THE Chemical Age

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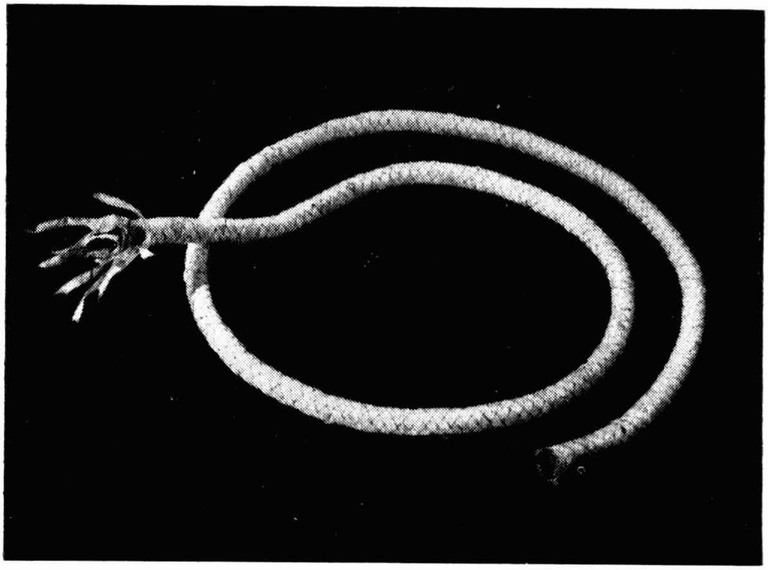

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King Coal

AT the end of the first decade of the atomic age, coal is still the principal source of energy for British production and economics, and in mid-1954 it remains one of the few commodities still rationed or allocated. Earlier this year (see THE CHEMICAL AGE, 1954, **70**, 359) we called for a more comprehensive national fuel policy with as much emphasis upon improved efficiency in utilisation as upon the drive for greater production of fuel and power. The recent presidential address to the Institute of Fuel by Dr. W. Idris Jones, Director-General of Research for the National Coal Board (*Journal of the Institute of Fuel*, 1954, **27**, 219), confirms this. Insofar as present knowledge can reasonably guide us, most of our mechanical energy in the year 2,000 will still be derived from coal.

If sulphuric acid is the conventional measure of chemical industry, coal or its equivalent in terms of power is the measure of total industrial activity. The world average for use of fuel and power *per capita* is a ton and a half of coal (equivalent). For the United States the actual figure per head is eight tons; for Britain it is four and a half tons. These are figures of comparison just as significant as values of gold, dollars and sterling; as economic indices their only weakness is that they express only usage and ignore efficiency of utilisation. Basically, Britain is better off than most countries, and the present restoration of our industrial and economic strength may well be principally attributed to the simple fact that in the long run our 'on-the-spot' availability of coal must keep us in the front rather than in the middle or rear sections of the race. Our economy is traditionally sensitive to the price of coal, but Dr. Idris Jones cites the opinion of economists that from every ton of coal we should be able to produce £100 worth of goods and services; even at the present price of coal this is a sound conversion-ratio. So long as the price industry must pay is fairly related to the true cost of extracting coal, two other factors must be regarded as more important: — (1) Adequacy of supply and (2) Efficiency of utilisation.

There appears to be no cause for pessimism about our reserves of coal. Attempts to estimate how much coal is still left have varied widely and all of them have been based upon inadequate data. Dr. Idris Jones takes the view that when and if we need more coal badly enough we shall 'find ways and means of getting and using vast tonnages that we now consider to be both unworkable and unacceptable.' The problem over the next 50 or 100 years is not likely to be the quantity available but one of quality. Dr. Idris Jones regards a better knowledge of coal-blending as the short-term solution and processing to up-grade low-quality coals as the long term solution.

Labour may well present itself as the principal factor of limitation. The current shortage is dangerously expressible in terms of age groups. Too many men over 50 are in the industry, but there are far too few under 30. During the next 10-15 years, 300,000 juveniles and young men need to be recruited into the industry. 'Efforts are being made to make the industry attractive to young men from all walks of life.' But we may reasonably wonder whether these efforts can be successful; mere propaganda will not put more youth at the coal-face, and improvements in welfare and working conditions are general features of heavy industry today. Much fuller utilisation of mechanisation, based as it must be upon substantial and new capital investments, is the only one likely solution as this would kill two birds with one stone—reducing the total labour force required and attracting new recruits by offering better jobs and opportunities. We have seen that it is possible for nationalised industry to be fed with huge sums—too much rather than too little new capital has been allocated to electricity even during a period of capital restriction. It remains to be seen whether the nationalised coal industry will also be generously backed, or whether it will suffer the more common supply fate of state-controlled venture, the provision of too little too slowly. Meanwhile, hopes that the labour problems of the industry can eventually be solved must remain wishful and pious.

The current usage efficiency for coal is given by Dr. Idris Jones as 35 per cent. This is an average that conceals wide variations, as these more detailed figures show:—

	Actual (1953) %	Estimated (AD 2000) %
Steam power in industry	50	70
Power station usage	22	32
Railway usage	7	10—15
Domestic heating	30	50—60

With these predicted improvements in fuel-burning efficiency, there will also be substantial reductions in atmospheric pollution. The over-all average of 35 per cent may thus rise to 45 or 50 per cent by the end of the century—provided that there is an enormous and accelerated rate of capital investment in equipment. This virtually means that we shall in the year 2000 be making three tons of coal do the present work of four tons. However, this is perhaps too generalised a summary; for the industrial steam user will be getting only two and a half tons to do what three and a half tons does now, while the domestic user will be getting one ton to do what nearly two tons does for him today. Thus, in return for widespread capital investment in coal output and usage methods, there will be considerable variations in rate of benefit. If the economic changes of the past 25 years are a reliable form of experience, we can be quite sure that by AD 2000 the price of coal will have risen by at least 25 per cent relatively and by a good deal more absolutely. In terms of cost, therefore, coal may not be an appreciably cheaper source of energy even for the domestic consumer and it will be a significantly dearer source for industry. This is not stressed to criticise in any way the real or prospective offerings of modern fuel technology, but merely to point out that the 'heat' and 'energy' items in all our budgets, domestic or industrial, will increase remorselessly if we do not install better equipment. Investment and installation are a defence against steadily rising costs far more than a means of reducing costs. To that extent, selling the general idea of better fuel utilisation is difficult and will continue to be so. Dr. Idris Jones says: 'More people, from directors and managers downwards, must become more conversant with fuel and energy usage. The main reason for the shocking inefficiency of so much of our fuel-using equipment in the past has been lack of interest, despite all the publicity and "know-how," on the part of managers. The next 50 years or so will present a great challenge to men of foresight, courage, adaptability and creativeness.'

The chemical industry, at any rate in many of its factories, offers a wide field for fuel economy. Except in some heavy chemical branches, the cost item of fuel, essential though it is, has a small incidence upon total costs. Many other items in the production budgets are far more influential. Indeed, for both fuel and labour, which are such dominant items in many other industries, the chemical industry has an exceptionally high conversion-ratio. Economy drives tend to be aimed at the larger cost factors. Routine drying and evaporation loads are especially 'ripe for economy,' though often enough the fuel cost per £100 of product can be reduced only trivially; in such cases there is more incentive if the total fuel bill per annum is regarded as the target for economy without budgetary relationship to the production line as a whole. To cite an actual example from contemporary semi-heavy chemical industry, a small factory annually producing approximately £240,000 worth of product from a single process has a solid fuel bill of about £1,000 for the drying load involved. A 10 per cent saving on fuel, if achievable, is only about 0.025 per cent of turnover, but it seems more appreciable when looked upon as an absolute saving of £100 per annum: a capital outlay of up to £500 or £600 would be amply justified if the equipment obtained produced such an annual economy.

Notes & Comments

Seaweed

WHETHER we have truly made significant progress in utilising seaweed is an open question. Not many days ago anybody visiting one of our most prosperous South Coast resorts would have seen a substantial labour force on the beach forking up thick bands of seaweed and tossing it back into the outgoing tide. It seems that every time a high tide is particularly turbulent, hundreds of tons of seaweed are deposited. It seems, too, that an increasingly long sector of the South Coast is becoming exposed to this natural pollution. If the seaweed is not speedily moved, it putrefies malodorously, and if certain favourable climatic conditions arrive later it becomes the breeding-bed for huge populations of small flies. The combined assault of sea-weed and flies in 1953 caused considerable economic losses to some resorts. Now there is a collective defence scheme through which the resources of coastal authorities are pooled, so that seaweed depositions can be swiftly moved and the beaches sprayed with insecticide when invasion by flies is likely. How far these measures will be successful awaits the testing time of this summer and autumn.

New Sausage Skin

MEANWHILE we read that Norwegian seaweed is being collected, dehydrated in two plants, then shipped to Germany where in a single factory 22,000,000 yds. of a new kind of sausage skin will be produced each month, a sausage skin claimed not only to be 20 times lighter in weight than cellophane skin, but also edible. This type of development, apparently an alginate-polymer development, might seem hopeful as a means of converting scourge into benefit, but unfortunately the varieties of seaweed that pollute beaches are seldom those which can be processed effectively. Secondly, the tonnage scales of 'nuisance and utilisation' are in hopeless imbalance. While a factory needs steady and reliable supply for its basic raw material, the 'free' harvests of seaweed that rough weather flings on beaches arrive too massively and too irregularly. It is gloomily improbable that the disposal of unwanted seaweed can ever be 'married' with a utilisation project.

Obsolete Industry

SEAWEED burning, today, is a relatively obsolete industry for its products can be obtained far more economically by other industrial processes. To use seaweed for the land as a bulky organic manure (a common practice in the Channel Islands and in parts of Cornwall) is practicable when farms and beaches are close together, but significant disposal in this way is impossible when most of the one-time farmland within a mile or two of the shore is now paved and built upon, as is largely the case with the Sussex coastline. What is needed is a new industry able to utilise all or most kinds of seaweed and convert them into an economic product. Such a development seems doomed to remain a pipe-dream, despite the considerable progress made in the past ten or 20 years in developing alginates and other seaweed-based chemicals.

Troubles for Potash

LESS than 40 years ago potash enjoyed a monopoly market, but there are signs now, despite the great growth in fertiliser usage, that the market is becoming too competitive to be comfortable for producers. The first war broke Germany's world monopoly; the second split the German industry (still the predominant European source) into two sections, East and West. There are few British buyers of potash who have not in the past 18 months observed a powerful intensification of East and West German competition. This is, perhaps, a natural development in any country without its own potash industry, for markets such as these must attract competition. But current reports from the United States, who now possess a well-established and expansive potash industry, indicate that competition is even fiercer there. US producers are demanding increases in import duty rates, claiming that East German potash is being 'dumped' on the US market. It is said that East German potash is offered to US buyers at only $24 per ton plus freight, whereas in Britain and Denmark the prices asked are equivalent to $39 and $30.6 per ton plus freight. US potash sells in America at an average price of about $37 per ton. If these comparative figures are even roughly accurate, there is every indication that potash production now seriously exceeds demand.

From the Dead Sea

THERE was a not dissimilar indication some two years ago when the impressive post-war expansion programme of the French potash industry was sharply revised. The supply position will not be made easier by the revival of Israel's production from the Dead Sea, a source that disappeared through works damaged in the Israel war. Output is reported to be 45 per cent more than a few months ago and rising to 3,000 tons per month. It is certainly not irrelevant to wonder what would happen if the mile-deep potash deposits of Yorkshire could be economically worked, enabling the UK, one of the biggest markets for foreign potash producers, to become self-sufficient!

Publicity

LAST week the Manufacturing Chemists' Association of America was holding its first 'Chemical Progress Week'; this is already visualised as an annual event and has the aim of securing greater public recognition and understanding for both chemistry and the chemical industry. On this initial occasion certain cities were especially selected for maximum attention — Charleston, Houston, Midland, Wilmington and Paducah — for one would hardly expect the chemical industry to eschew the pilot-operation technique for entirely new ventures in publicity.

Consideration Advisable

IT is perhaps a little paradoxical that the American industry should adopt this policy of wooing public interest and friendship when so much less is done in the United Kingdom where, at any rate in pamphlets, nationalisation is a live issue. But in 1952 a survey revealed that American public opinion was by no means well disposed towards the industry there. Just over 50 per cent of the 'interviewees' thought that the industry was dangerous and unhealthy to work in, and well over 60 per cent thought it was insufficiently competitive. From that time onwards, not quite two years ago, the Manufacturing Chemists' Association has been planning a public relations programme. Time may reveal that their policy of action is sounder than ostrich sand-burying. Here in Britain we do not know what the general public thinks about the chemical industry. Any opinion a member of the industry may hold is just a guess, and most of us with regular contacts in or with the industry are likely to be biassed. Only a small proportion of the industry's products are seen and consumed by the public as such; the major proportion is intermediately used so that no one in the public knows how much material from the industry has indispensably gone into the making of his clothes, his furniture, his car, his radio or TV set. This is not helpful as a background for being appreciated, and it is clear from the public advertising of certain of our larger companies that they are well aware of the importance of a sound publicity plan to overcome this specific difficulty. Collectively, however, the industry apparently feels that publicity efforts of the kind now being made in the United States are not needed on this side of the Atlantic; or perhaps it is felt that such open efforts are a little vulgar? We do not go so far as to say that MCA policy should be slavishly imitated here; but we suggest that much more consideration should be given to the basic problem as a whole.

Sweden & Atomic Research

Mr. Erlander, Prime Minister of Sweden, stated recently that Sweden has enough uranium to cover present consumption for 'several thousands' of years. He claimed that Sweden had the most completely equipped nuclear physics laboratories in Europe after Great Britain, but she could afford research only on peaceful applications of atomic energy, on which she was at present spending about £166,000 a year.

I.C.I.'s Profit-Sharing Scheme

75,000 Employees May Soon Have a Share in the Firm

DETAILS of the firm's profit-sharing scheme were given by directors and executives of Imperial Chemical Industries Ltd. at a Press conference held in the Board Room at Imperial Chemical House, Millbank, London, on Wednesday, 19 May. The conference, which was attended by the city editors and financial correspondents of national newspapers and magazines, was presided over by Mr. S. P. Chambers, C.B., C.I.E., deputy chairman.

Mr. Chambers explained that I.C.I.'s board of directors had had a profit-sharing scheme under consideration for a long time and it had been considered by the firm's Productivity Committee soon after the war. As it was realised that profit-sharing would not result in an immediate improvement in productivity the committee switched its attention to other plans, but it was felt that the time was now ripe for the adoption of such a scheme.

Following is the statement which was affixed to notice-boards throughout all I.C.I. works on Friday, 21 May:

'The board of directors have for some time had under consideration the introduction of an employees' profit-sharing scheme, as they feel that it is desirable that the interests of employees should be identified even more closely with those of the company.

How Scheme Will Operate

'Subject to the approval on 17 June, 1954 (the date of the annual general meeting of the company) of certain proposals regarding capital reorganisation, it is the intention of the board to introduce the profit-sharing scheme outlined below. The scheme will provide for a bonus to be paid to trustees who will acquire at current market price and accumulate on behalf of employees ordinary stock in the capital of the company for transfer to employees in minimum blocks of £25 units. Final details will be issued as soon as practicable, but the following is a provisional outline of the scheme, in the hope that it will be introduced with effect on and from 1 January, 1954:—

'Any employee of the company employed in the United Kingdom, either full time or part time normally for at least 22 hours a week, whose employment can be terminated by a period of notice of three months or less, will be entitled to participate in the scheme in respect of the year 1954, if he or she is in the employment of the company at the date of the company's annual general meeting in the year 1955 (normally held in June) and has been continuously in such employment since 1 January, 1953, and has reached the age of 21 years on or before 1 January, 1954. In respect of future years a similar period of qualification will be required.

Doubling of Ordinary Stock

'The amount of bonus for each employee will be 1 per cent of his or her annual remuneration for each 1 per cent of the total annual dividend in excess of 5 per cent paid on the ordinary stock of the company. The proposals regarding the reorganisation of the capital involve the doubling of the present issued ordinary stock of the company, and the rate of dividend of 15 per cent proposed for the year 1953 is therefore equivalent to $7\frac{1}{2}$ per cent on the reorganised capital.

'The remuneration on which the bonus will be based will be the employee's total remuneration in the fiscal year ended on 5 April prior to the annual general meeting at which the final ordinary dividend is declared.

'The payments of bonus will be subject to deduction of income tax at the employee's appropriate personal rate.

'The net amounts of bonus will be paid to trustees for investment in the ordinary stock of the company, stock for this purpose being issued to the trustees at current market price. Stock so issued to the trustees will be initially retained by them, but will be transferred, without restriction, to each employee when at least 25 £1 units of stock have been built up on his or her behalf.

'On the assumption that the first year of operation will be 1954 and that the total ordinary dividend for that year exceeds 5 per cent, payments of bonus will be made to the trustees on the employees' behalf in June or July, 1955, after the company's annual general meeting.

'The scheme will not form part of any contract of employment between the company and any of its employees, nor will the benefits under it form part of their contractual wages or remuneration.

'The board will retain complete discretionary control over the operation of the the scheme in all its aspects and will have power to amend or terminate the scheme if changed circumstances in the future should render such a course necessary.'

Many Schemes Studied

Sir Ewart Smith, technical director, gave further details of the scheme and said that scores of profit-sharing schemes had been carefully studied before the final draft had been drawn up. Many of the schemes introduced by other firms had failed because the firms concerned had wrongly believed that profit-sharing would cure bad labour relations and would immediately increase the worker's incentive to increase productivity. Profit-sharing could only be effective when a firm had good labour relations to start with and I.C.I. expected that it would merely reinforce its already good relations.

The firm's scheme was quite apart from its pension scheme and quite apart from its wages scale. It was not to be looked upon as wages—neither legally nor morally. The board hoped that when employees eventually obtained possession of their shares they would keep them for a longer rather than for a shorter time, but he made it clear that the individual employee could dispose of them at any time he wished once they became his property. Although the scheme might provide an added inducement for employees to remain with the firm, an employee could always take with him whatever shares the trustees held on his behalf on leaving the company.

75,000 To Benefit?

Sir Ewart went on to state that, after excluding employees under 21 years of age and those who had not been the necessary 2½ years with the firm, it was estimated that approximately 75,000 of the firm's 107,000 workpeople would be eligible to participate in the scheme. The estimated gross cost for 1954 would be about £1,000,000 and this would involve the issue, allowing for deduction of tax, of about 500,000 ordinary £1 units. Such an increase would be only 0.3 to 0.4 per cent of the ordinary capital which will be in issue.

Less Sulphuric Acid

February Output Lower Than January's

AFTER reaching in January the highest monthly figure for two years (with one exception), sulphuric acid production in the UK during February dropped by 13,700 tons (as 100 per cent acid) to 161,000 tons. This total was also appreciably lower than the figures for November and December, 1953, according to the April issue of the *Monthly Digest of Statistics,* just published by the Central Statistical Office.

Consumption of sulphuric acid in February also dropped, the monthly total of 174,000 tons being 3,000 tons less than in January.

The total production of phosphatic fertilisers (P_2O_5) in February was 32,000 tons, a reduction of 2,600 tons compared with January and slightly less also than for the two last months of 1953. Total consumption in February went up to 38,100 tons, an increase of 3,500 tons compared with January.

Production of nitrogenous fertilisers in February came to 24,640 tons, which was 3,200 tons less than the January figure and lower too than the monthly average for the last quarter of 1953. On the other hand, total disposals in February leapt to 32,010 tons, which was not only 5,230 tons above the January figure but higher than the monthly average for most of last year.

Compound fertiliser production in February showed an increase of 6,400 tons compared with January—178,400 tons as compared with 172,000 tons. As with nitrogenous fertilisers, consumption in February showed a big increase—185,000 tons as against 149,500 in January and higher also than any monthly figure for the two previous years.

The weekly average of carbon black production in February rose slightly in comparison with the January average, the respective figures being 1,230 tons and 1,180 tons, although the latter figure was the average of five weeks instead of four. Consumption again went up in February, the weekly average being 1,200 tons compared with 1,120 tons for January.

Wilton Visitors

The I.C.I. factories at Wilton were visited last week by 16 of the company's representatives from 15 European countries.

Cotton — Developments in Finishing*

Contributions of the Chemist to Textile Technology

THE finishing of cloth has not only kept up with progress in other branches of textile technology, but has many times anticipated it by creating new finishes and methods of finishing which have subsequently proved to be worth further development. Those to be described will be limited to the most significant and with the greatest promise for the future.

The chemical industry has made a notable contribution by experiments with new processes and new products—detergents, softeners, resins, various fillers, etc.—which enable the most diverse problems to be resolved and which meet all the requirements of the market most satisfactorily.

Some finishes are based on the permanent chemical transformation of the cotton. Others, however, are based on the application of various substances—which may be called auxiliaries—in a more or less permanent manner. In many cases the two types of finish complement each other so as to achieve the required results.

Of the first type is mercerisation, which involves the formation of an addition product. Then there is the parchmentisation process for cotton, obtained by treating the cotton with a strong solution of sulphuric acid at a low temperature, followed by a caustic soda treatment. In this case also an additional molecular substance is formed which decomposes in water and gives a swollen cellulose. The subsequent treatment with caustic soda enables one to obtain cloth with a particularly firm and elastic feel and a very valuable glasslike transparency.

Like Wool or Linen

In particular conditions of temperature and concentration, nitric acid confers a wool-like feel on cotton and a greater affinity for acid dyes. Likewise, treatment with acid salts and mixtures of acids, e.g. phosphoric or sulphuric, enables one to give the cloth a feel similar to linen.

Other permanent transformations of cotton employed in the finishing field are the superficial or deep etherification or esterification to which the fibre can be subjected, either over the whole surface of the cloth or on localised parts of the print so as to obtain new effects. Acetylation, treatment with ethylene oxide, benzylation, are examples of this.

Suitable use of these permanent transformations enables one to obtain magnificent finishing effects, e.g. crêpe effects following a design, the combined effects of crêpe and parchmentisation, embossing effects, transparent and opaque, effects of wrinkling and parchment effects, and many other possibilities which can be easily understood and which are the subject of innumerable patents.

Partial Modification

Among the finishes based on partial modification of the cellulose complex one may mention the treatments for anti-wrinkling, anti-creasing and anti-shrinking by means of aldehyde action at fixed concentration and temperatures, and the treatments for water-repelling by etherification or esterification of the cellulose. The esters are obtained by treating the cotton with the chloride or anhydride of a fatty acid with high molecular weight, with isocyanates or isothiocyanates or with cetyl esters.

Generally the treatment is carried out in solutions of acid chlorides or anhydrides in organic solvents or in emulsions of these products. The time of treatment is rather long and various methods have been tried out in order to accelerate it; among these is a pre-treatment with alkali or with ethylene oxide in gaseous form or in solution in an inert solvent.

The ethers are obtained by action of halogen salts of pyridine on aliphatic compounds of high molecular weight. These salts act by etherification of the alcoholic radicals of the cellulose so as to form stable complexes which confer water repellent qualities on the cloth. An example of these complexes is that of stearyl-oxymethylene cellulose ether, which can also be considered as a complex of formaldehyde and cellulose and octodecyl alcohol, or as the methylenic ether of the stearyl cellulose. This complex is obtained

* From a paper read at the Jubliee International Cotton Congress, Buxton, 13-20 May, by Dr. Alessandro Bolgiani ; presented at the afternoon session, 19 May.

by impregnation of the cloth in the padding mangle at 40° with a dispersion of octodecyl-oxymethylene pyridinium chloride, drying at a low temperature and finally scalding for a short time at a high temperature—e.g. 150° for 3 min.

Other finishes which can be considered in this category are the superficial solubilisation of cellulose by the action of salts such as cuprammonium, followed by re-precipitation of the cellulose, or the treatment with carbon disulphide and caustic soda, or the precipitation of cellulose directly from solution in xanthic acid with the object of imparting a particular appearance and feel to the cloth.

Possibilities Not Exhausted

All these experiments and the patents which have been taken out in this field have not exhausted the possibility of other finishes, and there have been interesting developments based on the partial or total transformation of the cellulose complex of the cotton either by the addition of other chemical complexes or by molecular transformation of the group itself.

The range ot finishes which can be obtained by application of auxiliary chemical products is enormous, including treatment of cotton with starch, insoluble casein or gums; with esters and cellulose ethers precipitated by acids and salts; with emulsions of acrylic or vinylic resins or their derivatives; with aminoplastics in emulsion; or with precondensates of the resins soluble in water and rendered insoluble in the cloth by the action of acid catalysts; and with ketonic resins (which have the advantage of not absorbing chlorine, as do the other synthetic resins).

For crease-resistance the melamine resins, the modified ureas, the ketonic resins and others have given sufficiently satisfactory results, although their use requires special technical devices to obtain the best results. A partial transformation of the fibre may prove the best answer to this problem. To obtain the best results consideration must also be given to the study of catalyst plasticisers, softening agents and possible mixtures of resins. Crease resistance in some materials may be obtained by treatment with aldehydes or dialdehydes, using certain inorganic salts, or with products obtained by the action of aldehydes on aluminoid substances.

The applications of synthetic resins which have already had considerable success, and which will have still more in the future, are those which aim at obtaining permanent chintz and embossing effects. At present the coloured embossing process has opened new possibilities. This operation requires special machines which imprint the embossed design and at the same time colour the background, with special pigment colours on the raised parts, or dye the background and the raised parts with different colours at the same time.

Other methods for obtaining similar results have been the subject of many experiments, and patents for some have been taken out. One particularly interesting process, which provides for the use of a ketonic resin with alkaline catalysts, is that of printing with salts intended to neutralise these catalysts in such a way as to remove the resins, from the points which have not been embossed, by washing after embossing and polymerisation. These salts (aluminium, chromium, manganese, tin, etc.) would then serve as mordants in the subsequent dyeing process.

Great importance is attached to the choice of resins, catalysts, structure of material, design, machine used, and temperatures, but the greatest importance of all must be laid on the humidity of the cloth before embossing, which must be of the order of 10-12 per cent for cotton.

A Typical Process

A typical process would be carried out as follows:

The cloth is impregnated with a solution of synthetic resin (generally melamine or modified urea); then it is dyed at such a temperature as not to promote polymerisation of the resin. It is then moistened by water spray and left to stand for a while, rolled up, so that the dampness is uniform; it is then embossed at 170-180° at a speed of 6-10 m. per min., with a pressure of 10-15 tons. Finally, it is polymerised at 130-140°. After polymerisation, washing at 50-60° with a slightly alkaline detergent is desirable.

Another group of finishes which are of value for many purposes are those which use resins of the vinyl, acrylic, glycerophthalic, etc., types, which are more or less plastic in form and dressed and dyed variously with dispersed mineral pigments in the form of paste diluted with solvent. These materials are widely used as white and coloured tablecloths, as imitation leather, and for various technical purposes. They have the advantage of high resistance to atmospheric and chemical agents, to abrasion, to creasing and to wear and tear. They also do not age so quickly, they are not inflammable, they resist mildew and are water repellent.

Worthy of note because they are so widespread are the water-proofing treatments based on rubber latex (natural or synthetic) vulcanised on the cloth; treatments with the afore-mentioned resins in water emulsions; treatments with cellulose derivatives; treatments with waxes and seccative oils dissolved in organic solvents; treatments with the insolubilised derivatives of vegetable and animal protein; and with synthetic derivatives of high molecular weight (e.g. starchy or aminic salts with urea or melamine and formaldehyde, vinyl stearates or stearylvinyl ethers and maleic anhydride, hydrochlorides of alkylimino ethers with formaldehyde, with stearyl-ethylene-urea, etc.).

Finally, there are the emulsions of wax with metallic soaps in a single bath, or in two baths, precipitating the metallic soap in the second. In this case the use of salts of zirconium is expedient, as they give more stability of the proofing to washing than the corresponding derivatives of aluminium.

Other interesting finishes are the treatments against mildew, rotting and parasites. At present these include the application of certain inorganic salts and of some organic products such as chlorophenol, salicylanilide, quaternary ammonium derivatives, organometallic derivatives, etc.

Also of interest are the researches and experiments to obtain a fireproofing property which will stand up to washing, and a greater resistance to abrasion. For this latter process colloidal silica and the silicic esters are now used with some success.

Saudi Arabian Oil Production

Saudi Arabia has become the leading oil producer in the Middle East and fourth largest producer in the world, the Arabian-American Oil Company reported recently from New York. The company said that Saudi Arabian output in March, 1954, reached 978,250 barrels a day. This topped the production of its neighbour, the Sheikdom of Kuwait, which was the leading Middle East oil producer last year.

Food Research Information

'RESEARCH on Food Preservation,' published recently by HMSO for DSIR (price 2s., by post 2s. 1½d.) provides for the first time information on the official and semi-official organisations in the United Kingdom which undertake research on food.

The field of research covered is that of the processing, storage and transport of food. Work on food production and on nutrition is included only when it is part of the work of organisations concerned with food preservation.

Each of fifteen research organisations is dealt with and the publication describes the nature of the work carried out at each of the laboratories controlled by each organisation. It includes a list of the names of research workers and a subject index.

Infestation Report

EVENT of the year at the Pest Infestation Laboratory was the occupation of the new biochemistry building, formally opened by Sir Ben Lockspeiser on 6 November last. 'Pest Infestation Research 1953' contains photographs of the new building and a short description.

The report shows that there has been a striking increase in the amount of work which the Laboratory is carrying out for the colonies. Special investigations have been made on such problems as the susceptibility of paddy and rice to attack by mites and the underground storage of grain in pits.

The laboratory is developing a quick electrical method for determining the moisture content of cereals, which takes about five seconds to test grain in the sack. Other work in progress includes tests of the effectiveness of impregnating sacks with pyrethrins and piperonyl butoxide; bio-assay of pyrethrins; a study of valone (2-*iso*valeryl-1,3-indandione); and a search for an alternative chemical basis for pyrethrum assay.

Three main lines of investigation have been followed by the Biochemistry Department: methyl bromide residues in wheat; separation and identification of acetylcholine in insects; and synthesis of allethrin labelled with carbon-14.

'Pest Infestation Research 1953' is published by HMSO for DSIR, price 2s. by post 2s. 1½d.

Satisfactory Year of Activity

AGM & Dinner of SCI Chemical Engineering Group

THE Chemical Engineering Group of the Society of Chemical Industry held its annual general meeting and dinner in London on Friday, 21 May. Mr. H. V. Potter (immediate past president of the Group) presided, in the unavoidable absence of the Group chairman, Professor F. H. Garner.

In its report for the year 1953 the general committee of the Group again recorded a satisfactory year of activity, in which the usual full programme of meetings in London and the provinces was carried out. There were six meetings in London, and four in the provinces, which were joint meetings with the Newcastle, Manchester, Glasgow and Bristol Sections of the Society.

The Group continued to nominate representatives on various committees of the British Standards Institution and other bodies, and continued to be responsible for the preparation of the Chemical Engineering section of the Society's *Annual Reports on the Progress of Applied Chemistry.* The compilation of that section was again undertaken by Dr. T. K. Ross.

Supervision of Papers

In November it was agreed that a subcommittee be appointed, consisting of J. W. Barrett, A. M. Clark, N. C. Fraser, T. W. Howard and G. W. Payne, and the honorary officers *ex officio,* to exercise general supervision on the standard of the papers intended for the Proceedings of the Group, to formulate the forward policy of the Group regarding papers, etc., and to make recommendations to the Group main committee.

Close co-operation was maintained with the Institution of Chemical Engineers, and the general committee again recorded with pleasure the continuance of most amicable relations with the Society.

Also the general committee recorded appreciation of the work of the convenors of the various sub-committees and of the loyal services of the hon. editor, Major D. M. Wilson, and of the hon. recorder, Mr. H. W. Thorp. It also expressed sincere appreciation of the continued help and advice given by the general secretary of the Institution of Chemical Engineers, Dr. J. B. Brennan.

In presenting the report, Mr. R. C. Odams (hon. secretary) added that this year the Chemical Engineering Group had held a two-day joint meeting with the Food Group, and had been asked to join with the Fine Chemicals Group in a one-day meeting next year.

Election Results

The following were declared elected to the general committee:—G. Brearley, T. K. Ross, R. F. Stewart and A. S. White. The chairman paid tributes to the following in declaring their re-election as honorary officers for 1954-55:—*chairman,* F. H. Garner; *hon. secretary,* R. C. Odams; *hon. treasurer,* F. A. Greene; *hon. editor,* D. M. Wilson; *hon. recorder,* H. W. Thorp.

A vote of thanks on behalf of the Group to the hon. officers for their work was proposed by Mr. E. le Q. Herbert and seconded by Mr. A. M. Clark, and carried with acclamation. Mr. Potter responded and paid a further tribute to Dr. Brennan and his staff for the able help they had given throughout the past year.

At the annual dinner of the Group the principal guest was Sir William Ogg, president of the Society of Chemical Industry. It had been hoped that Sir Harry Jephcott, the president of the Royal Institute of Chemistry, and Mr. Julian M. Leonard, hon. treasurer of SCI, would have been present, but they were unable to attend.

Other guests included Mr. W. J. Hooton, chairman of the British Chemical Plant Manufacturers' Association; Mr. J. R. Whinfield, chairman of the Plastics Group of the Society; Mr. W. L. Hill, chairman of the Agriculture Group of the Society; Mr. E. L. Streatfield, chairman of the London Section of the Society; Professor M. B. Donald and Mr. F. E. Warner, joint hon. secretaries of the Institution of Chemical Engineers; Mr. F. A. Greene, hon. treasurer of the Institution; Dr. J. Hoy Robertson, hon. secretary of the London Section of the Society; Mr. J. Davidson Pratt, Director, Association of British Chemical Manufacturers; Dr. E. H. T. Hoblyn, Director, BCPMA; Lieut.-Col. F. J. Griffin, general secretary of the Society; and Dr. H. J. T. Ellingham, secretary and registrar of the Royal Institute of Chemistry.

Academic Research of Industrial Value

Fascinating Show at Royal Society Conversazione

EVERY year, the great attraction of the Royal Society's Conversazione, held this year in the evening of 20 May, is that many of the exhibits are of yet-unpublished work. Number one in the programme, and certainly first in interest to an industrial chemist, was the gas-liquid chromatographic column developed by Drs. A. T. James and A. J. P. Martin at the National Institute for Medical Research. Using this apparatus, it is possible to make a complete analysis of, say, a motor spirit, in about three hours; separation by fractional distillation could easily take three weeks.

The stationary phase is some liquid of high boiling point, such as liquid paraffin, adsorbed on the surface of kieselguhr; the mobile phase is pure dry nitrogen. The column is a glass tube of narrow bore, drawn off somewhat at one end, and packed in the usual manner.

Two columns are used in the apparatus: one is loaded with 0.5 mg. of the liquid to be analysed, and the other is for balance. Both are enclosed in a thermostatically-controlled jacket, and nitrogen is passed down both columns at an equal and steady rate. Separation of the constituents of the sample takes place in the usual way, the most volatile being carried forward most rapidly.

Ingenious Density Meter

Analysis of the constituents as they emerge from the bottom of the column takes place in a most ingenious density meter. It is in the form of a balanced bridge, the nitrogen stream from each column being divided into two in the channels of a Perspex block. Between the two halves of the bridge is a chamber in which an electrically-heated element radiates heat equally on to two sensitive thermocouples.

When the bridge is in balance, there is no gas stream through the centre chamber (which may be compared to the galvanometer of a Wheatstone bridge); this condition is fulfilled when both nitrogen streams are of equal density. But when a very slight difference in density occurs between the two gases, there will be a slight displacement through the detector chamber and the amount of heat falling on the two thermocouples will no longer be equal. By attaching these thermocouples to an ordinary pen recorder, it is possible to obtain a plot resembling those obtained by liquid-liquid chromatography or electrophoretic separation. As with these, each peak is specific, and the area under the peak is directly proportional to the quantity of substance present in the mixture.

The sensitivity of the instrument is remarkably high: 0.06 μg. of amyl alcohol can be detected per ml. of nitrogen—1 part in 10,000.

Deducing Nature of Substance

Of particular importance is that the nature of a substance can be deduced by the rate at which it passes through the column. Thus in plots of retention time against number of C atoms, homologues lie along a straight line; the higher the degree of chain-branching, the lower the retention time; and if figures for two different stationary phases are compared, it is possible to obtain a very good idea of the composition and structure of an unknown substance.

The speed and efficiency of this method make it very much more convenient than analytical distillation, and more foolproof and reliable than infra-red spectroscopy. Its future in chemical industry seems assured.

Another exhibit of great industrial importance was that by Dr. E. V. Mills and A. E. J. Pettet, of the Water Pollution Research Laboratory, demonstrating the biological decomposition of cyanides. Washings from case-hardening or electroplating very often contain 100-200 ppm. of cyanides, and disposal of these wastes is a difficult matter.

As we have described in recent reports (see THE CHEMICAL AGE, 1954, **70**, 885), work has shown that gradually increasing the concentration of cyanide in the sewage applied to a percolating filter would condition some of the organisms present until they could tolerate quite high concentrations, even when not admixed with sewage.

In the exhibit, sodium cyanide equivalent to 100 ppm. HCN in tap water was continuously supplied to the column, which consisted of a typical coke percolation filter impregnated with conditioned sludge, and was decomposed to ammonia, part of which was biologically oxidised to nitrate. Continuously operating samplers showed that before treatment the solution gave a strong Prussian Blue reaction, but that afterwards it gave none.

The Laboratory have succeeded in interesting an industrial case-hardening concern, and it is hoped that a plant-size unit will shortly be put into operation. The organism responsible has not yet been identified.

Enhanced Thermoelectric Effects

Also of possible industrial importance was a demonstration of enhanced thermoelectric effects from semi-conductor junctions, by R. W. Douglas and H. K. Goldsmid, of G.E.C. Research Laboratories. In 1834 Peltier discovered that there is a heating or cooling effect, quite apart from the usual resistance heating, when an electric current flows through the junction between two different metals. Whether the junction becomes hotter or colder depends upon the direction of current flow. Recent work at G.E.C. has now produced a semiconductor thermo-junction which gives a cooling effect of nearly 28°.

Interest in the problem revived when the fundamental physical properties of semiconductors were studied during the development of silicon and germanium crystal valves. It is possible to get a large thermoelectric effect with semiconductors—about 100 times larger than with metals. This is not sufficient in itself to provide a practicable cooling effect because the Peltier cooling is usually much less than the heating effect in the junction due to its own resistance. When this resistance is made small by the use of short, thick junctions, too much heat is conducted from the hot to the cold end of the cooling unit and the cooling effect is lost.

The demonstration at the Royal Society showed a unit employing bismuth and a bismuth-tellurium compound which froze miniature ice cubes in a small metal tray. It is too early to say that this is the forerunner of new types of refrigerator units, or to quote firm figures for the efficiency of the system.

One possibility is that sources of low grade waste heat might be used with thermojunction generators to provide the low voltage high current supply required to operate the cooling junctions. The same factors which control efficient thermo-electric cooling apply also to efficient thermo-electric generators. The successful development of these to make use of waste heat or solar energy might well prove useful.

Another interesting exhibit from G.E.C., by E. H. Nelson and S. A. R. Rigden, showed how the constituents of a mixture of two rare gases may be separated and quantitatively determined by passing a direct current electric discharge through the mixture. The different colours of gases in discharge tubes enable them to be identified, and it has been found that in the rare gases the denser gas collects nearer to the cathode. Thus, in a mixture of two gases, measurement of the relative lengths of colour during discharge gives a close indication of the proportions of gas present. It is possible that the phenomenon could also be used in the purification of rare gases.

Recently demonstrated to the Physiological Society, an integrating soap-film flowmeter was exhibited by M. Ainsworth and J. W. Eveleigh, of the Chemical Defence Experimental Establishment, Porton. The instrument is designed to measure and record small quantities of gas such as that respired by an experimental animal.

'Unit-Volume' Pulses

Air flowing through the instrument carries a soap-film along a tube until it connects a pair of electrodes, where a current destroys the film and actuates a relay to form a new film at the inlet end of the tube. Each operation of the relay thus represents flow of a unit volume of air, and, used in conjunction with a suitable time-base, the instrument allows a fluctuating air-flow to be recorded as a series of 'unit-volume' pulses which can be counted over a measured time to integrate the flow.

Other interesting exhibits included a photo-electronic apparatus for the measurement of the velocity of rapid chemical reactions, by Dr. Q. H. Gibson, of the Department of Physiology, Sheffield; the spiral growth of cadmium iodide crystals, by Dr. F. C. Frank, of the H. H. Wills Physical Laboratory, Bristol; fluorescence and energy transfer between molecules by Dr. E. J. Bowen, B. Brocklehurst and D. Tanner, of the Physical Chemistry Laboratory, Oxford; and two exhibits from the British Museum, showing how chemistry is aiding the geologist, in the use of acids and transparent plastics for the preparation of vertebrate fossils, and in the analysis of bone as an aid to the determination of antiquity.

Ductile Zirconium

Production, Properties & Applications

BECAUSE of its excellent corrosion resistance and its low thermal neutron absorption cross-section, zirconium appears to be an ideal metal for nuclear energy applications. The Atomic Energy Commission in the United States is therefore interested in this metal as a material of construction for certain nuclear reactors. By sponsoring research on improved production methods and by financing production facilities, the AEC has substantially increased the production of ductile zirconium in the United States.

Before nuclear technologists discovered that zirconium was one of the few low-cross-section metals, there was a limited output of ductile zirconium and the price of the metal was $300 per lb. The opinion has been expressed that if the cost could be brought down to $8 per lb. non-nuclear demand in the United States might be expanded to 120 tons a year. If the price came down to $2½ there might well be a non-nuclear demand of 1,500 tons annually. The chief consumer would be the chemical industry, with an annual consumption of about 1,000 tons.[1]

Comparable to Titanium

In many respects zirconium is at much the same stage of development as titanium, which it also resembles metallurgically. Both titanium and zirconium are abundant in nature. Both metals have been known for more than a century, but have only recently been produced in commercial quantities, due partly to difficulties in extracting them economically from the minerals in which they occur and partly to the limited interest previously taken in their potentialities. Both titanium and zirconium have promising futures, provided that economic processes for large-scale production can be developed. It seems probable, however, that the former will eventually become an important structural metal, whereas zirconium will be used in more limited tonnages for highly specialised applications.

Almost all the zirconium of commerce is derived from two minerals, zircon ($ZrSiO_4$) and baddeleyite (ZrO_2). Zircon is a very stable substance, both physically and chemically, and is thus a common constituent of sedimentary rocks, particularly when concentration of heavier minerals formed part of the process of deposition. The mineral is an original constituent of most types of crystalline rocks, but especially of schists, gneiss and syenite. It is from the alluvial deposits derived from these rocks, however, that zircon is won. Being very resistant to weathering agencies and heavier than most of the associated minerals, it becomes concentrated in parts of the alluvium with other heavy minerals such as ilmenite, rutile and monazite.

Plentiful Distribution

Baddeleyite occurs in pegmatites and is also recovered from alluvial deposits. It is found in economic quantities only in Brazil, where it is present in water-worn pebbles and boulders in stream gravels.

The world's most valuable source of zirconium minerals is the naturally concentrated zircon-rutile-ilmenite black sands at Byron Bay, in New South Wales. Brazil is the second largest producer (chiefly baddeleyite), and there is also a substantial output from the monazite sands of Travancore. Almost half the United States' consumption of zirconium minerals is of beach sand deposits at Florida and more zircon is available in tailings from titanium operations than the market can absorb. The world's known resources are fully capable of meeting all requirements that can be foreseen.

So far as is known, the production of zirconium metal is at present confined to the United States and Britain. Current production in the former country falls into three main categories: crystal-bar made by the de Boer iodide process, sponge made by the Kroll process, and crude zirconium made by calcium or calcium hydride reduction of the oxide. The last, however, is produced only in limited quantities for special applications since it is non-ductile.

The de Boer iodide process is based on the decomposition of zirconium tetra-iodide in vacuum at a high temperature, producing zirconium metal and iodide vapour. In this process crude zirconium, obtained by the reduction of zirconium oxide with calcium, is heated in the presence of iodine to form the tetra-iodide vapour. This vapour encounters a zirconium filament heated to a high temperature in a vacuum by an electric current, and zirconium is deposited while the released iodine returns to react with more crude zirconium, thus repeating the cycle. In this way the filament is gradually built up.

Disadvantage of Method

Formerly the Foote Mineral Co. were the sole producers of iodide zirconium in the US. Towards the end of 1950, however, a plant capable of producing longer crystal-bar of larger diameter was built at Pittsburgh by the Westinghouse Atomic Power Division.

One of the principal disadvantages of the de Boer process is that the reactions of iodination and decomposition take place in the same vessel, at low pressures which are unfavourable to the iodine reaction. If these reactions could be carried out separately, it might be possible to develop a semi-continuous process and also to use a less expensive feed material, such as zirconium carbide or zirconium carbonitride. Both possibilities are being examined at the Battelle Memorial Institute under research projects sponsored by the AEC.

A semi-continuous process is being developed, in which zirconium iodide prepared by iodination of sponge is purified by fractional condensation and evaporation, and is then passed through decomposition bulbs similar to an ordinary de Boer bulb. Crystal-bar hairpins up to 1.7 in. diameter and 12 ft. in overall length have been produced for the AEC in experimental units at the Battelle Memorial Institute, but it is considered probable that commercial development will tend towards the production of longer lengths of smaller diameter.

As a result of increased output the price of crystal-bar has been reduced to about $50 per lb. It is considered possible that the production of low-cost crystal bar may eventually be achieved.[1]

Sponge is produced by a process developed by Dr. W. J. Kroll, which depends on the reduction of zirconium tetrachloride vapour by magnesium. The first step is the production of zirconium tetrachloride, which may be carried out by the chlorination of a zircon and carbon mixture. This yields a light powder which is purified by sublimation in a hydrogen atmosphere. The purified zirconium tetrachloride is then reduced with magnesium. The reduced mass contains particles of zirconium intermingled with magnesium chloride, which is removed by melting and boiling in a sealed and evacuated steel retort. The sponge is removed from the crucible and cut into small pieces, which are pressed into small billets for convenience and melted. At present the only producer of zirconium sponge in the United States is the Bureau of Mines.

The Kroll process was adopted by Murex Ltd. as the basis for their investigation when the production of zirconium was under consideration. A plant built on similar lines to the original plant of the US Bureau of Mines at Albany was eventually laid down by this company at its works at Rainham, Essex.[2]

Many technical problems remain to be solved before low-cost sponge zirconium can be produced. The Kroll process is a batch process and the size of the reduction units is limited by the ability to dissipate the high heat of reaction from the units. The recovery of sponge is a costly operation and special precautions must be taken to minimise the hazards arising from the extreme reactivity of finally divided zirconium. Research is therefore being directed to the development of a continuous process for the reduction of zirconium tetrachloride with magnesium, which would represent an important step forward in zirconium technology.

Other Methods Investigated

Many other methods for producing zirconium have been investigated and some have been tried on a small commercial scale. Among the latter are the reduction of alkali double fluorides with sodium or aluminium, reduction of the chloride with calcium, reduction of oxide with carbon or the carbide, and reduction of the halides with hydrogen. At the US Bureau of Mines laboratory, Albany, Dr. Kroll and his colleagues have investigated the production of malleable zirconium by reduction of chloride with fused magnesium under helium. Some of the many sidelines arising in the course of this work have been summarised in THE CHEMICAL AGE.[3] Arc reduction of the tetrachloride has also been examined.

Like titanium, zirconium is extremely sensitive to impurities, nearly all of which affect its properties and behaviour. It has a strong affinity for the non-metallic elements, and particularly for oxygen and nitrogen, which cause embrittlement of the metal. Since there is no practical method of removing these elements from the metal, it is essential that they should be eliminated during the preparation if high purity zirconum is desired. Furthermore, pure zirconium is so reactive, particularly in the finely divided state, that it must be agglomerated without exposure to the atmosphere if a high degree of purity is desired. These considerations have caused investigators to concentrate on the halides rather than the oxides as starting materials in the metal reduction process.

Further complications are presented by the small quantities of hafnium compounds contained in all zirconium ore. Because of their marked similarity in properties to the analogous zirconium compounds, these impurities can only be eliminated by special techniques, but the separation process is not expensive. For most nuclear applications low-hafnium material is required, but for other purposes it is unnecessary to reduce the hafnium content, which is normally about 2 per cent by weight of the metal produced.

Excellent Corrosion Resistance

The authors of the Paley Report consider that because of its excellent resistance to corrosion by many chemical reagents, a low-cost zirconium is likely to find its largest commercial application in the construction of corrosion-resistant equipment and perhaps as an alloying addition in high temperature materials. It would probably supplant tantalum in many applications in which resistance to hydrochloric acid is important, since the latter metal is roughly 2½ times as heavy and is more costly pound for pound.

Zirconium's resistance to sulphuric acid, though excellent in dilute solutions, becomes very poor in concentrations exceeding about 70 per cent. It has excellent nitric acid resistance at all concentrations and temperatures, but its use as a container for this acid would be limited by strong competition from other metals.

Zirconium melts at 1,860°; it combines with oxygen and nitrogen at temperatures as low as 300-400°; hydrogen is absorbed at temperatures in the region of 300-400°; but is expelled at about 1,000°. Because of this property consideration has been given to the possibility of using zirconium as a means of producing pure hydrogen.

Mechanical Strength

Despite its lower density of 6.5, drawn zirconium has a tensile strength similar to that of medium-carbon steel. Its strength-weight ratio is therefore higher than that of steel, though inferior to that of high-aluminium alloys. Zirconium sheet is quite ductile when annealed, and deep drawing and spinning should be possible.

The possibilities of developing high strength in zirconium by alloying are considered to be much the same as those for titanium. For various reasons such as cost, greater density and lower modulus of elasticity, structural zirconium alloys are unlikely to compete with structural titanium alloys. There appear to be favourable prospects for zirconium, however, in applications where both strength and corrosion resistance are required, particularly since technological progress can be expected to lead to further improvements in the strength of zirconium alloys.

Several hard zirconium alloys, in which the metal accompanies aluminium, manganese, silicon and other materials, are now in common use. Cooperite, a nickel-zirconium alloy, is acid-resistant, non-rusting, very hard, and makes an efficient high-speed cutting tool. Because of zirconium's affinity for oxygen and nitrogen, ferro-zirconium is used in the steel industry as a scavenger.

Zirconium has exceptionally good gettering properties, and its use in electronic valves is now well established. This field of application is unlikely to become really extensive, however, until zirconium alloys with improved high-temperature strength properties have been developed.

Zirconium foil from 0.0005 to 0.0002 in. is used as a flux in welding tungsten to tungsten, tungsten to molybdenum, molybdenum to molybdenum, and other combinations of metals. Electrodes of zirconiated

[continued on page 1200

The Export Situation

A General Decrease, But Some Welcome Rises

ALTHOUGH trade appears still to be in a healthy state, the total value of chemical exports from Great Britain dropped during April to £16,175,804, compared with £17,273,004 for March, a fall no doubt attributable to the Easter holidays. One or two welcome increases may be noted, but on the whole this decrease is reflected in all figures, both for customers and class of commodity.

General inorganic and organic chemicals show a decrease over the previous month from £4,954,594 to £4,602,659, and the fact that this fall is not greater is attributable to continuing high alkali exports and the maintenance of most minerals at the March levels. Glycerine is recovering after extra-high sales in January and alcohols are fairly steady, but lead tetra-ethyl continues to fall. India's purchases decreased considerably in this class, from £547,467 to £389,990, but exports to the US rose from £230,881 to £305,799, and to Canada, from £138,916 to £294,239.

Exports of coal tar products were less to Eire and Belgium, but otherwise increased. The fluctuation of benzole exports reached an upper point last month, but the phenomenal rise of coal tar has fallen off.

Dyes are still rising, with big increases for India and Pakistan, but medicinal products have dropped slightly, particularly to India and the Sudan. Essences and perfumes are up over the four months January-April, but dropped from £2,003,239 in March to £1,692,031 in April, and plastics showed a similar, although less severe, fall. Fertili-

TABLE 1
VALUE OF EXPORTS IN £ : PRINCIPAL COMMODITIES

	April 1954	Mar. 1954	April 1953
Acids, inorganic	39,425	51,662	30,612
Copper sulphate	458,759	498,264	628,764
Sodium hydroxide	330,309	463,260	221,150
Sodium carbonate	213,860	184,274	109,171
Aluminium sulphate	55,908	29,726	48,211
Bismuth compounds	25,908	33,986	19,325
Calcium compounds, inorganic	56,988	54,295	49,090
Magnesium compounds	49,703	49,662	66,967
Nickel salts	54,175	53,534	39,848
Potassium compounds, ex. fertilisers, bromides and iodides	42,065	31,780	39,281
Glycerine	30,770	10,460	25,344
Ethyl, methyl, etc., alcohols	116,402	157,966	58,058
Acetone	63,663	77,257	64,654
Lead tetra-ethyl	178,287	219,754	277,780
Total for chemical elements and compounds	**4,602,659**	**4,954,594**	**4,210,071**
Coal tar	84,240	134,915	94,788
Cresylic acids	39,516	43,670	43,397
Benzole	238,880	191	28,039
Creosote oil	155,640	155,743	268,543
Total from coal tar, etc.	**540,001**	**360,082**	**459,310**
ndigo, synthetic	81,841	85,605	79,298
Total for synthetic dyestuffs	**873,190**	**830,127**	**537,139**
Medicinal and pharmaceutical products, total	**2,628,559**	**2,955,873**	**2,613,318**
Essential oils—			
Natural	33,665	42,341	39,061
Synthetic	65,486	96,847	58,756
Flavouring essences, etc.	100,254	96,339	80,243
Total for essential oils, perfumes, etc.	**1,692,031**	**2,003,239**	**1,682,953**
Ammonium nitrate	14,874	269	74,990
Ammonium sulphate	134,606	232,203	446,212
Total for all fertilisers	**211,509**	**284,754**	**580,650**
Paints, pigments and tannins, total	**1,400,824**	**1,612,533**	**1,266,788**
Plastics materials, total	**1,901,590**	**2,019,971**	**1,757,083**

TABLE 2
VALUE OF EXPORTS IN £ : PRINCIPAL CUSTOMERS

	April 1954	Mar. 1954	April 1953
Gold Coast	314,824	376,417	334,335
Nigeria	368,522	348,253	337,550
South Africa	915,551	921,104	767,028
India	1,103,500	1,562,742	1,150,593
Pakistan	469,674	405,492	109,290
Singapore	246,971	358,496	304,514
Malaya	180,345	294,821	279,601
Ceylon	123,998	182,673	219,445
Hong Kong	348,402	367,269	360,793
Australia	1,229,865	896,164	725,531
New Zealand	428,223	515,432	323,455
Canada	773,384	454,914	868,521
Eire	530,393	603,381	521,550
Finland	272,654	201,047	122,024
Sweden	505,014	629,994	384,658
Norway	257,791	241,053	232,699
Denmark	352,060	378,534	351,420
Western Germany	287,774	287,227	287,053
Netherlands	697,376	661,820	526,403
Belgium	312,741	360,550	339,462
France	384,194	506,553	390,864
Switzerland	174,106	234,589	131,703
Italy	539,875	520,613	323,919
Spain	150,551	145,605	99,325
Portugal	231,358	202,154	301,884
Greece	56,617	45,783	86,326
Turkey	156,548	50,906	33,040
Israel	23,468	66,899	41,138
Egypt	160,678	335,775	298,114
US	856,127	666,774	718,982
Argentina	197,456	398,528	24,489
Total value of chemical exports	**16,175,804**	**17,273,004**	**14,986,823**

sers are right down, despite a substantial rise for ammonium nitrate.

Table 2, which gives some details of exports to the principal consumers, shows that most have fallen slightly. Sales to Australia and Canada have increased considerably over last month, and those to Turkey show a steady improvement; the most welcome rise, however, is in exports to the US, which have risen from £666,774 to £856,127.

Summer Symposium

Full Programme for Midlands Society

AS we previously announced, the Midlands Society for Analytical Chemistry is holding an 8-day Symposium on Analytical Chemistry at Birmingham University from 25 August to 1 September next (both dates inclusive). The lecture programme has now been completed and consists of four plenary lectures, 35 original papers and 17 papers on recent advances in selected branches of analysis. The papers to be read are as follows:—

Plenary Lectures

'Progress of Organic Spot Test Analysis Based on Experience of the Chemistry of Specific, Selective and Sensitive Reactions,' by Professor Fritz Feigl.

'The Development of the Birmingham Analytical School,' by Professor M. Stacey, F.R.S.

'The Impact of Microchemistry in Analytical Research,' by Professor M. K. Zacherl.

'The Development of Precision Weighing: An Historical Survey,' by Dr. G. F. Hodsman.

Original Papers

'The Titration of Inorganic and Organic Compounds, Especially Proteins, with Tervalent Copper (Percuprimetry),' by G. Beck.

'Recent Advances in Quantitative Inorganic Analysis,' by R. Belcher.

'The Determination of Sulphur: A Wet Combustion Method,' by P. O. Bethge.

'Titrimetric Analysis of High Precision and Accuracy: (I) An Examination of Attainable Precision; (II) A System of Weight Titrimetry Using Arbitrary Standards,' by E. Bishop.

'Heterogeneous Phase Redox Indicators and Their Applications,' by F. Burriel-Marti.

'A Thermogravimetric Study of the Dehydration and Rehydration of Some Complex Proteins,' by C. Duval and L. Robert.

'A Thermogravimetric Study of the Precipitates formed between Dimedone and Aldehyde,' by C. Duval and N. Dat. Xuong.

'A Spectrographic Study of the $—XO_4$ ions as an Aid to their Analytical Behaviour,' by C. Duval and J. Lecomte.

'Some Recent Advances in Complexometric Titrations,' by H. Flaschka.

'The Analysis of Chloroacetic Acid,' by L. P. Dupee and K. Gardner.

'The Determination of Sulphur in Steel,' by D. Gibbons.

'The Estimation of Reducing Sugars by Alkaline Reagents, with Special Reference to Nitrosalicylic Acid,' by R. T. Bottle and G. A. Gilbert.

'The Volumetric Determination of Small Quantities of Some Metal Ions Using Organic Complexing Agents,' by F. Holmes.

'Advances in Oscillographic Analysis with the Polaroscope,' by J. Heyrovsky (read by J. E. B. Randles).

'Galvanic Analysis,' by P. Hersch.

'A Thermogravimetric and Spectrographic Study of the Reaction in the Solid State Between Metal Oxides and Sodium Peroxide,' by Miss M. Jacquinot.

'The Indicator Properties of 3-Methoxybenzidine,' by M. Kapel.

'Quantitative Visual Colorimetry,' by J. King.

'Identification of Amino-acids and Vitamins by Means of Physical Constants,' by A. Lacourt, G. Depadwa and N. Delande.

'New Aromatic Amines as Reagents for Tungsten,' by F. Lucena.

'Developments in the Analysis of Fluorine-Containing Organic Compounds,' by Miss A. M. G. Macdonald.

'A Thermogravimetric and Spectrographic Study of Copper Hydroxides and Copper Oxide Hydrates,' by Miss C. Ott.

'Recent Advances in Chelatometry,' by R. Pribil.

'Photoelectric Complex Formation Titrations,' by Anders Ringbom.

'The Determination by Radio-activation of Traces of Alkali Metals in Materials of Geochemical Interest,' by L. Salmon and A. A. Smales.

'A New Determination of Nitrogen in Organic Compounds,' by W. Schöniger.

'Chemical Analysis by Microwave Spectroscopy,' by J. Sheridan.

'Some Heinous Errors in the Theory and Practice of Analysis,' by T. B. Smith.

'The Effect of the Trifluoromethyl Group on the Properties of some Analytical Reagents,' by A. Sykes.

'The Determination of Potassium and Sodium in Coal Ash,' by H. Thomas.

'A Method for Separating Ions in a Single Drop,' by H. Weisz.

'Investigations on Organo-Metallic Complexes,' by Cecil L. Wilson.

'The Chromatographic Separation of Penta-erythritol and its Determination as the Dibenzal-acetal,' by K. Sporek and A. F. Williams.

'The Nature of Metal/Ion Reagent Complexes, with Special Reference to their Spectra,' by R. J. P. Williams.

'Extraction Separations of Inorganic Compounds,' by Philip W. West.

Recent Advances

(i) *Industrial Applications*

Iron and Steel—B. Bagshawe; Non-Ferrous Metals—G. W. C. Milner; Coal and Coke—R. A. Mott; Coal Tar—T. A. Vaughan; Paints and Varnishes—C. Whalley; Ceramics—H. Bennett; Foods—D. Dickinson; and Plastics—J. Haslam.

(ii) *Special Techniques*

Inorganic Chromatography—F. H. Pollard; Mass Spectrometry—J. Robb; Polarography—W. Cule Davies; Spectrography—R. L. Mitchell; Absorptiometry—W. N. Aldridge; Biochemical Analysis—Garfield Thomas; Qualitative Analysis—H. Holness; Ion Exchangers—G. H. Osborn; and The Quantometer—I. G. Slater.

The Secretary has already received more than 400 requests for application forms, including many from abroad. Accommodation in hotels is available but limited and intending delegates should obtain their forms of application quickly from the Symposium Secretary, Dr. J. W. Robinson, 139 Stourport Road, Kidderminster, Worcs. A list of suitable hotels will be supplied on request.

Scottish Gas Disappointment

Natural gas exploration work initiated earlier this year at Cousland, near Dalkeith, by the D'Arcy Exploration Co. Ltd., has been suspended. The Scottish Gas Board has indicated that the investigation has not provided 'very satisfactory results.' Borings have been carried to 2,000 ft. and have confirmed the presence of natural gas, but the quantity has proved smaller than anticipated. A full report on the project is being made to the Gas Council.

Directors' Dispute

Injunction Granted in the High Court

IN the Chancery Division of the High Court on 20 May, Mr. Justice Wynn-Parry found in favour of plaintiffs in a motion by Mr. J. E. Galloway, Mr. J. A. Oliver and Mr. D. F. Galloway, for an injunction to restrain Mr. E. C. Richardson, Mr. H. O. Raphael and Mr. C. G. Poppleton from excluding plaintiffs from meetings of directors of P. H. Galloway Ltd., manufacturing chemists, and from interfering with them in the execution of their duties as directors.

On 16 March, said His Lordship, a meeting was requisitioned by shareholders to consider a resolution for the removal of plaintiffs from the board and to alter the articles of association. Plaintiffs very properly offered no opposition to the meeting being called, but there was the important question whether the notice convening the meeting was sent out under the authority of the board.

He found as a fact that the notices were sent out and the meeting was convened without the authority of the board of directors. Plaintiffs had challenged the validity of the meeting at which there was an attack upon them. They were there, but they took no part in the proceedings. The fact that the notice convening the meeting was sent out without the authority of the board was sufficient to vitiate the whole proceedings.

Ductile Zirconium

continued from page 1197]

tungsten for argon arc welding have recently been developed by the Murex company.[4]

Zirconium has a low linear coefficient of expansion which may make it suitable as a glass-metal sealing metal. Another potential field of application is in the production of electrolytic condensers, which call for a metal with excellent corrosion resistance, capable of giving a high-resistivity, high-dielectric constant oxide film. Zirconium is also used to improve the efficiency of pumping systems and as a getter in vacuum metallising.

REFERENCES

1 'The Promise of Technology,' *Resources for Freedom*, **iv**.
2 Miller, G. L., 'Zirconium,' *Murex Review*, **1**, [8], 51.
3 THE CHEMICAL AGE, 1953, **68**, 247.
4 *Idem*, 1954, **70**, 1005.

Laboratory Experiments in General Chemistry and Semi-Micro Qualitative Analysis. By G. W. Watt and L. O. Morgan. McGraw-Hill Book Company Inc., New York and London. 1953. Pp. viii + 228. 28s.

This book, with paper cover, multi-ring binding, and perforated tear-out pages, punched for transfer to a ring binder, is of a form common in the United States as a combined laboratory textbook and notebook, but not yet much favoured in this country. Leaving aside the relative merits of this as opposed to the more orthodox form, a topic which has frequently been argued, the book has the disadvantage that it is designed to accompany a specific textbook in general chemistry. It is claimed in the preface that it may be adapted for use with other textbooks and it is probably sufficiently flexible to be used in this way.

The first 130 pages comprise procedures for 49 experiments in elementary chemistry, together with the space to write up the results of these experiments and a series of questions designed to test the understanding of the principles involved. These experiments deal with the fundamental laws, the nature of reactions, simple preparations and simple physical determinations such as the measurement of molecular weights and solubilities. These experiments are on the whole well chosen and in some cases novel; it is perhaps doubtful if it is wise to put as early as Experiment 4 for an elementary class the heating of copper oxide in a current of hydrogen, even with a precautionary inspection of the apparatus by the instructor; or whether determination of the formula of magnesium oxide by heating the metal in air is pedagogically sound without laying considerably more stress on the possible errors than is actually done. But on the whole the student who carries out these experiments and answers the questions attached to each should have a satisfactory grasp of a good selection of the principles of chemistry.

The second part of the book concerns itself with the semi-micro identification of the familiar cations and eight of the commoner anions. Cation analysis is treated group by group, using the method of group solutions for practical work, and the student is expected to finish his course by the analysis of six unknown mixtures containing both cations and anions. An adequate account of the theory is given for elementary purposes and an adequate knowledge of this is clearly expected to be absorbed by the student, since the questions requiring answers are quite comprehensive.

Although it is doubtful if the book would be sufficiently along British educational lines to find use as a standard school text in this country, it could be used with advantage by the teacher desirous of extending or modifying his existing laboratory teaching.—Cecil L. Wilson.

Introduction to Chemistry. By R. T. Sanderson. John Wiley & Sons, New York; Chapman and Hall, Ltd., London. 1954. Pp. 542. 44s.

This is a text book apparently designed for use by elementary chemistry classes in United States colleges. It is said to be based on two principles; first, that text books should not contain more than can be assimilated and second, that learning must include understanding as well as memorisation. As a result the book contains more explanatory material than is usual in a book of this type and less purely descriptive matter. An attempt is made to give only the most essential information and to explain it simply and thoroughly. In some parts of the book the aims of the author seem to be largely fulfilled although some of the earlier explanations may appear superfluous in view of their very elementary nature. In some cases, attempts to avoid mathematical reasoning make the text perhaps unnecessarily long winded. In others, treatment tends to be sketchy. Clear and often amusing explanatory diagrams are a feature of the book, though some may feel that the rather comic ones might have been drawn in more serious vein. Emphasis generally seems to be on theoretical aspects and there are few references to, or illustrations of, laboratory work.

The first third of the book deals with elementary aspects. Simpler concepts are defined and illustrated by reference to common compounds. Equations, energy changes and the combination of elements are then considered, including an outline of atomic structure, ionisation potential and electron affinity. Ionic and covalent bonds are distinguished and directional properties of the latter indicated. Co-ordinate bonds are, however, dismissed in a paragraph. Oxidation and reduction are explained in terms of electron transfer and periodicity is introduced at this stage.

Succeeding chapters on physico-chemical topics seem rather unbalanced. Certain aspects of the states of matter, forces between molecules and vapour pressure are clearly outlined, but van der Waal's equation does not seem to be mentioned and the treatment of solutions is sketchy. Osmosis receives only a page and the relationship between osmotic pressure and concentration only a bare mention. The effect of temperature on osmotic pressure is not considered. It is not made clear that the relationships between elevation of boiling point or depression of freezing point and concentration are only really true in very dilute solution. On the other hand the hydration of ions is considered in some detail.

Oxygen, oxidation, acids, bases and ionic equilibria, including complex ions and solubility product, indicators and titrations, are then considered. The treatment of indicators and titrations might be improved by use of typical *p*H-titration curves. Buffer solutions do not seem to be considered. There are chapters on hydrogen and its compounds, electrochemistry, the halogens and a more advanced account of periodicity. The most common metals are considered very briefly. A chapter on carbon and silicon is mainly a very condensed account of organic chemistry which should either be considerably expanded or omitted from a book of this kind. The book concludes with chapters on rules of chemical reaction and compound stability, nuclear changes and the history of chemistry, the last two of which are brief, and a final one on earning a living as a chemist, some of which applies mainly to conditions in the USA.

Many of the chapters conclude with questions designed to test and help the understanding of the reader. Answers to numerical questions would be useful. The emphasis on theory in this book and the rather unbalanced treatment of certain aspects would require its use as a text book to be supplemented by other reading and practical work. The price is high for a book of this type.—W.R.M.

AKTIVE KOHLE UND IHRE INDUSTRIELLE VERWENDUNG. By G. Bailleul, K. Bratzler, W. Herbert and W. Vollmer. Third edition. Ferdinand Enke Verlag, Stuttgart. 1953. Pp. 143, 56 illustrations and 17 tables. Paper DM. 18.00, cloth DM. 19.60.

In recent years activated charcoal has been used to an ever-increasing extent both in industry and in the research laboratory. This book gives a survey of the industrial aspect. Two introductory chapters by W. Herbert describe the preparation and properties of activated charcoal and give a brief account of adsorption mechanisms. These are followed by a number of articles on the use of activated charcoal in various fields, such as the purification of gases, the recovery of solvents from gases, the separation of gases (by W. Vollmer), the decolorisation of liquids and the purification of water (by G. Bailleul). K. Bratzler contributes an authoritative section on the use of charcoal in batteries. In the final chapter W. Herbert describes the methods used in testing charcoals to determine their suitability for a particular process.

The quality of these contributions varies considerably. The articles by Drs. Vollmer and Bratzler are excellent, although even here there are occasional patches of obscurity. Some of the other articles are badly organised and there is much needless repetition. The printing in many of the flow-sheets is so small as to almost illegible. The reviewer was greatly puzzled by two illustrations to which he could find no reference in the text. The component parts of these are carefully lettered but there is not even an explanatory legend. One of the graphs is incorrectly labelled. It is surprising to find so many imperfections in a third edition.—J. C. P. SCHWARZ.

• HOME •

Chemical Exports Maintained

A review of UK exports, compiled by the *Board of Trade Journal,* gives a volume index number of 125 (1950 = 100) for chemicals exported during the first quarter of this year. This is the same as for the fourth quarter of 1953 and compares with 105 for the first quarter of last year.

More Chemical Workers

According to the latest (April) issue of the *Monthly Digest of Statistics,* the estimated total of employees in coke ovens, chemicals and dyes, explosives and fireworks, in February, was 285,000, an increase of 1,200 compared with the figure for January and higher than it has been for more than a year.

Barytes Mine Closed

Anglo-Austral Mines Ltd. have closed their barytes mine at Cow Green in Teesdale. Owing to foreign competition, the demand for barytes has fallen. In prosperous times about 130 men were employed with a weekly wage bill of about £1,000 and output was about 500 tons weekly. Two years ago the number of employees fell to 50 and at present less than a dozen are cleaning up the premises.

Adrenocorticotrophic Hormone

Answering a question in the House of Commons last week, the Minister of Health, Mr. Iain Macleod, said there were no regulations governing the prescription of cortisone and ACTH for the use of private patients, but in the public interest he had limited their distribution to selected hospitals. Asked what ACTH stood for, Mr. Macleod replied: 'It is a short name for a very complicated drug.'

Search for Natural Gas

Deep drilling for natural gas in Sussex, as part of the Gas Council's five-year exploration plan, is due to start shortly. The work is being carried out on behalf of the Council by the D'Arcy Exploration Co., a subsidiary of the Anglo-Iranian Oil Co. Site clearance has been started near Crowborough Warren, Crowborough, in the vicinity of Ashdown Forest, where it is expected that a well will be drilled to a depth of about 2,000 ft.

Another Fall in Price

From 18 May the Ministry of Materials once again reduced its selling prices of tungsten ores (wolframite and scheelite) of standard 65 per cent grade and ordinary quality. The reduction was of 5s., the new price being 180s. plus 10s. charge per long ton delivered consumers' works. Early in May wolframite stood at 235s. and scheelite at 230s. per unit plus 10s. charge.

More Employment at Wilton

Imperial Chemical Industries Ltd. expect that by the end of this year about 7,500 men and women will be employed at their new Wilton Works in North Yorkshire. The biggest item in this year's operating programme will be the starting of the Terylene plant, due towards the end of the year.

Sugar Refinery Reopening

Closed last November because the expected demand for sugar following de-rationing did not materialise, the Glebe Sugar Refining Co.'s refinery at Greenock is to be reopened towards the end of July. Greenock has two other refineries, both of which are working to capacity.

Long Service Recognised

A total of 900 years' service with Imperial Chemical Industries Ltd., Dyestuffs Division, was recognised recently when presentations were made at the firm's Blackley, Manchester, headquarters to 42 employees. Heading the list was Mr. H. Jackson, of Bramhall, joint managing director of the Dyestuffs Division, who has been with the firm 40 years.

Gifts to University

The following donations and gifts to Leeds University have been announced: for post-graduate research in chemical engineering, Department of Coal, Gas & Fuel Industries, £1,000 over two years from the Shell Petroleum Co. Ltd.; for research, School of Chemistry, £300 from Monsanto Chemicals Ltd.; to purchase a low-temperature refrigerator for organic chemistry, £130 from I.C.I. Ltd. In addition, Brotherton & Co. Ltd. have promised a donation of £2,000 a year for seven years for Lectureships and Fellowships in Chemistry and Chemical Engineering.

• OVERSEAS •

Alumina From Jamaica

The first shipment of Jamaican alumina refined from local bauxite to be sent to the Aluminium Company of Canada plant at Kitimat, British Columbia, recently left Port Esquivel, Jamaica.

To Buy Government Rubber Plants

The American Synthetic Rubber Corporation has been formed by a group of 29 companies to place a single bid for the purchase of one of the Government-owned synthetic rubber plants now offered for sale to private concerns.

Orissa Steel Project

Dr. Carl Popp, chief engineer of the West German concern of Demag, recently arrived in Bombay en route for New Delhi with a preliminary report on the Rs. 720,000,000 steel project at Rourkela, Orissa. He said the report, which has been prepared by the German combine, Krupps-Demag, would be presented to the Government of India in the near future.

Nuclear Research in Brazil

A special nuclear research division and laboratories will be established at the Physical Research Centre whose construction is now nearing completion at Morro Sao Joao, Rio de Janeiro. The President of the National Research Council recently stated that equipment for nuclear research and for the production of radio-active isotopes would soon arrive from abroad for installation in the new department.

Aden Refinery Operating in August

Sir William Fraser, chairman of Anglo-Iranian Oil Co. Ltd., has announced that the company's new 5,000,000 tons a year Aden Refinery is to come into operation in August. 'This,' Sir William points out, 'is about four months in advance of our best expectations, and represents a remarkable feat of successful planning and construction by our team of staff and contractors.' Construction of Aden Refinery, on a barren site across the bay from Aden town, began on 1 November, 1952. It will thus have taken only twenty-one months to transform a stretch of desert into a large operating refinery.

Claims for New Alloy

The development of a new alloy of titanium, said to be as strong as high-test steels, but 40 per cent lighter, has been announced by the US Army's arsenal at Watertown, Mass. The alloy is claimed as a potential substitute for steel in many ordnance components.

Gold Mines in Difficulties

The gold-mining industry in Western Australia has asked the Commonwealth Government for assistance because producers of one-third of the country's gold output are in difficulties. Although last year's output of 1,053,779 oz. was the biggest for 11 years, new mines are not coming in to replace those which are dying out.

Oil Prospecting in Bengal

Proposals have been received from the Caltex and Burmah Oil Companies concerning rights for oil prospecting in the Bengal basin, said Mr. K. D. Malaviya, Deputy Minister for Natural Resources and Scientific Research, in the House of the People, recently. He said the Assam Oil Company had also sent proposals. These proposals were under consideration by the negotiating committee appointed by the Government.

Canadian Investment in Rhodesia

The Canadian (Overseas) Asbestos Corporation have bought an asbestos mine in the Belingwe district of Southern Rhodesia and have set aside $3,000,000 to develop its output to 15,000 tons of fibre a year. The output of the Belingwe mine will be exported to India where Rohtas Industries (India) Ltd., who have large factories near Calcutta, will manufacture it into asbestos roofs and sheeting for further export throughout Asia.

Uranium-Thorium Factory

Mr. K. D. Malaviya, Deputy Minister for Natural Resources and Scientific Research, told the Indian Council of States recently that the building of the uranium-thorium factory in Bombay would be completed by the end of the year. He said it was expected that all the machinery and equipment required, both foreign and home-made, would be ready within the next three months.

· PERSONAL ·

At the recent annual general meeting of the Institute of Physics, SIR JOHN COCKCROFT (director of the Atomic Energy Research Establishment at Harwell, and chairman of the Defence Research Policy Committee) was elected president. MR. G. R. NOAKES was elected a vice-president, DR. S. WHITEHEAD was re-elected hon. treasurer and DR. B. P. DUDDING re-elected hon. secretary. The two new ordinary members of the board elected were DR. K. A. G. MENDELSSOHN and MR. H. P. ROOKSBY.

PROFESSOR D. M. NEWITT, F.R.S., Courtauld Professor of Chemical Engineering at the Imperial College of Science and Technology, has been nominated as president of the Association of Scientific Workers.

SIR GEORGE BRIGGS, A.M.I.Mech.E., who has accepted an invitation to become a director of the Brush Group, is a director of Tube Investments, Ltd., and a member of the Royal Ordnance Factories board. He was Deputy Controller, Iron and Steel Supplies, at the Ministry of Supply, from 1942 to 1945, and Deputy Controller of Supplies (Munitions Production), Ministry of Supply, from 1951 to 1952.

The council of the University of Leeds have announced the appointment of DR. C. S. WHEWELL, at present Reader in Textile Finishing in the department of textile industries, to be Professor of Textile Technology in that department.

MR. A. FRASER MUCH, who is attached to the I.C.I. packaging adviser's section, has been elected vice-chairman of the Institute of Packaging. After service during the war in various army posts, including that of Preservation & Packaging Co-ordination Officer, Ministry of Supply, he was one of the early enthusiasts who nursed the Institute of Packaging from an idea to fruition. A member of the council with unbroken service, he became the first secretary of the Northern Area and is now chairman of the area. He is hon. treasurer of the Institute of Materials Handling.

Queens' College, Cambridge, has elected to an official Fellowship DR. ROBERT NEVILLE HASZELDINE, of Sidney Sussex College, university demonstrator in chemistry.

One new Fellow has been elected by the Textile Institute. DR. PAUL AUGUST KOCH, of St. Gallen, Switzerland, is head of the Scientific Department of Stoffel and Co., a prominent Swiss textile firm. Before the war he lectured on textiles at the University of Dresden and at Graz, Austria. He has contributed to many scientific journals, encyclopaedias and to other textile publications.

Hickson & Welch Ltd. have announced the appointment of DR. T. HARRINGTON, B.Sc., F.R.I.C., M.I. Plant S., and MR. G. K. DAY, A.S.A.A., as joint managing directors. DR. D. A. W. ADAMS, B.Sc., has been appointed a director of the company.

National Benzole Co. Ltd. has announced the appointment of MR. KEITH FRENCH, M.Sc., F.R.I.C., as assistant chief chemist (research) at their Watford Laboratories. Educated at Christ's College, Finchley, Mr. French joined the company as junior research assistant in the laboratories in 1938. Nine years later he was promoted assistant research chemist and became senior research chemist in 1950.

MR. D. H. ROBINSON is to be managing director of Thomas Hedley & Co. Ltd., following the resignation of MR. R. CRAIG WOOD. MR. T. C. BOWER and MR. G. WILLIAMS have been appointed directors.

DR. WILLIAM L. EVERS and DR. O. V. LUKE have been promoted to new positions with Celanese Corporation of America. Dr. Evers, who has been assistant manager of the Summit (New Jersey) Research Laboratories, in charge of Plastics Division research, is now assistant to the technical director of the Plastics Division, and has been succeeded in the former position by Dr. Luke, who was formerly chief physical chemist of the Clarkwood (Texas) petroleum chemical laboratory.

MR. J. A. CONNEL has been appointed to the board of Unilever Ltd. At the forthcoming annual meeting of Unilever NV it will be proposed that he be also appointed a member of the board of that company.

MR. R. W. PENNOCK, who will become I.C.I. Billingham Division staff manager on 1 June, has been personnel and labour manager of the Salt Division since 1950. He succeeds MR. H. J. TORTISE, who died in February. Mr. Pennock joined I.C.I. in July, 1947. Two months later he moved to the labour department at Billingham and remained there until November, 1950, when he went to the salt department.

MR. JOSEPH WALTON, joint managing director of Thos. W. Ward Ltd., completed 50 years' service with the company on 14 March and at a dinner given in his honour at the Royal Victoria Hotel, Sheffield, recently, he was presented by the directors with a silver rose bowl. Mrs. Walton received a diamond spray brooch. In making the presentation, Mr. Ashley S. Ward, president of the company, referred to the unique fact that Mr. Walton commenced in the rail department as a youth and had been with that department ever since. Under his guidance it had laid railway sidings for some of the largest undertakings in the country.

MR. G. R. MARSH, who has been a director of Wickman Ltd. for 14 years, has been appointed managing director of the company.

A life-long interest in steam locomotives has led MR. P. C. ALLEN, main board director of I.C.I., to write his latest book 'Locomotives of Many Lands.' Illustrated by his own photographs, the book describes characteristic locomotives of 26 countries, and it is dedicated to the secretary of the I.C.I., 'and through him, to the chairman and directors of I.C.I., for without many travels on the affairs of that company I should never,' says Mr. Allen, 'have been able to write it.' The publishers are The Locomotive Publishing Co. Ltd., London.

Mr. Allen's love of locomotives dates from the day when, as a three-year-old, his father lifted him up to see a train of the old Midland and Great Northern Railway go by, drawn, he distinctly remembers, by a bright yellow engine. Since that day 46 years ago, railways have been one of his keenest interests, and he has gathered together a small 'museum' of famous nameplates, etc.

Mr. P. C. Allen joined I.C.I. in 1928 as a chemist after gaining an M.A. and B.Sc. at Oxford. In 1942 he became joint managing director of I.C.I.'s Plastics Division, being appointed chairman of that division in 1948. He was promoted to the main board in 1951 as director in charge of Group E (I.C.I. Paints, Plastics and Leathercloth Divisions) and has since also become responsible for the 'Terylene' Council.

MR. W. S. HUXTABLE, who has been elected chairman of Runcorn Urban Council, is employed at the I.C.I. Castner Kellner works, Weston Point, Runcorn.

MR. JOHN H. LORD, Dunlop director, has been elected a director of the Dunlop Tyre and Rubber Corporation, Buffalo, USA, of which MR. GLENN H. CRAWFORD, vice-president and comptroller, has been appointed president and treasurer in succession to MR. EDWARD B. GERMAIN, who has retired.

The Warner Memorial Medal, awarded by the Textile Institute in recognition of outstanding work in textile science and technology, is to be conferred on MR. R. MEREDITH, of Cheadle, a research physicist at the British Cotton Industry Research Association.

MR. S. H. ELLIOTT, managing director of H. J. Elliott Ltd., 'E-MIL' Works, Treforest, Glam, has just left for his annual visit to stockists and distributors of 'E-MIL' brand volumetric glassware, thermometers and hydrometers, in Denmark, Sweden and Norway.

First prize in the Jubilee Essay Competition of the Institute of British Foundrymen was recently awarded to MR. D. F. BAILEY, a member of the Research and Development Department of Bakelite Ltd., for his essay on shell-moulding. Mr. Bailey is in charge of the experimental foundry. Before joining Bakelite Ltd. he had 12 years' experience in the foundries industry, and is now senior vice-president of the Coventry Section of the Institute of British Foundrymen. In addition to the national award his entry was awarded the first prize of the Birmingham branch of the Institute.

British Chemical Prices

LONDON.—Business on the industrial chemicals market is fairly widespread and the call for deliveries against contracts is well up to schedule. As far as the acid products are concerned makers prices are well held and quotations generally are steady. Reports indicate a good inquiry for shipment despite keen competition. There is a good outlet for the tar products although there has been a seasonal falling off in the demand for pitch.

MANCHESTER.—The past week has seen little or no change in general trading conditions on the Manchester market for heavy chemical products. So far as values are concerned there has been little indication of easiness, most lines being on a steady to firm basis. Contract deliveries of the alkalies and other bread-and-butter lines keep up satisfactorily and a fair number of new inquiries from home users as well as from shippers has been reported. Except for the compounds and some of the nitrogenous materials seasonal quieter conditions obtain in the fertiliser section. Most of the tar products, both light and heavy, continue to find a ready outlet.

GLASGOW.—During the past week the demand for a wide range of chemicals has been extremely good, with textiles, paint and allied industries still the main consumers. The demand for agricultural chemicals has also remained very firm and, with the exception of an indication of a forthcoming rise in some prices, the tendency has been steady. With regard to export, there has been very little change, although there has been a slight falling off in inquiries compared with the past two or three weeks.

General Chemicals

Acetic Acid.—Per ton : 80% technical, 10 tons, £86. 80% pure, 10 tons, £92 ; commercial glacial 10 tons, £94 ; delivered buyers' premises in returnable barrels ; in glass carboys, £7 ; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £130 per ton.

Alum.—Ground, about £23 per ton, f.o.r. MANCHESTER : Ground, £25.

Aluminium Sulphate.—Ex works, £14 15s. per ton d/d. MANCHESTER : £14 10s. to £17 15s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non-returnable drums ; 1 ton lots £58 per ton.

Ammonium Chloride. — Grey galvanising, £31 5s. per ton, in casks, ex wharf. Fine white 98%, £25 to £27 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £34 10s. per ton.

Ammonium Persulphate. — MANCHESTER : £6 5s. per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £97 and £94 10s. per ton.

Antimony Sulphide.—Golden, d/d in 5-cwt. lots as to grade, etc., 2s. 2d. to 2s. 8d. per lb. Crimson, 3s. 4½d. to 4s. 5¼d. per lb.

Arsenic.—Per ton, £45 5s. nominal, ex store.

Barium Carbonate.—Precip., d/d : 4-ton lots, £39 per ton ; 2-ton lots, £39 10s. per ton, bag packing.

Barium Chloride.—£42 15s. per ton in 2-ton lots.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £42 10s. per ton d/d ; 2-ton lots, £43 per ton d/d.

Bleaching Powder.—£21 per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140-lb. bags, carriage paid : Anhydrous, £58 10s.; in 1-cwt. bags ; commercial, granular, £38 10s. ; crystal, £41 ; powder, £42 ; extra fine powder, £43 ; B.P., granular, £47 10s. ; crystal, £50 ; powder, £51 ; extra fine powder, £52.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid : Commercial, granular, £67 ; crystal, £75 ; powder, £72 10s. ; extra fine powder, £74 10s. ; B.P., granular, £80 ; crystal, £84 10s. ; powder, £87 ; extra fine powder, £86 10s.

Calcium Chloride.—70/72% solid £12 10s. per ton.

Chlorine, Liquid.—£32 per ton d/d in 16/17-cwt. drums (3-drum lots).

Chromic Acid.—2s. 0⅝d. per lb., less 2½%, d/d U.K., in 1-ton lots.

Chromium Sulphate, Basic.—Crystals, £65 6s. 8d. per ton d/d U.K., in lots of 1 ton and over.

Citric Acid.—1-cwt. lots, 205s. cwt. ; 5-cwt. lots, 200s. cwt.

Cobalt Oxide.—Black, delivered, 13s. per lb.

Copper Carbonate.—MANCHESTER : 2s. 1d. per lb.

Copper Sulphate.—£77 per ton f.o.b., less 2% in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £9 12s.

Formaldehyde.—£37 5s. per ton in casks, d/d.

Formic Acid.—85%, £86 10s. in 4-ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1.260 S.G., £14 7s. 6d. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hydrochloric Acid.—Spot, about 12s. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—27.5% wt. £124 10s. per ton. 35% wt. £153 per ton d/d. Carboys extra and returnable.

Iodine.—Resublimed B.P., 15s. 4d. per lb. in 28 lb. lots.

Iodoform.—24s. 4d. per lb. in 28 lb. lots.

Lactic Acid.—Pale tech., 44 per cent by weight £122 per ton ; dark tech., 44 per cent by weight £73 per ton ex works 1-ton lots ; dark chemical quality 44 per cent by weight £109 per ton, ex works ; usual container terms.

Lead Acetate.—White : About £137 15s. per ton.

Lead Nitrate.—About £112 per ton.

Lead, Red.—Basis prices per ton. Genuine dry red lead, £122 10s. ; orange lead, £134 10s. Ground in oil : red, £142 ; orange, £154.

Lead, White.—Basis prices : Dry English in 5-cwt. casks, £128 15s. per ton. Ground in oil : English, under 2 tons, £133 15s.

Lime Acetate.—Brown, ton lots, d/d, £40 per ton ; grey, 80-82%, ton lots, d/d, £45 per ton.

Litharge.—£124 10s. per ton, in 5-ton lots.

Magnesite.—Calcined, in bags, ex works, £22 to £24.

Magnesium Carbonate.—Light, commercial, d/d, 2-ton lots, £84 10s. per ton, under 2 tons, £92 per ton.

Magnesium Chloride.—Solid (ex wharf), £14 10s. per ton.

Magnesium Oxide.—Light, commercial, d/d, under 1-ton lots, £245 per ton.

Magnesium Sulphate.—£15 to £16 per ton.

Mercuric Chloride.—Technical Powder, 23s. 9d. per lb. in 5-cwt. lots ; smaller quantities dearer.

Mercury Sulphide, Red.—27s. 3d. per lb., for 5-cwt. lots.

Nickel Sulphate.—D/d, buyers U.K. £154 per ton. Nominal.

Nitric Acid.—£35 to £40 per ton, ex-works.

Oxalic Acid.—Home manufacture, minimum 4-ton lots, in 5-cwt. casks, £129 10s. per ton, carriage paid.

Phosphoric Acid.—Technical (S.G. 1.700) ton lots, carriage paid, £92 per ton ; B.P. (S.G. 1.750), ton lots, carriage paid, 1s. 3½d. per lb.

Potash, Caustic.—Solid, £94 10s. per ton for 1-ton lots ; Liquid, £34 5s.

Potassium Carbonate. — Calcined, 96/98%, about £59 10s. per ton for 1-ton lots, ex-store.

Potassium Chloride.—Industrial, 96%, 1-ton lots, £23 to £25 per ton.

Potassium Dichromate.—Crystals and granular, 11⅞d. per lb., in 1-ton lots, d/d UK.

Potassium Iodide.—B.P., 13s. 1d. per lb. in 28-lb. lots ; 12s. 7d. in cwt. lots.

Potassium Nitrate.—Small granular crystals, 81s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 9½d. per lb. for 1-cwt. lots ; for 3 cwt. and upwards, 1s. 8½d. per lb. ; technical, £8 7s. per cwt. ; for 5-cwt. lots.

Salammoniac.—Dog-tooth crystals, £70 per ton ; medium, £67 10s. per ton ; fine white crystals, £21 10s. to £22 10s. per ton, in casks.

Salicylic Acid. — MANCHESTER : Technical 2s. 7d. per lb. d/d.

Soda Ash.—58% ex-depot or d/d, London station, about £15 5s. 6d. per ton, 1-ton lots.

Soda, Caustic.—Solid 76/77% ; spot, £26 to £28 per ton d/d. (4 ton lots).

Sodium Acetate.—About £80 per ton d/d.

Sodium Bicarbonate.—Refined, spot, £13 10s. to £15 10s. per ton, in bags.

Sodium Bisulphite.—Powder, 60/62%, £40 per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£76 to £98 per ton, according to quantity.

Sodium Cyanide.—100% basis, 9¾d. to 10¾d. per lb.

Sodium Dichromate.—Crystals, cake and powder, 10d. lb. Net d/d UK, minimum 1-ton lots ; anhydrous, 11½d. lb. Net del. d/d UK, minimum 1-ton lots.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals £28 a ton ; commercial, 1-ton lots, £26 per ton carriage paid.

Sodium Iodide.—B.P., 15s. 1d. per lb. in 28-lb. lots.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £12 7s. cwt.

Sodium Metasilicate.—£22 15s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, over 98% 6-ton lots, d/d station, £27 10s.

Sodium Nitrite.—£32 per ton (4-ton lots).

Sodium Percarbonate.—12½% available oxygen, £8 2s. 10½d. per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots : Di-sodium, crystalline, £37 10s., anhydrous, £81 ; tri-sodium, crystalline, £39 10s., anhydrous, £79.

Sodium Prussiate.—1s. to 1s. 1d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Sulphate (Glauber's Salt).—About £8 10s. per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER : £6 10s. per ton d/d station.

Sodium Sulphide.—Solid, 60/62%, spot, £33 2s. 6d. per ton, d/d, in drums ; broken, £33 2s. 6d. per ton, d/d, in drums.

Sodium Sulphite.—Anhydrous, £59 per ton ; pea crystals, £37 12s. 6d. per ton d/d station in kegs ; commercial, £23 7s. 6d. per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £23 11s. to £26, according to fineness.

Tartaric Acid.—Per cwt. : 10 cwt. or more, £10 10s.

Titanium Oxide.—Standard grade comm., with rutile structure, £155 per ton ; standard grade comm., £135 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d : white seal, £92 10s. ; green seal, £91 10s. ; red seal, £90.

Solvents and Plasticisers

Acetone.—Small lots : 5-gal. drums, £136 per ton ; 10-gal. drums, £126 per ton. In 40/45-gal drums less than 1 ton, £101 per ton ; 1 to 9 tons, £98 per ton ; 10 to 49 tons, £96 per ton ; 50 tons and over, £95 per ton. All per ton d/d.

Butyl Acetate BSS.—£173 per ton, in 1-ton lots ; £171 per ton, in 10-ton lots.

***n*-Butyl alcohol, BSS.**—10 tons, in drums, £161 10s. per ton d/d.

***sec.*-Butyl Alcohol.—5 gal. drums £159 ; 40 gal. drums : less than 1 ton £124 per ton ; 1 to 10 tons £123 per ton ; 10 tons and over £122 per ton ; 100 tons and over £120 per ton.**

***tert.*-Butyl Alcohol.—5 gal. drums £195 10s. per ton ; 40/45 gal. drums : less than 1 ton £175 10s. per ton ; 1 to 5 tons £174 10s. per ton ; 5 to 10 tons, £173 10s. ; 10 tons and over £172 10s.**

Diacetone Alcohol.—Small lots : 5 gal. drums, £177 per ton ; 10 gal. drums, £167 per ton. In 40/45 gal. drums ; less than 1 ton, £142 per ton ; 1 to 9 tons, £141 per ton ; 10 to 50 tons, £140 per ton ; 50 to 100 tons, £139 per ton ; 100 tons and over, £138 per ton.

Dibutyl Phthalate.—In drums, 10 tons, 2s. per lb. d/d ; 45 gal. drums, 2s. ¾d. per lb. d/d

Diethyl Phthalate.—In drums, 10 tons, 1s. 10¼d. per lb. d/d ; 45 gal. drums, 1s. 11¾d. per lb. d/d.

Dimethyl Phthalate.—In drums, 10 tons, 1s. 7¼d. per lb. d/d ; 45 gal. drums, 1s. 8¾d. per lb. d/d.

Dioctyl Phthalate.—In drums, 10 tons, 2s. 8d. per lb. d/d ; 45 gal. drums, 2s. 9½d. per lb. d/d.

Ethyl Acetate.—10 tons lots, d/d, £135 per ton.

Ethyl Alcohol (PBS 66 o.p.).—Over 300,000 p. gal., 2s. 9d. ; 2,500-10,000 p. gal., 2s. 11½d. per p. gal., d/d in tankers. D/d in 40/45-gal. drums, 1d. p.p.g. extra. Absolute alcohol (75.2 o.p.) 5d. p.p.g. extra.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° o.p. : 500 gal. and over in tankers, 4s. 10d. per gal. d/d ; 100-499 gal. in drums, 5s. 2½d. per gal. d/d. Pyridinised 64 o.p. : 500 gal. and over in tankers, 5s. 0d. per gal. d/d ; 100-499 gal. in drums, 5s. 4½d. per gal. d/d.

Methyl Ethyl Ketone.—10-ton lots, £141 per ton d/d.

Methyl *iso*Butyl Ketone.—10 tons and over £162 per ton.

***iso*Propyl Acetate.**—In drums, 10 tons, £130 per ton d/d ; 45 gal. drums, £135 per ton d/d.

***iso*Propyl Alcohol.**—Small lots : 5 gal. drums, £118 per ton ; 10-gal. drums, £108 per ton ; in 40-45 gal. drums ; less than 1 ton, £83 per ton ; 1 to 9 tons £81 per ton ; 10 to 50 tons, £80 10s. per ton 50 tons and over, £80 per ton.

Rubber Chemicals

Antimony Sulphide.—Golden, 2s. 3¼d. to 3s. 1½d. per lb. Crimson, 3s. 4¼d. to 4s. 5¼d. per lb.

Carbon Bisulphide.—£60 to £65 per ton, according to quality.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—Ton lots, £76 10s. per ton.

India-rubber Substitutes.—White, 1s. 6¾d. to 1s. 10¼d. per lb. ; dark, 1s. 4½d. to 1s. 8d. per lb.

Lithopone.—30%, £50 per ton.

Mineral Black.—£7 10s. to £10 per ton.

Sulphur Chloride.—British, £55 per ton.

Vegetable Lamp Black.—£64 8s. per ton in 2-ton lots.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, March-June, £17 1s. 6d.

Compound Fertilisers.—Per ton in 6 ton lots, d/d farmer's nearest station, I.C.I. Special No. 1 £27 9s.

'Nitro-Chalk.'—£15 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean agricultural for 6-ton lots, d/d nearest station, March to June, £26 12s. 6d. per ton.

Coal-Tar Products

Benzole.—Per gal., minimum of 200 gals. delivered in bulk, 90's, 4s. 10¾d. ; pure, 5s. 2d.

Carbolic Acid.—Crystals, 1s. 4d. to 1s. 6¼d. per lb. Crude, 60's, 8s. MANCHESTER : Crystals, 1s. 4½d. to 1s. 6½d. per lb., d/d crude, 8s. naked, at works.

Creosote.—Home trade, 1s. to 1s. 4d. per gal., according to quality, f.o.r. maker's works. MANCHESTER : 1s. to 1s. 8d. per gal.

Cresylic Acid.—Pale 99/99½%, 5s. 8d. per gal. ; 99.5/100%, 5s. 10d. American, duty free, for export, 5s. to 5s. 8d. naked at works.

Naphtha.—Solvent, 90/160°, 4s. 10½d. per gal. for 1000-gal. lots ; heavy, 90/190°, 3s. 8d. per gal. for 1000-gal. lots, d/d. Drums extra ; higher prices for smaller lots.

Naphthalene.—Crude, 4-ton ots, n sellers bags, £14 12s. to £22 per ton, according to m.p. ; hot pressed, £34 per ton in bulk ex-works ; purified crystals, £59 per ton d/d.

Pitch.—Medium, soft, home trade, 160s. per ton f.o.r. suppliers' works ; export trade 230s. per ton f.o.b. suppliers port.

Pyridine.—90/160°, 45s. per gal. MANCHESTER : 42s. 6d. to 45s. per gal.

Toluol.—Pure, 5s. 6d. ; 90's, 4s. 10d. per gal., d/d. MANCHESTER : Pure, 5s. 8d. per gal. naked.

Xylol.—For 1000-gal. lots, 5s. 8d. to 5s. 10d. per gal., according to grade, d/d.

Intermediates and Dyes (Prices Nominal)

***m*-Cresol** 98/100%.—3s. 9d. per lb. d/d.

***o*-Cresol** 30/31° C.—1s. 4d. per lb. d/d.

***p*-Cresol** 34/35° C.—3s. 9d. per lb. d/d.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—88/89°C., 1s. 11d. per lb.

Dinitrotoluene.—S.P. 15° C., 1s. 11½d. per lb. ; S.P. 26° C., 1s. 3d. per lb. S.P. 33°C., 1s. 1½d. per lb. ; S.P. 66/68°C., 1s. 9d. per lb.

***p*-Nitraniline.**—4s. 5½d. per lb.

Nitrobenzene.—Spot, 9½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.

Nitronaphthalene.—2s. per lb.

***o*-Toluidine.**—1s. 7d. per lb., in 8/10-cwt. drums, drums extra.

***p*-Toluidine.**—5s. 6d. per lb., in casks.

Dimethylaniline.—3s. 1d. per lb., packed in drums, carriage paid.

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsib.e for errors that may occur.

Mortgages & Charges

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

MURGATROYD'S SALT & CHEMICAL CO. LTD., Sandbach. 21 April, Trust Deed dated 1 April, 1954, securing £3,500,000 consolidated loan stock, present issue £3,303,000; charged on properties specified in schedule to deed and a general charge. *£3,275,000. 10 December, 1953.

W. G. & T. ROBINSON (1937) LTD., Birmingham, soap makers. 12 April, £3,500 charge, to Wesleyan & General Assurance Society; charged on land with factory buildings and premises at Bescot Crescent, Walsall. *——. 28 April, 1953.

Increase of Capital

The following increase of capital has been announced: WILLIAM BRIGGS & SONS LTD., from £500,000 to £1,000,000.

Change of Name

The following change of name has been announced: PADIHAM CHEMICAL CO. LTD. to GILLS LTD., on 22 March.

New Registrations

Wendt (Great Britain), Ltd.

Private company. Capital £500. Manufacturers or processors of and dealers in chemical, pharmaceutical, medicinal, industrial and other preparations or compounds, etc. Directors: Otto Wendt and Edgar H. Richardson. Reg. office: Broughton House, 6/8 Sackville Street, London, W.1.

Trafford Chemical Developments, Ltd.

Private company. Capital £25,000. Manufacturers, producers, refiners and distillers of and dealers in crude oil, petroleum products, and coal, coal products and chemicals derived therefrom, etc. Directors: Fdk. McMullen and Herbt. M. E. Steiner.

Company News

British Drug Houses, Ltd.

The 1953 consolidated sales of British Drug Houses Ltd. and its overseas subsidiaries were maintained at around, although slightly below, the previous year's level, more than 43 per cent being in overseas markets. Consolidated profits for 1953 were £594,318, as against £521,384 for the previous year, but with higher depreciation and tax charges the net figure was £124,695, as against £163,827. A dividend of 12½ per cent is recommended, this being an increase of 2½ per cent on the 1952 figure.

Greeff-Chemicals Holdings, Ltd.

In a statement circulated with the annual report of Greeff-Chemicals Holdings Ltd. for 1953, the chairman, Mr. S. B. Smith, refers to continued trading improvement in the second half of 1953 and higher turnover in the current year to date than for the corresponding period of the year under review. The group profit for 1953 was £86,416 against £60,537 for 1952, and after taxation the net profit was £43,314 as against £31,825. The improved results, states Mr. Smith, are due not only to the improvement in the company's trading, but also to improved trading by the companies in which it holds trade investments. A final ordinary dividend of 21¼ per cent is recommended, making 25 per cent for the year, compared with a total of 17½ per cent for the previous year.

Anglo-Iranian Oil Co., Ltd.

Sir William Fraser, chairman of the Anglo-Iranian Oil Co. Ltd., in a statement circulated with the annual report for 1953, points out that assets and liabilities representing the company's interests in Iran remain included in the accounts at substantially the same figure as for 1950 and 1951.

When a settlement regarding these interests is concluded with the Iranian Government, it is the board's intention to make any necessary adjustments in the form and content of the accounts. Gross consolidated profit totalled £63,883,828, comparing with £61,260,584 for 1952. Should the company's claim for relief from UK taxation in respect of Kuwait taxation be accepted, the net increase in the group's tax-paid profits to the end of 1953 could approximate £20,000,000. The board recommends a final ordinary dividend of 25 per cent, and in addition a cash bonus of 2s. 6d. per £1 stock unit, both less income tax. Total capital expenditure during 1953 was just under £75,000,000, made up chiefly of expenditure on refineries. The total refinery throughput during the year was 20,000,000 tons, which was 2,000,000 tons greater than in 1952. Severe competition had been experienced in all the company's markets and trading conditions had been far from easy.

Reichhold Chemicals, Ltd.

In a statement issued in connection with the forthcoming annual meeting of Reichhold Chemicals Ltd. (to be held in London on 15 June), the chairman, Mr. W. H. Breuer, says that demand for Vinamul polyvinyl acetate and other synthetic resin emulsions and Vinalek polymer solutions continues to increase after a record turnover in 1953. The vinyl companies have acquired adjoining factory premises in order to cope with expanding production. The final dividend is 10½ per cent, making 13½ per cent for the year. No dividend was paid for 1952.

Next Week's Events

MONDAY 31 MAY

Royal Society of Arts

London: John Adam Street, Adelphi, 6 p.m. Third Cantor Lecture on 'The Chemistry of Leather,' by Dr. Henry Phillips.

WEDNESDAY 2 JUNE

Royal Institute of Chemistry

London: Lewis Berger (Great Britain) Ltd., Homerton, E.9, 2.30 p.m. Works visit by London Section.

THURSDAY 3 JUNE

Chemical Society

London: Burlington House, Piccadilly, 7.30 p.m. The Claude Silbert Hudson Memorial Lecture by Professor E. L. Hirst.

KID Exemptions

THE Board of Trade is considering the renewal of the exemption from Key Industry Duty of a number of commodities (mainly chemicals) for the period 19 August, 1954, to 18 February, 1955.

Any representations on this subject should be addressed to the Industries and Manufactures Department, Division 1, Board of Trade, Horse Guards Avenue, London, S.W.1, as soon as possible, and in any case not later than June 12.

Notices of the Orders listing items exempted from Key Industry Duty were printed in the *Board of Trade Journal* issues of 20 February, 3 April and 1 May this year. Notices of further Exemption Orders which may be made before 19 August will be published in the *Board of Trade Journal* of the appropriate date.

The Treasury has made an Order under Section 10 (5) of the Finance Act, 1926, exempting the following articles from Key Industry Duty, for the period 20 May-18 August, 1954:

p-Anisidine; *o*-chloro-mono-nitro-benzene; L-histidine mono-hydrochloride; lithium hydroxide; and sodium tetraborate, of which the boron is in the form of a stable isotope of atomic weight either 10 or 11, of a value not less than £1 per g.

This Order is the Safeguarding of Industries (Exemption) (No. 5) Order, 1954, and is published as Statutory Instruments 1954, No. 652. Copies may be obtained (by post 3½d.) from HM Stationery Office, Kingsway, London, W.C.2, and branches, or through any bookseller.

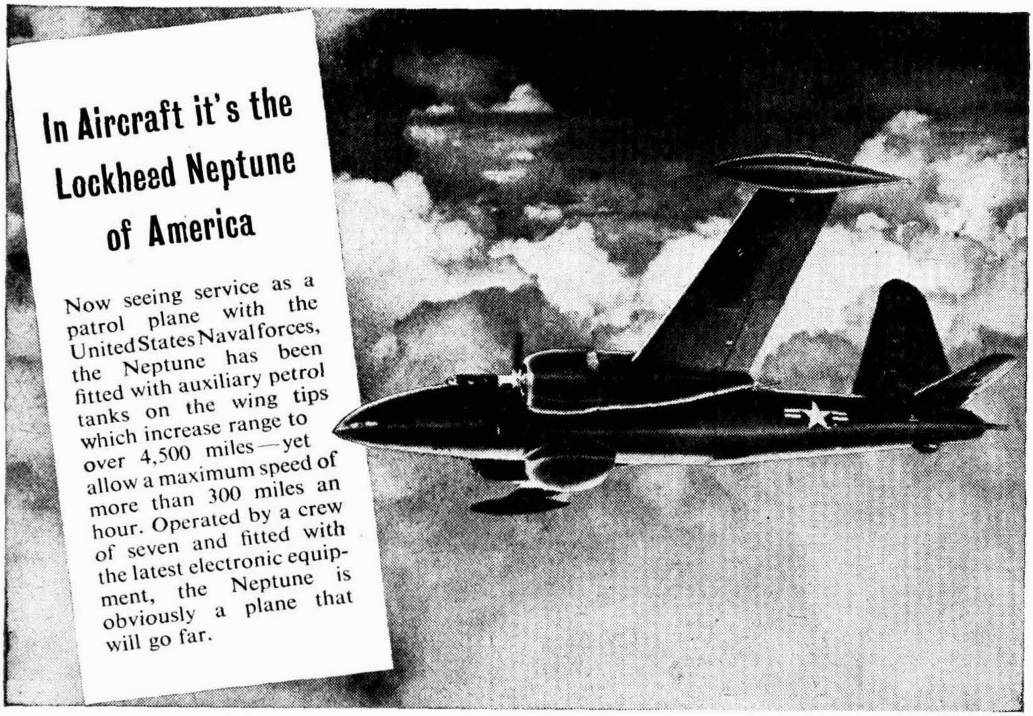
Change of Name

The name of the parent company of the Brush Group has now been changed to The Brush Group Ltd., from The Brush Electrical Engineering Co. Ltd. The name Brush Electrical Engineering Co. Ltd., has been given to the group's subsidiary company managing the factory at Loughborough.

Oil Survey Aircraft

A specially equipped aircraft is to be used in an oil survey of the Eucla Basin, in far-western South Australia. The survey will be made by the Federal Bureau of Mineral Resources.

A GREAT RANGE



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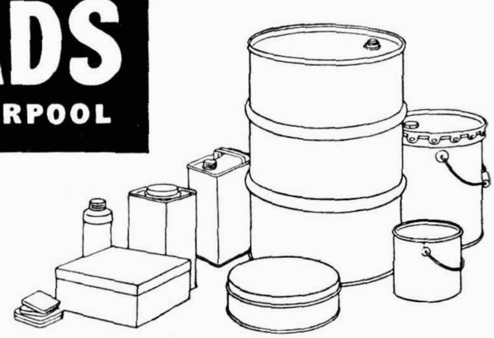

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Chemical & Allied Stocks & Shares

THE flow of higher dividend and share bonus news has kept stock markets strong and active with further gains in many well-known shares, some of which reached new high levels. There is now a general movement to reverse the very conservative dividend policy which has ruled since the war and to pay out a little more to shareholders. By far the greater part of net profits is still placed to reserves, and the higher dividends are fully justified, although it is realised that in future they must be expected to fluctuate more closely with the financial results from year to year.

I.C.I. An All-time High

Chemical and kindred shares have been prominently active with Imperial Chemical touching the all-time high level of 63s. in response to the annual report. The company's ingenious profit-sharing scheme, which will make workers shareholders as well, attracted widespread attention, and is regarded as an important indication on confidence in the outlook. Laporte 5s. shares have been active around 17s. 6d. on higher dividend hopes, Albright & Wilson 5s. shares at 25s. 9d. responded to the financial results, Monsanto were also influenced by the past year's results and these 5s. shares changed hands around 27s. Reichhold 5s. shares were up to 8s. 10½d. on the past year's figures, Yorkshire Dyeware & Chemical 5s. shares strengthened to 9s. 6d., Fisons have been good at 48s. 6d., British Chrome Chemicals 5s. shares were 17s. 9d., Hickson & Welch 10s. shares 13s. 6d.xd and British Glues & Chemicals have been active up to 15s. 3d.

There was considerable activity in William Blythe 3s. shares which changed hands up to 16s. 3d. at one time, before easing to 15s. 9d. Under the influence of the financial results, Greeff-Chemicals Holdings 5s. shares were 22s.xd, while Brotherton 10s. shares were 26s. and Boake Roberts 5s. shares 13s. 9d. Shares of plastics companies were also more active and mostly higher on balance with British Xylonite a good feature up to 41s.xd. Bakelite 10s. shares, however, have not kept best levels at 26s. 6d. British Industrial Plastics 2s. shares were 6s. 6d.

In other directions, the 4s. units of the Distillers Co. showed steadiness at 21s. on market hopes of an increase in the forthcoming dividend. Continued hopes of a possible hint of a share bonus at the annual meeting on Monday next kept Unilever lively up to the new high level of 76s. 6d., while Unilever NV were up to 78s. 3d. on talk that application may be made for listing the shares on the New York Stock Exchange. Elsewhere, Borax Consolidated have been firm at 51s. 6d. and Turner & Newall were lively, but after reaching 86s. eased to 83s. 6d. Triplex Glass 10s. shares moved higher at 26s. 3d. on the possibility of an increased dividend. Coalite & Chemical 2s. shares have changed hands around 2s. 9d.

Boots Drug 5s. shares were 24s. 7½d.xd, following the bigger dividend. Glaxo 10s. shares were 50s. and British Drug 5s. shares were 10s. 3d. helped by the higher distribution. Guest Keen have not kept best levels but were active around 57s. 7½d. in the belief that acquisition of the company's former denationalised steel interests will not require the raising of additional capital. United Glass Bottle were 69s. 3d. Oils have been prominently active with Anglo-Iranian up to the new all-time level of £12¼, before easing to £12⅛. The market is continuing to assume that Anglo-Iranian will distribute a share bonus. This hope is based on the belief that assets may be revalued, but the latter would probably have to await a Persian oil settlement. Shell rose to £5 18s. 9d., but later eased slightly on the chairman's warning of growing competition in the oil industry.

'Nationalise I.C.I.'

AT the annual conference of the Socialist Medical Association in London on 23 May, a resolution was passed urging the Labour Party to concentrate on the planning of ways and means most appropriate for taking over Imperial Chemical Industries Ltd. into public ownership. Another resolution demanded nationalisation of the drug industry.

One of the delegates said I.C.I. had introduced a new principle of giving their workers bonuses which ultimately could be converted into shares, and declared that the object was to antagonise the workers against the project of nationalising the industry.

CLASSIFIED ADVERTISEMENTS

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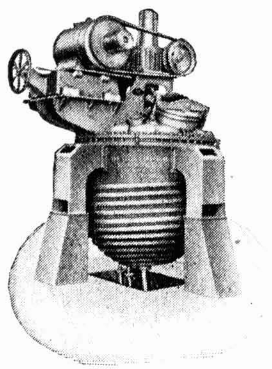

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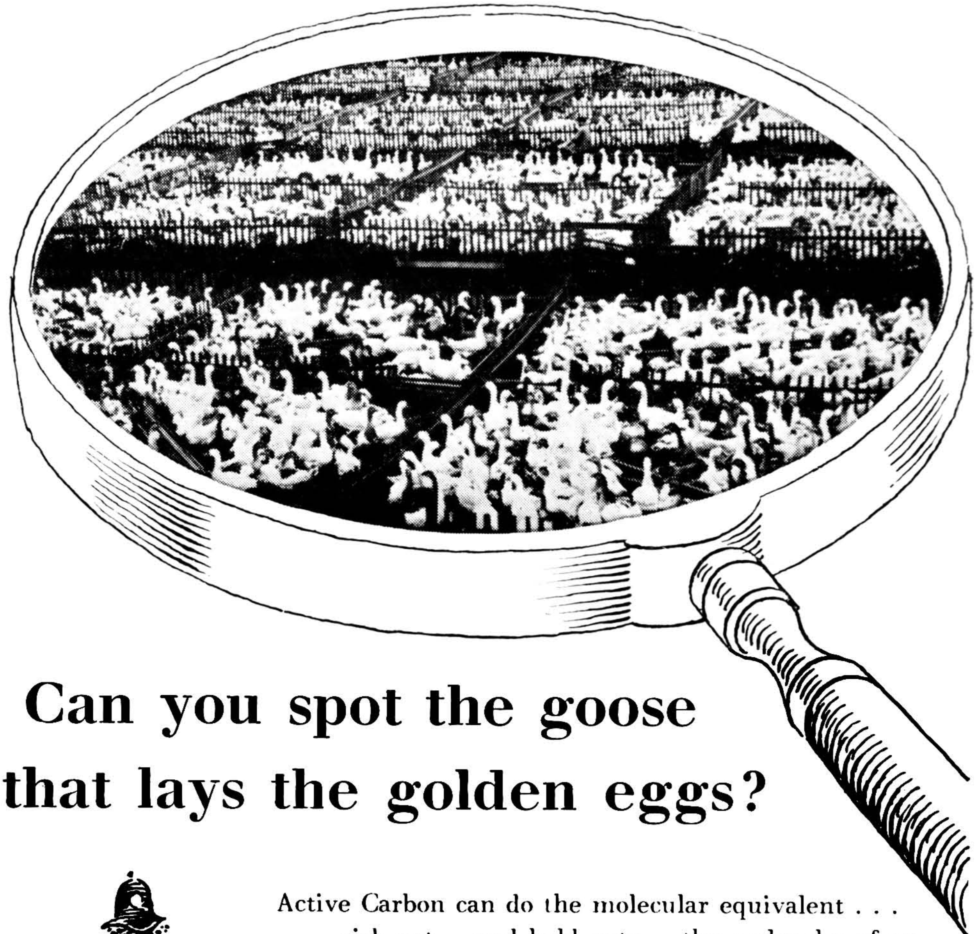

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