Town Council for the third term.

SIR ROBERT MCALPINE, whose death occurred on November 3 at the age of 87, was well known in the chemical industry. Among the famous buildings for which he and his firm were responsible are the British Dyes building at Huddersfield, and factories and housing schemes of British Celanese, Ltd., at Spondon, Derbyshire. The Wembley Exhibition buildings were their outstanding achievement.

THE DOWAGER LADY BEECHAM died at Mursley Hall on November 3 at the age of 83. She was married in 1873 to Mr. Joseph Beecham, son of the founder of the famous patent medicine business. He was created a baronet in 1914 and died in 1916. Lady Beecham leaves two sons, Sir Thomas Beecham, the music conductor, and Mr. Henry Beecham, and six daughters.

Chemical Matters in Parliament

Imperial Chemical Industries and India

IN the House of Commons on Monday Mr. T. Smith (Normanton) asked the Secretary for India whether he was aware that indignation had been aroused in India at the news that Imperial Chemicals, Ltd., were negotiating with the Government of India for a 50-year monopoly to exploit the chemical resources of the Punjab; and, in view of the fact that India would shortly be given a new Constitution, what steps he proposed to take to ensure that in the event of any such contract being entered into the interests of India would be adequately safeguarded.

Sir S. HOARE said he had no information beyond what was contained in the official report of the proceedings of the Legislative Assembly on August 14, of which he was sending the hon. member a copy. The matter was one within the discretion of the authorities in India, who would, he had no doubt, see that the interests of India were properly safeguarded.

Imperial Smelting Corporation

Annual Report

IN their report for the year ending June 30, the Imperial Smelting Corporation shows that gross income amounted to £163,930, against £137,189 in 1932-33. After deducting expenses, fees and tax provision, the net balance is up from £129,880 to £154,984. Preference dividends for the year total £134,538, and the carry-forward is raised from £12,680 to £33,126.

In a detailed survey of operations, it is stated that the new vertical retort zinc distillation plant of Improved Metallurgy, Ltd., at Avonmouth, has been completed since the close of the financial year. The first half of the plant was brought into operation early in August, and the second half early in October. It is hoped that the whole of the new plant will soon be running at a production of over 20,000 tons per annum. This plant is now producing on a commercial scale the highest grade of metal, the production of which marks an important extension in the range of the company's activities.

Since the close of the financial year the share capital of the Basic Slag and Phosphate Companies, with acid and fertiliser works at Newport, and slag grinding plants at Panteg, Gowerton and Port Talbot, has been acquired. As already announced, an arrangement has been entered into with Fison, Packard and Prentice, Ltd., under which the interests of that company and those of the Imperial Smelting Corporation in the production and distribution of fertilisers in the West of England will be merged.

The Corporation has an issued capital of £4,494,766 in 2,069,809 6½ per cent. cumulative preference, and 2,424,957 ordinary shares of £1.

Importer's Slander Action

£1,200 Damages

IN the King's Bench Division on Wednesday, Mr. Justice Avery and a special jury had before them an action by Mr. Oberto Braga, an importer of resin and other foreign products, carrying on business at Mincing Lane, against Mr. Albert James Wuertz-Field, a perfumery manufacturer, carrying on business at Dominion House, St. Bartholomews Close, E.C., to recover damages for alleged slander.

Plaintiff is a Swiss by birth and came to this country in 1910. After the war he was interested in a process for extracting oil from nuts. He was associated in business with the defendant. Plaintiff complained that on April 19, 1933, at the defendant's office, defendant said "falsely and maliciously" to a Mr. B. A. Christoff and Mr. A. Jouharoff, about the plaintiff, words implying that plaintiff had been guilty of dishonest trade practices. At the time plaintiff was negotiating in business with Mr. Christoff's firm, but owing to the statement of defendant the negotiations fell through.

Defendant denied the words attributed to him, but said any words he had used were true in substance and in fact. Defendant also pleaded that he was not aware of plaintiff's negotiations with Mr. Christoff.

The jury awarded the plaintiff £1,200 damages and his lordship entered judgment accordingly with costs.

Notes and Reports from the Societies

Society of Chemical Industry

Birmingham Section: Industrial Gas Masks

MR. J. DAVIDSON PRATT, general manager of the Association of British Chemical Manufacturers, dealt with "Industrial Gas Masks" in a paper which he read at Birmingham on Tuesday. Firms intending to purchase gas masks, he said, should first determine the nature of the gases to be encountered in the works, and then discuss the respirators required with an organisation which had specialised in the production of gas masks, and be guided by their advice. The user was entirely in the hands of the maker since he had usually no means of checking the control and supervision during manufacture. A difficulty arose in regard to the gas test. Only a limited number of tests could be made on each type of container, and the problem was to choose a test gas for the particular type which would give a fair average idea of its performance against any gas of the series for which it was designed. Even among organic vapours there was no clear correlation between the chemical and physical properties and the amounts of the vapours that a respirator would absorb, while the same held good for alkaline absorbents and acid gases. This was a problem on which further investigation was necessary. For the service gas mask, the test gases were generally chloropicrin or carbon tetrachloride, to test what might be called the straight absorptive capacity of the respirator, and phosgene to test its catalytic absorptive activity.

Proper Storage Conditions

The purchaser, if he had one particular gas to deal with, could always satisfy himself as to the protection, by means of special tests against that carried out either by the maker or an independent authority. The Home Office had arrangements for testing designs of industrial respirators for particular gases before it approved them for use, but the approval referred only to the original design, and there was no Home Office control over the efficiency of the firm's subsequent production. A firm, having purchased gas masks for its particular gas hazards, must give consideration to their storage and use so that they would be found satisfactory and could be used efficiently when the emergency arose. The best course was not to store the masks in their haversacks or other receptacles as the bending and distortion of the rubber would promote cracking and accelerate ageing. The best course was to hang them in a dark cool cupboard protected from all fumes and from the wet, with the face-piece spread out, so that, if of rubber, it was not under strain. The life of the mask, if of rubber, would be improved if it was worn occasionally, say, once a month. This would fit in well with the necessity for giving the workmen regular practice in the use of the gas masks so that they might be able to wear them without fear of failure when the need arose. After use, the inside of the face-piece should be wiped with a disinfecting solution and dried before being put away. It was a wise precaution to inspect the whole respirator carefully at the same time, to make sure that the face-piece and container were not defective in any way and that the container was showing no signs of corrosion which might destroy its protective value.

For detailed advice as to how the inspection should be done, the Army publication "Defence Against Gas" would be found useful, as the main features of service and industrial gas masks were generally the same. The same booklet would give useful instructions regarding minor repairs, the replacement of containers, the fitting of gas masks and tests for gas tightness. Regular periodic inspection was vital for an emergency device like a respirator, otherwise it might be found to be defective when the need for its use suddenly arose. The life of a gas mask presented a difficult problem. Service respirators of the post-war types, when in regular use with troops in peace, had given an average life of over five years in this country. There was no reason why the face-piece of an industrial respirator should not last equally long. The container presented a more difficult problem. If not used against gas it should last as long as the face-piece, but when it had been employed against gas in any considerable concentration on one or more occasions, internal corrosion was likely to occur, unless the maker had introduced special protective measures in the design, and this factor was the one likely to determine the life of the container.

Dust Masks

There were innumerable designs of dust masks on the market, mostly not very efficient or comfortable. They generally covered the nose and mouth only, and were consequently more difficult to fit comfortably than a complete face-piece. Rubber was generally used for the fitting surfaces, but could be attached to a metallic body. The filtering materials generally used were cotton wool or rubber sponge. In some designs the wearer breathed in and out through the filter. This had often serious objections and in the better designs an outlet valve for the expired air was fitted. Such masks could not be used where there was any toxic gas present with the dust or where there was a deficiency of oxygen.

The need for a comfortable and efficient dust mask was becoming more and more apparent in order to stamp out the diseases of silicosis produced by the inhalation of silica dust, for example, in quarrying and sandstone cutting and dressing, and of asbestosis produced in the working of asbestos. Wet working and ventilation had done much to reduce the dangers, but there were many cases where these methods would not suffice and where some means to prevent, or at least to reduce, the inhalation of dust was necessary. In a few cases a hose mask could be used, but it had obvious limitations, and a dust mask or respirator to protect the nose and mouth was required. No design on the market could yet be regarded as satisfactory and work was now being conducted by a Government department in an attempt to solve the problem.

Plastic Group: Impregnation of Textile Fabrics

A JOINT meeting of the Plastics Group, and the Glasgow Sections of the Society of Chemical Industry and the Institute of Chemistry was held at the Royal Technical College, Glasgow, on November 2, when a paper on "Impregnation of Textile Fabrics" was read by Mr. W. Bain. Mr. Thomas Donaldson occupied the chair.

In impregnating thick textile materials, said Mr. Bain, it was essential to make sure that the fabrics were thoroughly dry. In recent years wetting-out agents were applied not only to the solid textile but also to the saturants used for impregnation. Formerly, soaps were used as wetting-out agents, but new products have been developed which show considerable improvement over soaps, and Mr. Bain described tests which had been carried out to investigate the property of penetration and showed that results obtained using a stalagometer were closely related to those obtained by the "sinking time" method. One of the difficulties in the impregnation of textiles was the tendency to get greater concentrations of the saturant near the surface of the fabric due to the filtering action of the fabric. It is possible, however, by lowering the surface tension to obtain complete impregnation. If possible, attempts should be made to impregnate with small molecules and increase the molecules *in situ* by polymerisation or oxidation.

The ability to impregnate textiles completely is of vital importance to many industries, including the impregnation of armatures for the electrical industry and the impregnation of solid woven textiles for use as friction fabrics. For certain technical purposes it is often advisable to have varnishes with a high solid content and a low percentage of solvent. Varnishes of this type are often very viscous and considerable difficulty is experienced in getting them to penetrate materials thoroughly, but by the judicious application of suitable wetting agents this difficulty can be minimised. The more thorough the impregnation the better the resultant product appears to be, and this is particularly true of fabrics which have to resist abrasion throughout their thickness, and also for insulating materials which have to resist high breakdown voltages.

Society of Dyers and Colourists

Scottish Section : Rayon

THE opening meeting of the Scottish section of the Society of Dyers and Colourists was held at the Royal Technical College, Glasgow, on October 26, when a paper was given by Dr. A. V. Pitter, of North British Rayon, Ltd., Jedburgh, on "Rayon, its Manufacture and Properties."

The lecturer traced the evolutionary history of rayon from a position of little industrial significance in 1890 to its present position in 1934, when the world production has reached an estimated figure of nearly 300,000 tons per annum. A description of the viscose process was given, and the various physico-chemical changes taking place during each stage of the process were discussed. An interesting relationship between the viscosity of viscose and the time of maturing of the alkali cellulose had been found by the lecturer in 1927 and the results obtained were submitted. It was shown that the reciprocal of the logarithm of the viscosity varied linearly with the maturing time. Thus,

$$\frac{1}{\log r} = At + C \ldots \text{(temperature constant)}$$

where r = viscose viscosity in poises, t = maturing time, and A and C are constants. The physical significance of the constant C was discussed and it was shown that A was a function of the temperature.

The author analysed the modern views on filament structure, and correlated the physical properties of the yarn with its structure from the viewpoint of micelle orientation. A brief survey was given of modern developments in the viscose process and the present trend in the research for novelty yarns.

Manchester Local Sections

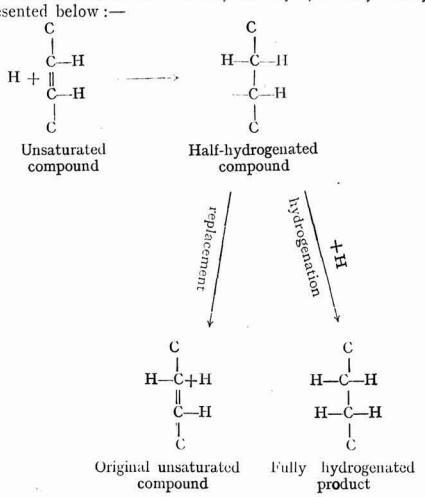
Professor Polanyi Discusses Heavy Water

A JOINT meeting of the Manchester Literary and Philosophical Society and the local sections of the Institute of Chemistry, the Society of Dyers and Colourists, and the Society of Chemical Industry was held at the Textile Institute, Manchester, on November 2, when Professor M. Polanyi, Ph.D., gave an address on "Heavy Water." Mr. John Allan, president of the Manchester Literary and Philosophical Society, presided.

Heavy water, said Professor Polanyi, has a density 10 per cent. greater than ordinary water. Its chemical composition is the same as that of ordinary water—two hydrogen atoms to one oxygen atom. Nor is there anything unusual about the oxygen atom. All the heaviness is due to the new kind of hydrogen contained in the heavy water. This heavy hydrogen, which was discovered by Professor Urey, is the interesting part of the heavy water. Its atomic weight is two instead of one. It has been well known since the discoveries of Soddy and of Aston that chemical elements often exist in different forms called isotopes. The isotopes have different atomic weights but otherwise are chemically identical. The interesting thing about the heavy hydrogen is that while it is to be considered as an isotope of ordinary hydrogen from the structural point of view, it does not behave as other isotopes do. It is not chemically identical with ordinary hydrogen but distinctly different from it. The difference has been discovered to be due to a dynamical principle, to be derived from the "uncertainty principle" of Heisenberg. Owing to the uncertainty principle, atoms bound in molecules have a permanent agitation which cannot be removed even when all the heat motion has died out (at absolute zero). The permanent energy corresponding to this permanent motion is different for particles which are absolutely identical with regard to the forces originating from them but different in mass. Compounds of heavy hydrogen have a smaller amount of "permanent energy" than the corresponding compounds of ordinary hydrogen. This difference accounts for all chemical dissimilarities between the two sorts of hydrogen and their compounds.

The main experiment to show the chemical dissimilarity of ordinary and heavy hydrogen is made by mixing two hydrogen compounds, one of heavy and the other of ordinary hydrogen. An interchange of the different hydrogen atoms may then occur, resulting in a stationary distribution of the two sorts of hydrogen between the two compounds. Owing to the chemical dissimilarity the stationary distribution will not be an equal one. Generally, there will be a preference for the heavy hydrogen to go into that compound in which the hydrogen atoms are held by a firmer bond. Such interchange reactions have been studied to some extent in the university laboratories at Manchester and Cambridge. One of the more recently discovered facts is the exceptional preference of alcohol for heavy hydrogen. When heavy water is mixed with an alcohol (ethyl alcohol and amyl alcohol have been used) a distribution of the heavy hydrogen is attained in which the hydroxyl group of the alcohol contains twice as much heavy hydrogen as the water (Bawn and Polanyi). A further point of interest is the catalytic interchange of hydrogen atoms between hydrogen and ethylene (Farkas and Rideal), hydrogen and benzene (Horiuti, Polanyi, and Ogden), and water and benzene (Horiuti and Polanyi).

The compound evidence of these experiments leads to a theory of these catalysed interchange reactions which seems to elucidate also the mechanism of hydrogenation. An account of this theory (which is in course of publication in the "Transactions of the Faraday Society") is very briefly represented below :—



The first step in both reactions (hydrogen replacement and hydrogen addition) is the linking of a hydrogen atom to one of the carbons of the unsaturated bond. The "half-hydrogenated" compound thus formed, if left to itself, will spontaneously lose a hydrogen atom and thus revert to its original state. The whole process will then result in the replacement of a hydrogen atom only. This event can be forestalled by the bringing up of a second hydrogen atom, the addition of which to the "half-hydrogenated" compound will transform it into the fully hydrogenated product. It seems possible that the mechanism of many other reactions in which hydrogen is involved may likewise be elucidated by the observation of an accompanying interchange of hydrogen atoms. Such prospects seem to justify the importance attached by chemists to the discovery of heavy hydrogen.

Institution of the Rubber Industry

London Section : Rubber in Contact with Foods

THE London and District Section of the Institution of the Rubber Industry will hold a meeting on Monday, November 12, at 7.30 p.m., at the British Empire Club, 12 St. James's Square, London, S.W., when Mr. T. H. Messenger, M.Sc., A.R.C.S., of the Research Association of British Rubber Manufacturers, will read a paper on "Rubber for Use in Contact with Foodstuffs and Beverages." Mr. T. Macara, F.I.C., director of the British Association of Research for the Foodstuffs Industry will open the discussion. The chair will be taken by Lt.-Col. G. R. Harding.

The Chemical Society

Development of Chemical Kinetics

In dealing with the development of chemical kinetics in a lecture to the Chemical Society at Birmingham, on November 5, Dr. C. N. Hinshelwood made reference to the part played by molecular collision processes, and the rise and fall of the radiation theory. He explained how the old simple idea of definite " orders of reaction " had to be replaced by a more complex treatment involving the consideration of the balancing of processes of activation and deactivation. The utility of the conception of the activation energy was traced, and it was shown how this quantity emerged as perhaps the all important one in determining the rates of chemical reactions.

Recent ideas on the existence of various activated states were outlined by Dr. Hinshelwood, and illustrated with specific examples. He pointed out that in the case of acetaldehyde the phenomena described were not likely to be explicable solely in terms of the existence of isomeric forms, since identical effects were found with nitrous oxide where similar tautomeric forms could not usefully be assumed. The discovery of chain reactions was sketched, and the properties of these reactions indicated. The lecturer also pointed out that there was often a tendency to exploit ideas rather beyond their proper scope, and the lecturer expressed as his personal opinion that in many cases the existence of chains was assumed without proper evidence. Finally, the influence of quantum mechanics on our views of chemical kinetics was referred to, but the lecturer did not consider that very fundamental changes had been so far made.

Wherever possible detailed reference was made to experimental results with the two substances acetaldehyde and nitrous oxide, and new results were quoted proving that the purely homogeneous decomposition of acetaldehyde could be disentangled without question from any surface effects (contrary to certain criticisms), and also making improbable the suggestion that reaction chains of any appreciable length played a part in the normal thermal decomposition.

The Royal Society

Award of Medals

Included among the medallic awards made by the Royal Society this year are the following :—

The Rumford Medal to Professor W. J. de Haas for his researches on the properties of bodies at low temperatures, and in particular for his recent work on cooling by the use of adaibatic demagnetisation.

A Royal Medal to Professor S. Chapman for his researches in kinetic theory of gases, in terrestrial magnetism and in the phenomena of the upper atmosphere.

The Davy Medal to Professor W. N. Haworth for his researches on the molecular structure of carbohydrates.

The name of Sir Frederick Gowland Hopkins has been put forward for election as president for the ensuing year .

British Association of Chemists

Annual General Meeting and Dinner

The seventeenth annual general meeting of the British Association of Chemists will be held at the Waldorf Hotel, Aldwych, London, on November 24. The annual dinner and dance will be held at the same hotel in the evening. It is hoped that as many members and friends as possible will endeavour to attend. Tickets 12s. 6d. each (exclusive of wines), may be obtained from the General Secretary, "Empire House," 175 Piccadilly, London, W.1.

President Visits the Scottish Section

A meeting of the Scottsh Section was held at the Royal Technical College, Glasgow, on November 2, when Professor E. C. C. Baly, president of the Association, delivered a lecture on the photosynthesis of carbohydrates. Professor G. G. Henderson (Glasgow University) took the chair.

Professor Baly gave an interesting account of some of the difficulties and setbacks which had been overcome up to the present, and in addition to describing what had so far been achieved he indicated some of the problems of science, which he hoped might eventually be solved by his work. He hopes he may be able to throw some light on the vexatious question of how life began.

The discussion, although short, served to emphasise how important the subject was.

British Science Guild

Research and Development Lectures

In 1933 the British Science Guild inaugurated a series of research and development lectures, with the object of directing public attention to the importance of scientific research and of the utilisation of its results. Early in 1934 the proposal was made by Lord Melchett, president of the Guild, that the lectures should be given in the theatre of the Royal Institution, in which special equipment and facilities exist for the experiments and demonstrations it was desired to have. The proposal was accepted and the British Science Guild had the use of the lecture theatre on two occasions in May.

The success which has attended these lectures has encouraged the belief that the continuance of the series is desirable and the managers of the Royal Institution have agreed to co-operate with the British Science Guild in the arrangement of a further programme of four lectures. The subjects have been chosen from four branches of science, electricity, acoustics, metallurgy and biology. In each case the lecturer will describe some notable scientific principle or discovery and trace its consequences down to the point at which the practical and industrial applications which have flowed from it have become matters of national or even wider significance. The lectures will be on Wednesdays at 9 p.m. The programme is as follows: November 21, Mr. C. C. Paterson on " The Liberation of the Electron : Its Industrial Consequences "; December 12, Dr. G. W. C. Kaye on " Sound and Noise "; February 6, Professor C. H. Desch on " The Microscope and the Metal Industries "; March 6, Sir Frederick Keeble on " The Fertility of the Earth."

Letter to the Editor

" Celanese " Trade Mark

Sir,—The attention of our company has been drawn to an article entitled " Chemistry in Canadian Industries " in The Chemical Age, of October 27 (page 381). This article contains the following passage: " On the one hand, as in the case of aluminium, a new metal has become the material out of which many products are manufactured; on the other hand, wood pulp in the form of rayon and celanese constitutes a new competitive factor in the textile field."

This passage is liable to create the erroneous impression that the word "Celanese" is a common or descriptive name. We beg to draw your attention to the fact that the word "Celanese" is in no sense a common or descriptive name but is a registered trade mark and can be used correctly only to designate the products of our company, British Celanese, Ltd., who are the registered owners of this trade mark. While we are satisfied that the misuse in question is wholly through an oversight, we feel sure you will appreciate that the use of the word "Celanese" in a descriptive sense, if continued, might result in the word becoming no longer distinctive of our company's products with serious consequences to their valuable trade mark rights.

To prevent the word "Celanese" being used in a descriptive sense it is necessary to spell the word with a capital "C" and wherever possible also to place it within quotes. Moreover, it should be clear from the context that the word " Celanese " is not a term descriptive of artificial silk in general, but is simply the trade mark under which certain products of British Celanese, Ltd., are put on the market.—Yours faithfully,

Stephens and Allen.
(Patent Department, British Celanese, Ltd.)
Celanese House,
Hanover Square,
London, W.1.

News from the Allied Industries

Mineral Oil

THE FEDERAL COURT OF LOS ANGELES has ordered the Richfield Oil properties to be sold to the Sinclair Refining Co. for $4,400,000, despite the protests of the Standard Oil Co., of California, Government counsel and other interested parties.

Glass

THE INDUSTRIES REORGANISATION COMMITTEE of the United Provinces, India, has provided a grant of Rs.20,000 for research in the glass industry and has recommended the appointment of three experts. In spite of having the most up-to-date plant in the several glass factories in the Province it is now almost impossible to meet Japanese competition.

Dyeing and Finishing

THE MAIN OBJECTS OF THE REORGANISATION SCHEME to be applied to dyeing and finishing industries in the textile trade include provision (1) to regulate and control the reorganisation of the industry; (2) to remove excessive and obsolete plant; (3) to develop home and foreign markets; (4) to promote the initiation of and support research. (5) to protect the welfare of persons engaged in, or connected with, the industry; and (6) to promote co-operation with the other sections of the textile trade.

Rubber

THE INTERNATIONAL RUBBER REGULATION COMMITTEE, which at its recent monthly meeting failed to agree on the percentage of the basic quotas to be fixed to regulate exports during the first quarter of next year, were able to reach an agreement on November 2. The percentage decided upon is 75. This means that the percentage will rise from 70 in December to 75 in January. The primary object of the scheme, which came into operation on June 1, is so to regulate production as gradually to reduce stocks, and thereby strengthen the statistical position of the commodity.

Low Temperature Carbonisation

NOTICE OF SATISFACTION IN FULL on June 29, 1934, of trust deed dated November 25, 1926, and registered November 27, 1926, securing £300,000 cumulative income debenture stock, was filed on behalf of Low Temperature Carbonisation, Ltd., on October 30.

Non-Ferrous Metals

THE WORLD'S "APPARENT" CONSUMPTION OF TIN for the 12 months ended August, 1934, was 121,400 tons, as compared with 117,000 tons in the preceding 12 months. The amount of tin used in manufacture is given as 136,900 tons for the year ending August, 1934, an increase of 12.4 per cent. over the amount used in the previous year. The consumption of tin in the world's tinplate industry is given as 50,900 tons for the year ended August, 1934, as compared with 44,500 tons for the previous year, whilst the quantities used in the world motor industry in the same periods were 12,420 tons and 8,910 respectively.

Artificial Silk

THE WORK OF EXTENSION AND DEVELOPMENT at the Jedburgh factory of North British Rayon, Ltd., had continued during the whole of the year, involving a large capital expenditure. Output had been maintained at the highest possible level throughout the period. A progressive increase in the company's profits could be looked for in the future, said Mr. Ernest Walls, the chairman, presiding at an ordinary general meeting on November 1, but the rate of increase would be governed by the amount of finance available for the further development of output and technique. The remarkable natural growth of rayon could be expected to continue. If lower prices induced demand, demand should be very good, since prices were 25 per cent. below last year. It was reasonable to expect that a good deal of the 12,000,000 lb. of rayon formerly imported as rayon goods would be diverted to home production.

Continental Chemical Notes

Czecho-Slovakia

THE MANUFACTURE OF SYNTHETIC RESINS has been commenced by the Prague firm of J. Elias.

France

AN ANTHRACITE HYDROGENATION PLANT is to be constructed in the Lievin mining area at an estimated cost of 40,000,000 francs. The process to be operated is not divulged ("Metallbörse").

DIRECT CONVERSION OF IRON PYRITES into hematite pig iron, according to a process discovered by the Italian, de Vechi, is to be exploited in France by the Société d'Exploitation des Procédés de Vechi.

SARDINE OIL is claimed to be a promising raw material for soap manufacture after undergoing polymerisation and hydrogenation, according to a report in "Bulletin des Matières Grasses de Marseille." Treatment in the manner described results, after saponification with caustic soda, in stable soaps free from unpleasant odour ("Industrie Chimique").

Germany

GERMAN DEVELOPMENTS in the hydrogenation of anthracite to motor spirit by the Fischer process are reveiwed in the "Chemische Industrie," of November 3. The Ruhrchemie A.G., the general licensee of the Fischer patents, has almost completed installation of an experimental plant with an annual capacity of 1,000 tons which, given satisfactory results, will be the forerunner of a large scale plant in the near future. Similar plans are envisaged by the Victor Nitrogen Works, who propose to erect a plant with an initial annual output of 25,000 tons motor spirit to commence production about the middle of next year. Finally, the I.G. Farbenindustrie is busily engaged in applying to the anthracite field its extensive experience in the hydrogenation of lignite.

A RELIABLE ANTIDOTE TO PHOSPHORUS POISONING has been discovered in a combination of grape sugar and insulin which is intravenously applied ("Chemiker-Zeitung," October 31).

THE RURH CHEMIE A.G. has been engaged for the past two years in examining the suitability of low-pressure liquefied gases as a petrol substitute for propulsive purposes and now proposes to erect an experimental plant with an annual capacity of several hundred tons.

TEN LEADING CONCERNS, representative of various branches of the chemical, mining, oil and engineering industries are associated in the Lignite-Benzine A.G. which has been registered in Berlin with a share capital of 110 million marks. Its object is the production of fuel and lubricating oils from German lignite.

SOME OF THE TECHNICAL POSSIBILITIES of the high molecular alkyl chlorides, now available for the first time on an industrial scale, are reviewed in the "Chemiker-Zeitung," October 31, by Dr. W. Schrauth. They are prepared from the higher fatty alcohols by reaction with hydrochloric acid. Thus the mixture of alcohols obtained by catalytic reduction of coconut oil is convertible into a chloride with a chlorine content of 15.2 per cent., a flash point of about 170° C., a freezing point of about −12° C. and a specific gravity of 0.86. In general, the higher alkyl chlorides are readily soluble in common organic solvents, whilst themselves exercising a powerful solvent action upon fats, oils, waxes, bitumen, etc. They appear to be free from marked toxic effects.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

MARKET conditions have shown no material change during the week and prices have remained steady. There have been a few fluctuations in the prices of essential oils and business has been satisfactory. Heavy chemicals, wood disillation products, pharmaceutical and photographic chemicals, and intermediates have shown no price changes. Unless otherwise stated, the prices below cover fair quantities, net and naked at sellers' works.

LONDON.—Markets for practically all products continue firm and there is a good general demand. More interest is being by buyers in forward purchases. Prices in the coal tar products section continue firm with little change to report. Pitch is weak, at about 50s. per ton f.o.b. East Coast port.

MANCHESTER.—Developments on the Manchester chemical market during the past week have been comparatively few and the market as a whole has pursued a more or less humdrum course. There is still a limited inquiry in circulation relative to new forward contracts, but up to the present no very substantial weight of business appears to have been put through. The majority of users, apart from covering necessitous requirements over the next month or so, seem to be prepared for the time being to await possible developments with regard to values. The general opinion of traders, however, still is that little of a startling nature in this direction will occur. In the meantime, compared with the experience during the past month the call for deliveries of chemicals generally shows no indication of falling away, and in one or two directions a somewhat better movement of certain textile chemicals has been reported this week.

SCOTLAND.—Business remains steady in heavy chemicals.

Price Changes

Perfumery Chemicals.—SAFROL, 2s. 9d. per lb.

Essential Oils.—ANISE, 2s. 3d. per lb.; BERGAMOT, 6s. per lb.; BOURBON GERANIUM, 21s. per lb.; CAMPHOR, white, 1s. 1d. per lb.; EUCALYPTUS, Australian B.P. 70/75%, 1s. 1d. per lb.; LAVENDER, Mont Blanc, 38/40%, 20s. per lb.; LEMONGRASS, 4s. per lb.; ORANGE, sweet, 7s. 6d. per lb.

All other prices remain unchanged.

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.—10½d. per lb. less 5%. MANCHESTER: 10½d.

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°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £48 10s. to £53 ex store.

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

ACID, TARTARIC.—LONDON: 1s. per lb. SCOTLAND: B.P. crystals, 11d., carriage paid. MANCHESTER: 1s. 0¾d.

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.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

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

ANTIMONY OXIDE.—SCOTLAND: Spot, £26 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. 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, 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.—2s. 5d. to 2s. 9d.

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

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

CARBON BLACK.—3⅞d. to 5d. per lb. LONDON: 4¼d. 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.—LONDON: £4 2s. 6d. per cwt. SCOTLAND: £4 2s. less 2½ per cent.

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

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £26 per ton. SCOTLAND: 40%, £25 to £28 ex store.

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

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34; brown, £32 10s.

LEAD, NITRATE.—£28 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: £37 10s.

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

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

METHYLATED SPIRIT.—61 O.P. Industrial, 1s. 6d. to 2s. 1d. per gal. Pyridinised industrial, 1s. 8d. to 2s. 3d. Mineralised, 2s. 7d. to 3s. 1d. 64 O.P. 1d. extra in all cases. Prices 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.—8¼d. to 8¾d. per lb. without engagement.

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

POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5¼d. LONDON: 5d. per lb. with usual 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: £37 10s.

POTASSIUM CHROMATE.—6½d. 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: 9¾d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: B.P., 10d.

POTASSIUM PRUSSIATE.—LONDON: 8½d. 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 15s. per ton f.o.r. in bags.
SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£22 per ton. LONDON: £23.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND. Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. net for spot lots and 4d. per lb. with discounts for contract quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.
SODIUM BISULPHITE POWDER.—60/62%, £18 10s. per ton d/d 1-cwt. iron drums for home trade.
SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£32 per ton.
SODIUM CHROMATE.—4d. per lb, d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £15.
SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.
SODIUM IODIDE.—B.P., 6s. per lb.
SODIUM NITRITE.—LONDON. Spot, £18 to £20 per ton d/d station in drums.
SODIUM PERBORATE.—LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£13 per ton.
SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5s. to 5¾d. ex store. MANCHESTER: 5d. to 5½d.
SULPHUR.—£9 15s. to £10 per ton. SCOTLAND: £8 to £9.
SODIUM SILICATE.—140° Tw. Spot £8 per ton. SCOTLAND: £8 10s.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER. £3 5s.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £14 5s. per ton f.o.b.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.
SULPHUR PRECIP.—B.P. £55 to £60 per ton according to quantity. Commercial, £50 to £55.
VERMILION.—Pale or deep, 3s. 11d. to 4s. 1d. per lb.
ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.
ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.
ZINC SULPHIDE.—11d. to 1s. per lb.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8¼d. to 8¾d. per lb.; crude, 60's, to 2s. 2½d. per gal. MANCHESTER: Crystals, 7¾d. per lb.; crude, 1s. 10d. to 1s. 11d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.
ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.
BENZOL.—At works, crude, 9d. to 9½d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6½d.
CREOSOTE.—B.S.I. Specification standard, 4d. to 4¼d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 3¾d. f.o.r. North; 4d. London. MANCHESTER: 3¾d. to 4¼d. SCOTLAND: Specification oils, 4d.; washed oil, 4¼d. to 4¾d.; light, 4¼d.; heavy, 4¾d. to 4¾d.
NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 7d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3¼d. to 1s. 4d.; heavy, 11d. to 1s. 0¼d. f.o.r. SCOTLAND: 90/160% 1s. 3d. to 1s. 3¼d.; 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.—LONDON: 50s. per ton f.o.b. East Coast port.
PYRIDINE.—90/140, 7s. to 8s. 6d. per gal.; 90/180, 2s. 3d.
TOLUOL.—90%, 1s. 10d. to 1s. 11d. per gal.; pure, 2s. 2d. to 2s. 3d.
XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 1d. to 2s. 2d.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 8d. per lb.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.
BENZIDINE HCL.—2s. 5d. per lb.
p CRESOL 34-5° C.—2s. per lb. in ton lots.
m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 01½d.
DINITROCHLORBENZENE, SOLID.—£72 per ton.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags.
α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.
o-NITRANILINE.—3ss. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb.; 5-cwt. lots, drums extra.
NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
o-TOLUIDINE.—9½d. to 11d. per lb.
p-TOLUIDINE.—1s. 11d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Nov., £6 19s.; Dec., £7 0s. §d.; Jan., 1935, £7 2s.; Feb., £7 3s. 6d.; Mar./June, £7 5s.
CYANAMIDE.—Nov., £6 18s. 9d.; Dec., £7; Jan., 1935, £7 1s. 3d.; Feb., £7 2s. 6d.; Mar., £7 3s. 9d.; Apr./June, £7 5s.
NITRATE OF SODA.—£7 12s. 6d. per ton for delivery to June, 1935.
NITRO-CHALK.—£7 5s. per ton to June, 1935.
CONCENTRATED COMPLETE FERTILISERS.—£10 5s. to £10 17s. 6d. per ton according to percentage of constituents.
NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton.

Latest Oil Prices

LONDON, Nov. 7.—LINSEED OIL was easier. Spot, £19 (small quantities 30s. extra); Dec., £17 10s.; Jan.-April, £17 12s. 6d.; May-Aug., £18, naked. SOYA BEAN OIL was steady. Oriental (bulk), Nov.-Dec. shipment, £13 5s. per ton. RAPE OIL was quiet. Crude, extracted, £27; technical, refined, £28 10s., naked, ex wharf. COTTON OIL was firmer. Egyptian crude, £15 10s.; refined common edible, £18 10s.; and deodorised, £20, naked, ex mill (small lots 30s. extra). TURPENTINE was quiet. American, spot, 44s. 9d. per cwt.

HULL.—LINSEED OIL.—Spot quoted £18 2s. 6d., per ton; Nov.-Dec. and Jan.-April, £17 12s. 6d.; May-Aug., £17 17s. 6d., naked. COTTON OIL.—Egyptian crude, spot, £15 15s.; edible, refined, spot, £17 10s.; technical, spot, £17 10s.; deodorised, £19 10s., naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £13 10s., naked. GROUNDNUT OIL.—Extracted, spot, £23; deodorised, £27. RAPE OIL.—Extracted, spot, £26; refined, £27 10s. SOYA OIL.—Extracted, spot, £15; deodorised, £18 per ton. COD OIL (industrial), 25s. per cwt. CASTOR OIL.—Pharmaceutical, 36s. 6d.; first, 31s. 6d.; second, 28s. 6d. per cwt. TURPENTINE.—American, spot, 46s. 3d. per cwt.

Books Received

The Year Book of the Coke Oven Managers' Association, 1934. London: Benn Brothers, Ltd. Pp. 315.

Colloid Chemistry. By Arthur W. Thomas. London: McGraw-Hill Book Co. Pp. 512. 24s.

Statistische Zusammenstellungen uber Aluminium, Blei, Kupfer, Nickel, Quecksilber, Silber, Zink und Zinn. Frankfurt-am-Main: Metallgesellschaft A. G. Pp. 105.

The Testing of Bituminous Mixtures. By D. C. Broome. London: Edward Arnold and Co. Pp. 194. 15s.

The Spirit of Chemistry. By Alexander Findlay. London: Longmans, Green and Co. Pp. 510. 10s. 6d.

Drying Oils and Driers. London: Oil and Colour Trades Journal. Pp. 90. 3s.

Inventions in the Chemical Industry

Patent Specifications and Applications

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

Complete Specifications Open to Public Inspection

NITROGENISATION OF STEEL or alloy steel articles.—Chapman Valve Manufacturing Co. April 24, 1933. 28576/33.

WHITE PORTLAND CEMENT in a rotary kiln, manufacture.—J. Mercelis. April 25, 1933. 10084/34.

DERIVATIVES OF CELLULOSE, products containing.—Celluloid Corporation. April 26, 1933. 12302/34.

SEPARATION OF ALCOHOLS.—E. I. du Pont de Nemours and Co. April 25, 1933. 12457/34.

DYESTUFFS of the dioxazine series, manufacture.—I. G. Farbenindustrie. April 26, 1933. 12619/34.

METHYL METHACRYLATE, polymerisation.—E. I. du Pont de Nemours and Co. April 26, 1933. 12628/34.

N-BUTYL-AMINO-BENZENE, manufacture of derivatives.—I. G. Farbenindustrie. April 27, 1933. 12757/34.

CHLORINATED RUBBER, manufacture of compositions containing. I. G. Farbenindustrie. April 28, 1933. 12832/34.

REFINING VEGETABLE AND ANIMAL OILS and fats.—Metallges A.-G. April 28, 1933. 13036/34.

ACID SLAGS for deoxidising metals.—Soc. d'Electro-Chimie d'Electro-Metallurgie et des Acieries Electriques d'Ugine. May 13, 1932. 30310-1/34.

REACTION PRODUCTS, manufacture.—I. G. Farbenindustrie. March 2, 1932. 30898/34.

Specifications Accepted with Dates of Application

BASE-EXCHANGE MATERIALS, preparation.—H. Spence, G. Osborne and P. Spence and Sons, Ltd. Jan. 19, 1933. 418,362.

SUBSTANTIVE DYESTUFFS, manufacture.—Deutsche Hydrierwerke A.-G. Jan. 29, 1932. 418,295.

PLASTICISED COMPOSITIONS and articles made therefrom.—H. Dreyfus. Feb. 17, 1933. 418,506.

COLOURING MATTERS of the phthalocyanine series, manufacture. Imperial Chemical Industries, Ltd., R. P. Linstead, A. R. Lowe, I. M. Heilbron and F. Irving. April 22, 1933. 418,367.

PHOTOGRAPHIC MATERIAL for producing dystuff or pigment images.—Dr. B. Gaspar. March 24, 1932. 418,368.

SULPHUR DYESTUFFS.—Imperial Chemical Industries, Ltd., and E. Chapman. April 20, 1933. 418,444.

AZO DYES.—Imperial Chemical Industries, Ltd., and M. Mendoza. April 24, 1933. 418,381.

AZO DYESTUFFS, manufacture.—E. I. du Pont de Nemours and Co., I. Gubelmann and A. R. Murphy. April 25, 1933. 418,454.

AZO DYESTUFFS, manufacture.—E. I. du Pont de Nemours and Co., I. Gubelmann and A. R. Murphy. April 25, 1933. 418,455.

AZO DYESTUFFS, process for the manufacture.—I. G. Farbenindustrie. April 25, 1932. 418,458.

PARA (or 2.5) DIKETOCAMPHANE CARBOXYLIC ACID and related acids, process for the manufacture.—K. Tamura, G. Kihara, Y. Asahina and M. Ishidate. April 27, 1933. 418,385.

CAFFEINE AND QUININE, manufacture of a compound.—W. Lolimann. April 29, 1933. 418,600.

SODIUM ETHYL OXALACETATE and the product thereof, method of making.—U.S. Industrial Alcohol Co. July 26, 1932. 418,325.

THEOPHYLLINE AND ETHANOLAMINE, production of a compound.—Chemisch-Pharmazeutische A.-G. Bad Homburg. Oct. 3, 1932. 418,404.

POLYMERISATION PRODUCTS, manufacture and production.—I. G. Farbenindustrie. Nov. 25, 1932. 418,469.

HYDROCARBON OILS, cracking.—Standard Oil Co. Jan. 3, 1933. 418,547.

VINYL RESINS, production of filaments, films and the like.—Carbide and Carbon Chemicals Corporation. Jan. 25, 1933. 418,550.

Applications for Patents

(October 25 to 31 inclusive).

BASE-EXCHANGE WATER-SOFTENING MATERIAL, production.—Aktiebolaget Filtrum. (Sweden, Sept. 14.) 30740.

EVAPORATING APPARATUS for concentrating acid liquids.—Appareils et Evaporeteurs Kestner. (France, Oct. 30, '33.) 31106.

LUBRICANTS, manufacture.—Atlantic Refining Co. (United States, Nov. 1, '33.) 30780.

RUBBER COMPOSITIONS, manufacture.—J. P. Baxter and Imperial Chemical Industries, Ltd. 30642.

AZO DYESTUFFS, manufacture.—A. Carpmael (I. G. Farbeninndustrie). 31275.

HEAVY METAL COMPLEX COMPOUNDS of azo dystuffs, manufacture. A. Carpmael (I. G. Farbenindustrie). 31276.

DYESTUFFS, manufacture.—Compagnie Nationale de Matieres Colorantes et Manufactures de Produits Chimiques du Nord Reunies Etablissements Kuhlmann. (France, Dec. 2, '33.) 31273.

STARCH, treatment.—P. D. Coppock and Distillers Co., Ltd. 30781.

WHITE LEAD, manufacture.—F. Dietzsch, S. J. Hogg, A. R. Lucas and W. G. Wagner. 30792.

ISOTONIC SOLUTION of colloidal sulphur for injection purposes, etc., preparing.—Drug Products Co., Inc. (United States, Nov. 3, '33.) 30581.

HYDROCYANIC ACID, manufacture.—E. I. du Pont de Nemours and Co. (United States, Dec. 7, '33.) 30641.

DYESTUFFS, etc., of anthraquinone series.—E. I. du Pont de Nemours and Co. (United States, October 28, '33.) 31006.

THIOINDIGOID VAT DYESTUFFS.—S. Ellingworth and Imperial Chemical Industries, Ltd. 30812.

ROTENONE, producing.—E. W. Fawcett, Imperial Chemical Industries, Ltd. 31008.

FATTY ACIDS FROM HYDROCARBONS, manufacture.—C. J. Greenstreet. 30904.

ANTHRAQUINONE DYESTUFFS, etc.—N. H. Haddock, Imperial Chemical Industries, Ltd., F. Lodge and C. H. Lumsden. 31268.

NICKEL CARBONYL, manufacture.—C. F. R. Harrison and A. E. Wallis. 30985.

AZO DYESTUFFS on wool, etc., manufacture.—I. G. Farbenindustrie. (Germany, Oct. 25, '33.) 30637.

CONDENSATION PRODUCTS, manufacture.—I. G. Farbenindustrie. (Germany, Oct. 25, '33.) 30638.

REACTION PRODUCTS, manufacture.—I. G. Farbenindustrie. (March 2, '33.) (Germany, March 2, '32.) 30898.

COPPER-CONTAINING AZO DYESTUFFS, manufacture.—Imperial Chemical Industries, Ltd., and M. Mendoza. 31007.

COLORATION OF MINERAL OILS.—Imperial Chemical Industries, Ltd. 31009.

DYESTUFF INTERMEDIATES.—Imperial Chemical Industries, Ltd., and F. L. Rose. 31110.

AZO DYESTUFFS.—Imperial Chemical Industries, Ltd., and F. L. Rose. 31111.

STEEL, manufacture.—Imperial Chemical Industries, Ltd. 31269.

FORMING PLASTIC MATERIALS into cylinders.—Imperial Chemical Industries, Ltd. (African Explosives and Industries, Ltd.). 30814.

LOWER-BOILING HYDROCARBONS, *etc., production.—International* Hydrogenation Patents Co., Ltd. (Germany, Nov. 18, '33.) 31065.

POLYMERISATION PRODUCTS from thiovinyl ethers, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). 30622.

ORGANIC SULPHUR COMPOUNDS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie.) 30623.

ORGANIC COMPOUNDS, purification.—J. Y. Johnson (I. G. Farbenindustrie). 30624.

APPARATUS FOR EMULSION POLYMERISATION.—J. Y. Johnson (I. G. Farbenindustrie). 31003.

CATALYSTS FOR HYDROGENATION PROCESSES, etc., preparation.—H. P. Stephenson. 31282.

HYDROCARBON OILS, heating.—C. W. Stratford. (Jan. 12.) 30658.

THIAZINE DYESTUFF, manufacture.—W. W. Groves (I. G. Farbenindustrie). 30640.

SUBSTITUTED NITRO- AND AMINO-CHRYSENES.—W. W. Groves (I. G. Farbenindustrie). 30988.

Chemical Trade Inquiries

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

South Africa.—A Cape Town firm of manufacturers' agents desires to secure the representation of United Kingdom manufacturers of water softening apparatus, water purification plant, chlorination plant and proprietary chemical products for the Union of South Africa. The principal of the firm is at present in the United Kingdom for this purpose. (Ref. No. 408.)

Holland.—An agent established at Arnhem wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of chemicals for the soap, artificial silk, textile and agricultural industries. (Ref. No. 413.)

Yugoslavia.—A firm in Zagreb wish to represent United Kingdom makers of lubricating oils. (Ref. No. 416.)

From Week to Week

THE PAINT AND CELLULOSE SPRAYING CO., LTD., 74 Victoria Street, S.W.1, has changed its name to P.C.S., Ltd.

AFTER HAVING BEEN IDLE FOR SIXTY YEARS the Wheal Martha tin mine at Luckett, near Callington, which was once very productive, is being dismantled. Dynamite was used to demolish the pump house and its equipment, and the boilers had to be dug out of the ground in which they had become firmly embedded.

APPLICATION FORMS and particulars of the associate-membership examination of the Institution of Chemical Engineers for 1935, together with copies of a memorandum on "The Training of a Chemical Engineer," are now obtainable from the hon. registrar of the Institution at Abbey House, Westminster, S.W.1. The application forms are returnable on December 20.

THE DIRECTORS OF TURNER AND NEWALL, LTD., have sanctioned large extensions to their Widnes asbestos-cement works. Since the beginning of 1934 the demand for asbestos-cement pressure pipes has been such that the Everite factory has been unable to cope with it, and the existing factory is, therefore, to be doubled. It is estimated that the extensions will accommodate between 500 and 700 operatives.

THE DUKE OF KENT will be the guest of honour at a dinner on November 16, held to celebrate the coming-of-age of the Institute of Labour Management. This Institute, which was founded in 1913 under the name of the Welfare Workers' Associations, is a professional body engaged in what has recently come to be known as labour management. Among the other guests at the dinner will be Lord Trent and Mr. B. Seebohm Rowntree, both of whom were present at the inauguration of this body at York twenty-one years ago.

THE ANNUAL DINNER AND CARNIVAL DANCE of the Oil and Colour Chemists' Association will be held at "The Manchester," Ltd., Royal Exchange, Manchester, on Friday, November 16, at 7.30 p.m. Among the guests who have already accepted the Committee's invitation to be present are: Mr. A. P. Bevan, President-Elect of the National Federation of Associated Paint, Colour and Varnish Manufacturers: Professor T. P. Hilditch, D.Sc. (Lond.), F.I.C., Campbell Brown Professor of Industrial Chemistry, Liverpool University, and Mr. B. Mouat Jones, M.A., Principal, College of Technology, Manchester. Applications for tickets (7s. 6d. each) should be sent to the Hon. Secretary, Mr. H. Gosling, 22 Beaufort Road, Stockport.

THE NEXT SERIES OF LECTURES and demonstrations on tropical hygiene, which are intended for men and women outside the medical profession proceeding to the tropics, will be given at the London School of Hygiene and Tropical Medicine (University of London), by Lt.-Col. G. E. F. Stammers, and Sir Malcolm Watson, from December 10 to 14, 1934, inclusive. The course comprises five lectures which will be held from 3.30 to 5 p.m. each day. In addition to providing simple rules for guidance in regard to personal hygiene and preparation for life in the tropics, these courses of instruction also include information on some of the more common diseases and their prevention. The synopsis and other particulars can be obtained from the organising secretary, Ross Institute of Tropical Hygiene, Keppel Street, Gower Street, W.C.1.

UNDERWRITING HAS BEEN COMPLETED for an issue of 300,000 5s. shares of Motor Fuel Proprietary, Ltd., at 15s. each. The issue will be confined to shareholders of the company, who will be given an option for 12 months to take up one share at 15s. for every three shares applied for. A notice convening the extraordinary meeting on November 14, to sanction the necessary increase of capital was issued to shareholders on Monday, together with the report and accounts of the company. Mr. J. A. Dodero has been appointed a director of the company. A further extraordinary meeting has been convened for November 27, when resolutions will be submitted to change the name of the company to "Coal and Allied Industries, Ltd.," and to declare that the number of directors shall not be more than seven or less than three. Since last year the activities of the company have been directed to the erection and operation of a new plant, the use of the "Dvorkovitz" patents having been abandoned.

THE SIXTH AUTUMN RESEARCH MEETING of the Institution of Gas Engineers was held at the Institution of Mechanical Engineers, London, on Tuesday and Wednesday, under the chairmanship of Mr. C. Valon Bennett, president of the Institution. The reports submitted for discussion included the fifth report of the general research committee; a report on the use of coal tar oils in internal combustion engines, by Mr. H. M. Spiers and Dr. E. W. Smith; the Institution Gas Research Fellowship Report, dealing with the reactivities to carbon dioxide of cokes and other forms of carbon at high temperatures; the fourth report of the liquor effluents and ammonia sub-committee; two reports from the joint research committee of the Institution and Leeds University, one dealing with corrosion from products of combustion of gas (tube experiments), and the other with the controlled operation of a water gas plant; the 25th report of the refractory materials joint sub-committee; and notes on last year's visit to Canada and the United States, by Dr. F. J. Dent.

TWO NEW MEMBERS, sixteen associate members and six associates were elected at the autumn research meeting of the Institution of Gas Engineers held in London on Tuesday.

THE BRITISH AND COLONIAL CHEMICAL CO., LTD., 55/56 Basinghall Street, E.C.2, has increased its nominal capital by the addition of £3,000 beyond the registered capital of £2,000; the additional capital is divided into 3,000 cumulative preference shares of £1 each.

AS FROM THE BEGINNING OF NOVEMBER the Trade and Engineering Supplement of "The Times" has been converted into a new paper under the title of "The Times: Trade and Engineering." In its new form this review will have wider opportunities for achieving the purpose for which the Supplement was originally founded, that is, the advancement of British trade. It is to be published once a month, price 6d., and will be illustrated.

THE AUTOMOBILE ASSOCIATION'S London route map, of which the 2nd edition is now available to members, contains two new features which greatly enhance its value. Colour printing makes the map much easier to read and marginal extensions of the main roads out of London indicate the important centres they serve. A useful footnote gives details of traffic regulations for Waterloo Bridge during the period of reconstruction.

ACCORDING TO THE REPORT of the sea-borne trade of Bombay for the year 1933-34, which is just published, the imports of dyes during the year as compared with those of the past year stood stationary, but owing to the fancy of the public for lighter shades of dyes, important qualities of coal tar dyes showed an increase. Germany's share of the total imports improved to 53 per cent. Imports of alizarine dyes increased from 1.4 million lb. to 1.6 million lb. and imports of aniline dyes increased from 6.9 million lb. to 7.8 million lb. The remarkable feature of the year is the serious entry of Japan, into this field, her imports amounting to 900,000 lb. as against 150,000 lb. in the previous year. Imports from Germany rose from 3.9 million lb. to 4.3 million lb. Arrivals from the United States of America also rose from 684,000 lb. to 1 million lb., but those from the United Kingdom fell from 1.2 million lb. to 877,000 lb.

Company News

North Broken Hill, Ltd.—A dividend of 1s. 6d. per share has been declared, payable in Melbourne on December 12.

British Plaster Board, Ltd.—The directors announce an interim dividend of 15 per cent., less tax, on account of the year to April 30, 1935, payable on November 10.

Major and Co.—The report for the year ended March 31, 1934, shows a profit of £9,657, reducing the debit to £1,335, which is carried forward.

International Nickel Co. of Canada.—A quarterly dividend of 15 cents making a total dividend of 50 cents for the full calendar year, is announced.

British Cyanides.—A final dividend of 5 per cent. is announced. The financial year has been altered to end on September 30, instead of June 30, so that the final dividend of 5 per cent. will make a total of 9 per cent. for the fifteen months, against 3 per cent. for the previous twelve months.

Rio Tinto Co.—A half-year's dividend is declared of 2s. 6d. per share, less tax, on the 5 per cent. cumulative preference shares, payable on November 15, but no interim dividend will be paid on the ordinary shares, of which there are 425,000 of £5 each. No dividend has been paid on the ordinary shares since 20 per cent. was paid for 1930.

Wall Paper Manufacturers.—A profit for the year to August 31 of £742,469 is announced, in comparison with £635,056 for the previous year. After payment of debenture interest and preference dividends, and providing for taxation and "interest payable under agreements for purchase of new businesses," the directors recommend a final dividend of 5 per cent. on the ordinary, making 10 per cent. for the year, the same as last year, and 7½ per cent. on the deferred shares, making 12½ per cent. for the year, an increase of 1 per cent. on last year. Allocation to the various staff funds again totals £10,000, and £100,000 is transferred to reserve. Last year an allocation was made in reduction of goodwill, patents, trade marks, etc., of £98,815. The carry-forward is increased to £282,825, from £261,417 a year ago.

Motor Fuel Proprietary, Ltd.—The balance-sheet shows that expenditure for the 14 months to September 30 last totalled £11,232, increasing the development expenditure item to £28,460. Patent rights and licences stand at £55,000. The issued capital is £99,991.

Forthcoming Events

LONDON

Nov. 12.—Institution of the Rubber Industry (London Section). "Rubber for Use in Contact with Foodstuffs and Beverages." T. H. Messenger in collaboration with the Foodstuffs Research Association and the Institute of Brewing, 12 St. James Square, London, S.W.1.

Nov. 12.—Institute of Brewing (London Section). "A Retrospect of the Season." L. E. Simpkins. 6 p.m. Horse Shoe Hotel, Tottenham Court Road, London.

Nov. 12.—Institute of Fuel. Presidential Address by Sir Harry McGowan. 11.30 a.m. Melchett Lecture by Dr. Friedrich Bergius. 2.30 p.m. Geological Society of London, Burlington House, London.

Nov. 13.—Pharmaceutical Society of Great Britain. Lantern lecture. "Idiosyncrasies in Men, Animals and Plants." Professor J. B. S. Haldane. 8.30 p.m. 17 Bloomsbury Square, London.

Nov. 14.—Society of Public Analysts. Joint meeting with the Food Group of the Society of Chemical Industry. "Identification of Common Edible Sea Fish." C. H. Hattersley. "Fish Oils and their Vitamins." N. Evers. "Composition of Fish Pastes." Dr. H. E. Cox. "Notes on Fish Pastes." H. E. Manley. "Some Observations on the Amounts of Amines and Free Ammonia in Fish Products." D. H. F. Clayson and L. H. Lampitt. "Some Observations on Methods of Estimating the Degree of Preservation of White Fish." G. A. Reay. 8 p.m. Burlington House, London.

Nov. 15.—The Chemical Society. Discussion on "Chemical Problems in Agricultural Science," opened by Sir John Russell. 8 p.m. Burlington House, Piccadilly, London.

Nov. 16, 23 and 30.—University of London. "The Colloid Chemistry of India-Rubber." Professor H. Freundlich. 5.30 p.m. University College, London.

BIRMINGHAM.

Nov. 12.—Institution of the Rubber Industry (Midland Section). Joint meeting with the Institution of Automobile Engineers. "The Place of Rubber in Modern Car Seating." W. H. Chapman, Dunlop Rubber Co., Ltd. James Watt Memorial Institute, Great Charles Street, Birmingham.

BRISTOL.

Nov. 12.—Institute of Chemistry (Bristol and South-Western Counties Section). "The Preservation of Meat." Osman Jones. 7.30 p.m. University Chemical Department, Woodland Road, Bristol.

GLASGOW.

Nov 12.—Institute of Metals (Scottish Section). "The Influence of Manufacture of Wrought and Cast Aluminium Alloys on Design." W. C. Devereaux. 7.30 p.m. 39 Elmbank Crescent, Glasgow.

Nov. 16.—Andersonian Chemical Society. "Petroleum Refining To-day." W. R. Guy. 3 p.m. Royal Technical College, Glasgow.

LANCASTER.

Nov. 15.—Lancastrian Frankland Society. Short papers by members. 8 p.m. Storey Institute, Lancaster.

LEICESTER.

Nov. 14.—Leicester Literary and Philosophical Society. "Common Poisons and their Detection." S. B. Bratley. 7.30 p.m. College of Technology, Leicester.

MANCHESTER.

Nov. 16.—Oil and Colour Chemists' Association. Annual Dinner and Carnival Dance. 7.30 p.m. "The Manchester," Ltd., Royal Exchange, Manchester.

Nov. 16.—Society of Dyers and Colourists (Manchester Section). "The Comparison between Dutch and English Dyeing and Finishing Industries." Dr. J. F. Straatmann. 7 p.m. 36 George Street, Manchester.

NEWCASTLE-ON-TYNE.

Nov. 13.—Institute of Metals (N.E. Coast Section). Combined Lecture and Visit to Armstrong-Saurer Motor Works. Lecture by Mr. Nicholson. Newcastle-on-Tyne.

STOKE-ON-TRENT.

Nov. 12.—Ceramic Society (Pottery Section). "The Handling of Casting Slip." C. D. Grimwade. 7.30 p.m. North Staffordshire Technical College, Stoke-on-Trent.

SWANSEA.

Nov. 13.—Institute of Metals (Swansea Section). "Copper in Architecture: Some Chemical and Other Aspects." H. J. Vernon. 6.15 p.m. Y.M.C.A., Swansea.

Nov. 17.—Swansea Technical College Metallurgical Society. General meeting. "Some of the Industrial Uses of South Wales Coals." Donald Hicks. 6.45 p.m. Technical College, Swansea.

CUMBERLAND

Nov. 16.—West Cumberland Society of Chemists and Engineers. Social evening. 7 p.m. Workington.

YORKSHIRE.

Nov. 13.—Hull Chemical and Engineering Society. Joint meeting with the Hull Association of Engineers; "Stainless Steel—Its Development, Properties and Uses." A. E. Thornton. 7.30 p.m. Municipal Technical College, Park Street, Hull.

Nov. 14.—Society of Dyers and Colourists (Bradford Junior Branch). "Some Notes on the Preparation of Water for Industrial Purposes." P. Hamer.

Nov. 15.—The Chemical Society. Discussion on "The Surface of Glass," opened by Professor W. E. S. Turner. 5.30 p.m. Chemistry Lecture Theatre, University, Sheffield.