THE Chemical Age

VOL. LXXIII 16 JULY 1955 No. 1879

Volume LXXIII
Number 1879

The Chemical Age

Established 1919

The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

Telephone : FLEET STREET 3212 (26 *lines*) *Telegrams :* ALLANGAS · FLEET · LONDON

CONTENTS . 16 JULY 1955

Director : N. B. Livingstone Wallace, B.Sc.

Editor : E. Arnold Running *Manager : A. Walsby*

MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham
Phone : Midland 0784/5

SCOTTISH OFFICE: 116, Hope Street, Glasgow, C.2.
Phone : Central 3954/5

LEEDS OFFICE: Martins Bank Chambers Park Row, Leeds, 1
Phone : Leeds 22601

SINGLE COPY 1/- (BY POST 1/3) ANNUAL SUBSCRIPTION 42/-

Restrictive Practices

PUBLIC opinion has become restive about monopolies, trade price agreements, etc. Whether this restiveness is entirely a natural product or whether it has been stimulated by a section of the daily Press is any man's guess. The pace at which the Monopolies Commission has been investigating specific areas of trade and industry has also been increasingly criticised by the Labour Party; but whether that pace would have been any faster had the Labour Party remained in power is again anybody's speculation. Commissions once they have been set up in this country have a sound tradition of working calmly and without regard to political pressures; also, it is clear from the reports that the Commission has so far made that all opinions reached are by no means unanimous. The truth of the matter is that it is often exceedingly difficult to decide whether restrictive arrangements and their like are in the public interest or against it. To generalise on the subject turns this difficulty of judgment into an impossibility. Unhappily it is all too easy for critics to say that slow action or indecision represent a sop for big business interests.

A total abolition of restrictive practices in business would bring about complete freedom of competition. Ideally, of course, this complete freedom should be the mainspring of progress. However, those who hanker for it must appreciate that the impact should be widespread, not merely confined to a single aspect of industrial organisation. If a shop-keeper or small trader should be free to sell standard articles at any price he likes and without regard to the price fixed and advertised by the manufacturer, shops should also be allowed to remain open as long as they wish. Much of our social progress in this century has come about by the legal enforcement of restrictive practice upon conditions of trading, employment, etc., and there cannot be many people of sense who do not regard these changes as advances in the public interest. There are innumerable forms of restrictive practice in trades unions, some of them obsolete in our present state of full employment, all of them aimed in their origins at ensuring that one worker does not 'sell' his efforts more cheaply than another. Freedom is a great word and it can always rattle cheers on a reforming platform, but there is no way of combining totality of freedom with an organised society.

What is to be called the 'public interest'? A shopkeeper who undercuts the fixed selling price of some standard product might be regarded as acting in the public interest of consumers; his own motive is, of course, to secure more than his natural share of trade at the cost of working for a lower profit margin per unit sale. But if the profit margin has been fixed fairly, so that sales of the article in question carry their proper share of shopkeeping charges, the practice of under-cutting is

not in the interests of other shopkeepers. Inasmuch as these other shopkeepers maintain a generally good service for their local customers, stocking a variety of goods besides the highly popular lines whose price or prices are cut, is it in the public interest that their trading security should be threatened? Is it in the public interest that employment at these other shops should be threatened? Retail price-cutting makes an easy appeal at a time when the cost of living is high—if A can sell at a lower price, why cannot B and C and D, etc.? But in so many cases it will be found that A is concentrating upon heavy sales of a few widely-required articles, and not bothering to offer the full range of supplies or services that B, C, and D regard as their proper function. In the long run not even the interest of the consumer is advanced by price-cutting.

Should an industry composed of various companies arrange to sell similar classes of products at like prices, or at prices not below an agreed minimum? Again it is easy to condemn this practice—at first thought it has all the appearance of a conspiracy against the buyer. Yet *if the prices have been fairly fixed*, such a practice is as much in the public interest as it is against it. Manufacturing plant must be steadily maintained and replaced if an industry is to remain efficient; research costs for developing improved products must be met out of trading profits. A price-cutting manufacturer may be allowing no room in his profit margin for plant or research expenditure of any kind, yet his activities—possibly confined to convenient areas of low-cost operation close to his works—can cause serious trading fluctuations for manufacturers whose outlook is longer term and much more in the genuine interest of the public as a whole, of the public as worker, tax payer, and national consumer. Furthermore, let the argument in support of price cutting be unrestricted so that for the same class of article a wide variety of prices are asked in different areas. Buyers may well enjoy many short-term advantages, but the long-term situation will require an excessive employment of commercial or distributional labour, all of it concentrating upon a single factor of transaction, price; in these days of high staffing costs, there is an appreciable economy in systems of flat prices covering the whole of the country or at least large areas. Any agreement between competitive manufacturers that leads to the support of some minimum level of price must be judged on its detailed merits; it cannot be fairly condemned by a general principle. This is not said to defend all such agreements; there may indeed be some which go a good deal further than is necessary for orderly distribution. All that is suggested is that this type of restrictive practice, perhaps the most controversial, must be judged case by case, circumstances by circumstances, that the approach of judgment must be impartial. The Monopolies Commission was created with that purpose. Those who regard its function as one of sensational exposure and high condemnation are in fact weakening the Commission's potential contribution to an improved internal economy.

Last month the Federation of British Industries published a brief statement on this subject ('Restrictive Practices and the Public Interest,' 16 pp. 1s. 3d.). The FBI represents manufacturers that are members of trade associations and manufacturers who are not, and it is basically pledged to the operation of 'competitive free enterprise'. The pros and cons of restrictive practices within industries and trades are objectively set out. It is doubtful whether any completely disinterested body could have reached a fairer conclusion than that of FBI. 'The Federation therefore recognises that independent investigation of particular cases is the right way of approach, and that a tribunal such as the Monopolies Commission provides a sensible method of arriving at judgments of the relation between restrictive practices and the public interest in each case. If the Commission's reports clearly explain the reasons for its conclusions it can also guide industry in general to an understanding of the circumstances in which a practice is likely to be regarded on balance as consonant with, or contrary to, the public interest. In this way the disruption and damage that would follow from any action based on generalisations may be avoided and the true interests alike of productive industry and the nation may be furthered.'

Notes & Comments

Canada's Continued Progress

FOR all manufacturing industry in Canada 1954 showed a 3 per cent fall in gross sales value; but for chemicals there was a rise of 4.5 per cent. The main gains on the chemical front were for heavy chemicals, primary plastics, and the 'miscellaneous' class, each of which rose by 12 to 13 per cent. Fertilisers fell by 7 per cent, and paints, coal tar distillation products, and vegetable oils also dropped back. The total value of Canada's 1954 production of chemicals and allied products was $921,000,000, an all-time record. This is almost twice the figure for 1945 and over seven times the figure for 1930-35. On the other hand, Canada's imports of chemicals in 1954 were almost exactly the same in value as in 1953; a steady level of $220,000,000 seems to have been reached. This import figure still exceeds the figure for Canada's chemical exports though the 1954 increase in exports has helped to narrow the gap; it was a gap of about $80,000,000 in 1953 and only $60,000,000 in 1954.

Grumbling Unjustified

MOST of Canada's chemical expansion is still in the primary field—secondary chemical industry is handicapped in development because the essential market volume for economic output rates cannot be assured. The home market is uncertain, the overseas market are not easily accessible. This relatively slow pace of secondary product development is undoubtedly fostering a good deal of impatience among Canadian industrialists, and there is a growing demand for tariffs to protect the home market. It is not unnatural for Canada to feel that her export-import trading with other countries should be in a *quid-pro-quo* spirit. At any rate in this respect, Canada might well note that in 1954 her chemical export trade with the United Kingdom rose from $8,600,000 to $15,700,000; her chemical purchases from us remained about the same as in 1953, round about the $18,500,000 level. By contrast, Canada's chemical sales to the US showed little expansion at $85,900,000 while her imports from the US were still of the order of $190,000,000. Admittedly it is geography that dictates the main trends in Canada's international trade whether outwards or inwards; even so, it would seem that Canada has little now to grumble about so far as two-way chemical trade with the United Kingdom is concerned.

Water Chlorination Problem

AN INTERESTING paper (J. K. Johannesson, *N.Z. Journal of Science & Technology*, 1955, **36B**, 600) deals with a problem in water treatment by chlorination — the effect of naturally occurring bromide — which most investigations seem to have ignored entirely. Yet sea-water, often chlorinated when used for swimming-baths in coastal places, can contain as much as 60-70 ppm. of bromine, which is very much higher that the bromine content of freshwater supplies in Wellington, New Zealand, the cause of these new investigations. The addition of chlorine to bromide-containing water causes the release of bromine, $Cl_2 + 2Br' \rightarrow 2Cl' + Br_2$. The free bromine may form a hypobromite, which will later react with ammoniacal matter in the bath water to form an unstable bromamine. If, however, the water contains ammoniacal matter at the time of chlorination a mixture of chloramines and bromamine will be formed, and this mixture will have a much slower breakdown, i.e., will be more durably bactericidal. In other words, bromide presence in water leads to anomalous results with chlorination. The *o*-tolidine test for chlorine residues is also affected; indeed, it is said in the paper that 'conventional methods of analysis are inadequate.' Determinations in this particular piece of research were made by ultra-violet absorption spectra.

Feeding Plants Through Leaves

IN recent years there has been a good deal of discussion about feeding plants by applying solutions of nutrients to their foliage. A generation or so ago it was not believed that plants could absorb their mineral foods in this way, but trace-nutrient research showed that this in fact could occur; later on, it was also shown that the major nutrients like nitrogen and phosphate could also be introduced into plant systems by foliar intake. As a practical method of feeding crops, however, the spraying of nutrient solutions seems to be losing ground. The enthusiasm of novelty has melted in the face of realistic investigations. In two important reports of 1955, the latest annual report from Rothamsted and the Silver Jubilee Report from the Sports Turf Research Institute, special papers have surveyed the pros and cons of foliar spray application, and in each case the same conclusion is reached—that the method offers little advantage over the conventional method of solid fertiliser dressings. Neither for lawns nor for agricultural crops are there many circumstances when nutrient spraying is likely to be more effective or more economical.

Extent Negligible

BOTH discussions insist upon a distinction between genuine foliar spraying and irrigation feeding. When a large volume of water is applied to a crop, as in irrigation, the addition of soluble nutrients is not an example of foliar application, although some growers have made this claim. In such cases the overwhelming majority of the nutrient supply is carried into the soil by the water and the plants are fed in the usual manner, through their roots. The water acts simply as a carrier and the extent to which feeding through the leaf system occurs is negligible. For the present at any rate it seems improbable that solution spraying will compete at all noticeably with the drilling or broadcasting of solid fertilisers. These verdicts from independent research will suit the fertiliser industry which has invested large sums of capital in the past 10 years in modern plant to produce better-conditioned solid fertilisers.

By-Law Would Be 'Despotic'

AT a public inquiry in Glasgow, Imperial Chemical Industries and the Federation of British Industries described one of Glasgow Corporation's proposed by-laws as 'despotic, tyrannical, and arbitrary, leaving industrial firms with no right of appeal'. The by-law would require industrial firms to re-use water after it had been used for cooling purposes or process work.

Mr. A. M. Johnston, advocate, the commissioner appointed by the Secretary of State for Scotland to hold the inquiry, said it appeared to him that the by-law gave the Corporation power to dictate to industry. If the Corporation laid down certain requirements in their by-laws nobody could question them.

Mr. E. A. Jamieson, the Corporation's water distribution engineer, said that they were seeking to impose the by-law to prevent 'undue consumption' of water. He maintained that there were certain purposes, such as washing down premises, for which processed water could be used again. He did not agree that the by-law would be impracticable and expensive to carry out.

Mr. J. S. Evans, representing I.C.I. and the FBI, suggested that the word 'process' should be deleted from the by-law. He said that the re-use of processed water was a matter of extreme technical difficulty and should be left to the judgment of the specialists in the particular industry. In process work, he added, water became substantially contaminated, and only in exceptional cases would it be suitable for re-use. Water that had passed through a cooling process changed in nature and composition, and in his submission the Corporation were not entitled to make a by-law dealing with water that had already passed through the supply system.

At the end of the inquiry Mr. Johnston said that he would report to the Secretary of State, who would announce a decision.

IG Farben Successors

Details of New Expansion Schemes Announced

DETAILS of new expansion schemes to be carried out in the next few years were announced at the general meetings of the principal IG Farben successors held in the past three weeks. Farbenfabriken Bayer AG has prepared definite investment projects involving a total capital expenditure of about DM400,000,000 which are to be virtually completed by the end of 1957. Enlarged production facilities for heavy chemicals are regarded as particularly urgent. The sulphuric acid capacity is to be raised from the present level of 460,000 metric tons (SO_3) a year to about 600,000 tons. The chlorine-alkali capacity at Leverkusen, now permitting an annual output of 80,000 tons of chlorine and 90,000 tons of soda lye, is to be increased to 100,000 and 110,000 tons respectively. The production of chromium compounds, fluoric acid and fluorides, iron oxides and activated carbon is also to be increased.

Among synthetic fibres special attention is to be paid to the fully synthetic products on perlon and poly-acryl nitrile basis. Dralon (acrylic fibre) has proved so successful on the pilot scale that a large plant is to be erected now that the company has taken over the patents and rights in this field of Cassella Farbwerke AG. In the field of photographic film Farbenfabriken Bayer AG is still faced with bottlenecks, largely as a result of an exceptional increase in the demand for colour film.

Oil Cracking Plant

The oil cracking plant at Leverkusen is about to start operations and will treat some 600 tons of crude a month. A gas separation unit to process pure olefines will be added in the autumn, and provide several hundred tons a month of hydrocarbons for technical experiments. The site at Leverkusen, where the principal works of Farbenfabriken Bayer AG is situated, is now completely built up, and most new plants will in future be erected at the branch works at Uerdingen and Dormagen where new ancillary works—power stations, water works, repair workshops, etc.—are also to be set up.

Badische Anilin- und Sodafabrik AG intends to use the whole proceeds of the capital increase by DM169,900,000 for new chemical plant, especially in the fields of heavy chemicals, dyestuffs and textile chemicals, and raw materials for the plastics industry. The expansion of the fertiliser industry is considered to be essentially completed. The new investments in the dye sector are expected to contribute to a reduction of producing costs but the company used the opportunity of the shareholders' meeting for warning the Federal Government against 'premature curtailment of the German export promotion measures'.

Höchst's Expansion Programme

Farbwerke Höchst AG mentioned in the annual report for 1954 that large capital expenditure is required for production capacity for chlorine, sulphuric acid, carbide and phosphorus. At the general meeting it was stated that Farbwerke Höchst AG is about to take over Anorgana GmbH, with works at Gendorf, Upper Bavaria, a company which formed part of the IG Farben combine and was temporarily in the hands of the Bavarian State. Among finished and semi-finished products, plastics, fully synthetic fibres, foils and materials for lacquer manufacture require additional production capacity. Farbwerke Höchst AG is believed to take an active interest in the development of atomic energy for industrial purposes, and this impression was confirmed by remarks made at the meeting.

The affiliation of Anorgana GmbH to the Farbwerke Höchst group and the participation of the three big IG Farben successors in the newly formed Buna GmbH (half of the latter's capital is provided by Chemische Werke Hüls AG, the other half in equal parts by Farbenfabriken Bayer, Farbwerke Höchst and BASF) draw attention to the tendency for co-operation between West German chemical firms, especially those which formerly belonged to the IG Farben combine. In the same direction points the transfer of the poly-acryl nitrile interest of Cassella Farbwerke AG to Farbenfabriken Bayer. The Cassella management stated in explanation of this move that it had saved the company DM15,000,000 capital which could and would be used for other purposes, presumably in the plastics field. Here

and in the Buna project the principal reason for interesting the bigger IG successors in new ventures seems to be lack of financial resources on the part of the smaller successors who therefore find it advisable to divest themselves of part of the financial responsibility for new productions.

All three main successors however went out of their way at the meetings to stress that it was not intended to combine the separated groups now that the Federal Republic has regained its sovereignty and the IG Farben deconcentration could be revoked. It is felt in the light of experience over a number of years that the existing three companies are quite large enough to cope with present-day exigencies and stand up to foreign competition. Co-operation and co-ordination in the technical sphere however are envisaged, apparently on an increasing scale.

In the first half of 1955 all three IG successors scored substantial gains in home and foreign sales. BASF sales rose by 20 per cent, compared with the first half of 1954, and the share of exports advanced to more than 40 per cent. Farbenfabriken Bayer increased their sales in the first half of this year by 17 per cent, with exports rising to 38.4 per cent of total sales. Farbwerke Höchst report an increase in sales by about 10 per cent and might have achieved a greater rise but for lack of spare production capacity. Erection of new plant and extensions remains the most urgent task of all three companies.

The House of Benn

Publishers Celebrate 75th Anniversary

THE month of July is an important one in the history of the House of Benn, which publishes THE CHEMICAL AGE, for it marks its 75th anniversary. It was on 2 July, 1880, that John Williams Benn (later Sir John), started to publish *The Cabinet Maker*, one of our sister journals, which is appropriately drawing attention to the anniversary with a separate publication under the title 'Furniture and Furnishings, 1880-1955,' which is being issued free to its regular readers. This publication will review in some detail the important developments which have occurred in the furniture trade during the past 75 years.

The Cabinet Maker in the 2 July issue also published an article providing an intimate picture of the early years of the paper by Sir John Benn, Bt., grandson of the founder. In the same issue are reproduced some of the messages of congratulation which *The Cabinet Maker* has received from leaders of the furniture trade on attaining its 75th birthday. Sir Herman Lebus, who recalls meeting the journal's founder, pays *The Cabinet Maker* the compliment that it 'has grown in outlook with the industry during its period of development, and this in itself is a tribute to its awareness of the needs of the industry and its ability to meet them.'

Mr. MacAlister Bexon, C.B.E., honorary president of the British Furniture Manufacturers' Federated Associations, also in a congratulatory message, points out that *The Cabinet Maker* was the journal on which the House of Benn was founded, and adds '. . . and I am sure that the growth of the business, to be one of the leading publishers of trade journals, has been in no small measure due to the journalistic standards set by *The Cabinet Maker* to those journals which followed it.'

Increasing Canadian Research

INCREASING chemical research will be undertaken in Canada as current trends call for the development of products specially adapted to the country's economy, Dr. Roger Gaudry, new president of the Chemical Institute of Canada, recently predicted.

Dr. Gaudry, who is representing the Institute at the International Union of Pure & Applied Chemistry Convention which starts in Zurich next Thursday, 21 July, and later at the Third International Biochemistry Congress in Brussels, said that essential Canadian research stemmed from an expanding domestic chemical market, and from the need arising purely out of Canadian needs. 'For a long time we have considered research a matter of secondary importance, but the situation is changing rapidly', he said.

Dr. Gaudry stressed that Canadian progress must be along Canadian lines, and not a copy of the US. He considered that the Canadian chemical industry is in the process of acquiring a more diversified production. Some experts, he said, believe that Canada's chemical consumption will be doubled by 1975. Prohibitive tariffs are tending to deny Canadian chemical manufacturers access to foreign markets.

Polyester Resins

Survey of Methods & Applications

THE use of castor oil maleate or 1 : 3 butylene glycol maleate for bonding abrasive particles was described in an IG patent filed in Germany as long ago as 1933, in which it was stated that the rate of setting of the resin could be accelerated by the addition of styrene or benzoyl peroxide. This may well have been the first reference in the literature to the group of materials known as polyesters, which are formed by copolymerising material such as a glycol maleate in the actual application with a monomer such as styrene or a methacrylic acid ester.

It was about 1936 that chemists in the United States first turned their attention to polyesters. By the outbreak of the second world war there had already been considerable patent activity relating to the preparation of different modifications of unsaturated polyesters and their copolymerisation with various monomers. Subsequent patents covered additions of inhibitors to stabilise the polyester-monomer solutions and of 'accelerators' to shorten the period required for curing.

A simple unsaturated polyester is obtained by reacting together a glycol such as ethylene or diethylene glycol with maleic anhydride at 185-195°C for about three hours in an inert atmosphere. The resin so produced has limited compatability with styrene and other monomeric materials. The addition of benzoyl peroxide to a solution of this polyester in, for example, styrene, is followed by very rapid gelation, even at room temperature, resulting in a hard, brittle copolymer.

Improved Mechanical Properties

In order to obtain improved mechanical properties in the end product, the polyester must be suitably modified. This can be effected by incorporating in the reaction mixture higher monohydric alcohols such as decyl alcohol or polyhyrdric alcohols such as castor oil. Alternatively, the basic material may be modified by the inclusion of higher aliphatic acids or other saturated polycarboxlyic acids in the mixture. By choosing a suitable alcohol or acid it is possible to obtain modified polyesters which are compatable over a wide range of compositions with various monomers and which have the optimum mechanical properties for a particular application.

The longer the chain length of the glycol, the greater is the flexibility of the cured copolymer. The introduction of a saturated polycarboxylic acid, such as adipic or sebacic acid, also imparts improved flexibility and at the same time reduces the rate of cure. The longer the chain length of the aliphatic dicarboxylic acid, the greater is its internal plasticising effect. Thus sebacic acid [$HOOC(CH_2)_8COOH$] will impart a greater degree of flexibility than the same quantity of adipic acid [$HOOC(CH_2)_4COOH$].

Water-Soluble Polyesters

By using as the polyhydric alcohol a mixture of higher ethylene glycols containing predominantly heptaethylene glycol, polyesters which are water-soluble can be obtained, this property being derived from the oxygen bridges in the chain. On the other, hand, maximum water resistance is imparted to the end copolymer by eliminating as many oxygen bridges as possible from the polyester.

Further possibilities are presented by replacing maleic acid or anhydride in the reaction mixture by any unsaturated polycarboxylic acid.

The range of materials obtainable by modifying the polyester to suit particular applications can also be extended by varying the monomer and its proportion to the unsaturated polyester with which it is copolymerised.

Because of its relatively low cost and its outstanding electrical properties, styrene is the monomer most commonly selected for general use with unsaturated polyesters. By using methyl acrylate as a co-monomer, however, much softer copolymers are obtained. The mechanical and electrical properties of the copolymer are also very greatly influenced by the proportion of monomer employed.

Polyester resins can be formulated for curing either in the cold or at moderately high temperatures. Benzoyl peroxide, added to the reactive resin-monomer mix in the

proportion of 0.5-2.0 per cent, is an efficient general-purpose catalyst for hot curing, but other peroxides are also suitable. Methyl ethyl ketone peroxide, for example, may be employed as a catalyst when cold curing is desired.

When using a cold curing catalyst it is usual to add an accelerator to the reactive resin-monomer mix in order to cut down the cure time and also to assist in preventing after-tack. Among the accelerators used in the production of polyesters are cobalt naphthenate, dimethyl aniline, and lauryl mercaptan. In general, each accelerator gives the best results with a specific catalyst; dimethyl aniline, for example, is a good accelerator when used in conjunction with benzoyl peroxide. By altering the percentages of catalyst and accelerator added to the mix, the gel time can be controlled within very wide limits.

Various types of resins have been developed commercially to suit different needs. Low viscosity, highly reactive resins with high volume change during cure are usually employed when cured parts possessing rigidity and dimensional stability are desired.

For casting techniques, however, it is preferable to use low viscosity moderately reactive resins, with not such a high volume change during cure. A low viscosity, flexible type of resin is also available, its effect being to cut down brittleness and impart greater toughness to the product. For hand lay-up work there is a choice of high and medium viscosity types of resins, the former type being characterised by slow impregnation but quite a high resin pick-up, while the latter gives relatively fast impregnation but the resin pick-up is lower.

Typical Physical Properties of Three Basic Types of Polyester Resin/Glass Fibre Laminates

Property	Typical Values		
Type of Polyester Resin (see below)	Type 1	Type 2	Type 3
Flexural strength (lb./in.²)	← 45,000 to 50,000 →		
Young's modulus in flexure (lb./in.²)	3.0×10^6	2.2×10^6	2.6×10^6
Specific gravity	1.75	1.74	1.76
Power factor at 800 c/s.	0.02	0.012	0.012
Power factor at 1 Mc/s.	0.023	0.024	0.02
Dielectric constant at 800 c/s.	4.7	4.35	4.2
Dielectric constant at 1 Mc/s.	5.0	4.16	4.3
Volume resistivity at 20° C (ohm-cm.)	5×10^{14}	1.4×10^{13}	6×10^{14}
Water absorption, 24 hrs. at 20° C (mg) (BS 1137)	25	5	12

The above physical properties were obtained on polyester/glass fibre laminates approximately ⅛ in. thick, using 0.007 in. plain weave continuous filament glasscloth. The polyester resin content was approximately 40 per cent. Three types of polyester resin were used :—

Type 1. Polyester Resin.—Low Viscosity Cellobond Polyester Resin for general applications including roofing.

Type 2. Polyester Resin.—Medium Viscosity Cellobond Polyester Resin for hot-set preform moulding and general wet layup laminating including gel coating.

Type 3. Polyester Resin.—High Viscosity Cellobond Polyester Resin for fast cold setting particularly where retention of strength at elevated temperature is important.

(*The above data is by courtesy of British Resin Products Limited.*)

If it is desired to prolong the pot life of the resin, this can be done by adding a stabiliser such as tertiary butyl catechol to the mix.

It will be evident from these general observations that in formulating polyester resins, immense scope exists for tailoring the resin to suit a given end use. In formulating a composition for a new application, the first criteria are the mechanical and electrical properties required in the copolymer, which will determine the composition of the unsaturated polyester, the selection of the monomer, and the proportion of monomer to polyester. The addition of any further components to the mix will then be governed by such considerations as the shelf life of the composition after the addition of the catalyst and the time and temperature conditions for curing.

All normal types of polyester burn and will continue to do so when the cause of ignition is removed. Resins may be so treated, however, that the finished laminates will only support combustion while in actual contact with the flame source and are thus self-extinguishing. This property is usually imparted by the incorporation of chlorinated bodies in the resin formulation.

Ordinary polyesters are incapable of withstanding temperatures higher than about 150°C, at best. Heat resistance can be considerably improved, however, by the incorporation of a heat stable monomer such as triallyl cyanurate in the mix. Resins now available in the United Kingdom will withstand temperatures up to 200°C.

Resins used for constructional purposes require to be reinforced by a fibrous material. Though a variety of natural and

synthetic fibres could be used for this purpose, the material most extensively employed for polyester reinforcement is fibrous glass, which is available in several forms. The composition of the glass fibres is carefully controlled. The filaments have a tensile strength of about 250,000 p.s.i. and are dimensionally stable. They are incombustible and withstand temperatures up to 600°C. They also have high resistance to weathering and to many forms of chemical attack.

Woven glass fabrics have been used as the reinforcement in most of the articles so far manufactured in the United Kingdom from polyester/glass. Chopped strand mat is much cheaper than woven fabric and is a suitable reinforcement for many applications where the outstanding strength provided by woven cloth reinforcement is not called for. A third alternative is roving, which is the least costly method of reinforcement. It consists of 6, 12, or 60 strands wound parallel, i.e., with no twist, and a single strand with a twist of 1 turn per inch.

The bond between the reinforcement and the resin is improved by applying to the glass a surface dressing so formulated that part has an affinity for the glass and the remainder for the resin. Vinyltrichlorsilane is a good example of a dressing suitable for this type of application; the chlorsilane part of the molecule has an affinity for the glass while the vinyl group can co-polymerise with the resin.

Glass Reinforcement

Polyesters reinforced with fibrous glass have a higher strength/weight ratio than mild steel, aluminium or magnesium and can replace steel at one-third the weight. Their impact resistance exceeds that of most metals, whether judged on a straight weight or equal thickness basis.

Inert fillers are used to extend the resin, primarily in order to reduce the cost of the end product, but also for technical reasons. Smoother and more uniform surfaces are obtained when reinforced polyesters are filled. The filled resin, because of its higher viscosity, is less inclined to flow during moulding and wasting is thus reduced. A third advantage is the favourable effect on shrinkage of the resin during polymerisation, which can be controlled by the use of inert fillers.

Among the many materials which can be used as inert fillers are precipitated chalk, china clay, lithopone, silica powder, talcs, whiting, barium sulphate, alumina, celite, cork powder, wood flour, and coconut shell flour. Inert fillers with low absorption are desirable, since high loadings can be utilised. Care is required when selecting a filler to ensure that it does not adversely affect the cure characteristics of the resin. Consideration must also be given to the conditions imposed by the end use, especially in applications where resistance to chemicals or corrosion is required.

Processing Techniques

Various techniques have been developed for converting the resin into the finished product, among the more important being casting, hand lay-up, pre-forming and moulding, dough mixing and moulding, and laminating.

Casting is carried out with resins of low reactivity, which gel with a low exotherm, resulting in minimum shrinkage. Among the principal applications of this technique are the embedding of specimens and the potting of delicate electrical or electronic components.

The hand lay-up method allows extremely complicated shapes to be successfully fabricated and can also be used for the production of articles of almost unlimited size. This method has the advantage of eliminating the need for a large capital outlay on plant and equipment, but is costly in time and labour. Where large-scale production is contemplated it is therefore tending to be superseded, more especially in the United States, by pre-forming and moulding, which requires more expensive equipment, but reduces the curing time to a matter of three or four minutes in a hot press. Dough mixing and moulding also lends itself to high-volume production.

Laminating is carried out in a low-pressure compression press, containing tools of very large surface area. The polyester resin is poured on to the fibrous material, which is laid in the female tool, and the article is moulded in the usual way.

Polyesters can be coloured, if desired, by the addition of dyes or pigments. The colouring materials must be carefully selected, however, to ensure that the cure characteristics are not affected. A possible objection to pigmentation is the difficulty

which might be experienced in matching the colour exactly when repairs or replacements are desired. To get identical results it would be necessary to use the pigment originally employed and to apply it under precisely the right conditions. The problem is further complicated by the difficulty of obtaining colouring materials that do not fade on exposure to sunlight and weathering.

In contrast to some other sections of the plastics industry, which at one time were adversely affected by the activities of back-yard factories, the development of polyesters has at all times been on very sound lines. This is perhaps attributable to the fact that polyesters are constructional materials, which are of interest mainly to large companies with an engineering background.

So far as the technical development of polyesters is concerned the United Kingdom is well advanced, but the range of resins at present available commercially is to some extent restricted by the necessity for importing certain raw materials from other countries.

Britain Lags Behind

Because of the smaller domestic market, Britain probably lags behind the United States in the development of applications. The stage has been reached, however, when the potentials of polyesters have been very thoroughly tested and this important group of materials is being used commercially on an increasing scale. Production of polyester resins has approximately doubled in the past twelve months.

At present the main applications are in the production of curved panels for buses, moulded boats, and aircraft and Ministry of Supply uses, but the many other articles now being made in polyester glass include sports car bodies, radar housings and screens for aircraft, transparent corrugated sheeting for roofs, protective aprons for machine shop workers, artificial limbs, light-weight luggage, and piping for refrigeration.

The chemical industry still remains a new and difficult field for the application of these types of polyesters. Although the resins are proof against various types of acid in dilute form, both the polyester and the glass reinforcement are susceptible to certain strong chemicals. Much work is being done on the development of polyesters with improved resistance to chemical attack.

It was reported last year that a number of United States companies were interested in the possibilities of glass reinforced polyester construction for water cooling towers. The Monsanto Chemical Co. is already building a cooling tower of polyester glass, the main advantage being the appreciable weight reduction compared with wood or steel constructions.

Coal Bill Need Not Rise

Advice by Chairman of NIFES

COMMENTING on the coal price increase, Sir Leslie Hollinghurst, Chairman of the National Industrial Fuel Efficiency Service, said that this was a challenge that industry could afford to accept. At first light, an increase of 18 per cent on industry's fuel bill, now standing at £200-£250 millions for coal alone, might seem a serious threat to our power to compete in the export markets of the world. But NIFES had found that there were few works in general industry where fuel consumption could not be reduced by 15 to 20 per cent. The increased costs of fuel could, therefore, be offset by savings.

In order to help industry, NIFES was increasing its engineering staff and was now ready to accept additional work in every area of the country.

Sir Leslie said that he had an urgent message for all industrial concerns. It was 'Make sure that your stokers and boiler operators take advantage of the facilities for training. See to it that every boiler fireman trains for the City and Guilds Certificate. This is the surest way to quick savings'.

The training was readily available. Between now and September all firms should enrol their fireman at the nearest technical college for 'Boiler Operators' Certificate' courses. NIFES engineers would give any advice and assistance needed.

If it was impracticable to send the operators to the technical college, NIFES was prepared to bring the training to the operators. This 'NIFES Course of Training for Boiler Operators' which would be based on practical instruction on site and backed by material for home study, would begin in October and would prepare men for the City and Guilds Boiler Operators' Certificate.

To make a success of this form of training, Sir Leslie said that NIFES was asking for the help of all the principal industrial organisations.

Geneva Atomic Energy Conference

Details of British Participation

MORE than 60 papers dealing with many aspects of atomic energy will be read by British scientists at the international conference on the peaceful uses of atomic energy to be held at Geneva from 8 to 20 August. In the exhibitions which are being held at the same time British exhibits will occupy 30,000 sq. ft.

The conference is an outcome of proposals laid before the United Nations by President Eisenhower. It will be devoted to the presentation and discussion of papers on a number of main subjects related to the beneficial uses of atomic energy, presented from scientific and technical points of view. Coinciding with it will be two exhibitions illustrating the progress that has been made.

The United Kingdom was one of 84 nations invited to participate, the majority of whom have accepted. President of the conference will be Dr. H. J. Bhabha, director of the Tata Institute of Fundamental Research, Bombay, and Secretary of the Indian Atomic Energy Commission. Professor W. G. Whitman, head of the Department of Chemical Engineering in the Massachusetts Institute of Technology, is the secretary-general of the conference. In this capacity he will serve as an officer of the United Nations Secretariat, assisted by a working party headed by Dr. Ralph Bunche and Mr. Ilya S. Tchernychev (United Nations under-secretaries) and Dr. Gunnar Randers (special consultant to the Secretary-General, Dag Hammarskjold in matters relating to the Conference).

Britain's Official Delegation

Britain's official delegation will consist of Sir John Cockcroft, Director of the Atomic Energy Research Establishment, Harwell; Sir Christopher Hinton, managing director of the United Kingdom Atomic Energy Authority Industrial Group; Dr. J. F. Loutit, Medical Research Council and Agricultural Research Council; Sir George Thomson, Royal Society, representing universities, and Dr. Willis Jackson, Metropolitan-Vickers, representing British industry.

Sir Edwin Plowden, Chairman of the United Kingdom Atomic Energy Authority, will also attend, and advisers to the delegation will include representatives of the Atomic Energy Authority Research and Industrial Groups, the Chemical Research Laboratory, the Medical and Agricultural Research Councils, the Department of Scientific and Industrial Research, the Ministry of Defence, the Ministry of Fuel and Power, the Institute of Civil Engineers, British Universities and a number of industrial concerns. The total party of delegates, advisers and staff for the conference and exhibitions will number more than 160. This does not include the industrial representatives attending the exhibition.

The UK's Contribution

The United Kingdom Papers Committee, under the chairmanship of Sir John Cockcroft, was set up to integrate the British contributions to the conference and has been drawing up a list of papers and authors covering a wide variety of topics. More than 120 authors submitted just over 100 papers, of which 67 will be read. The remainder will be included in the report of the proceedings which will be published. Including those from Britain more than a 1,000 were submitted altogether, and the final selection of those to be read has been in the hands of a committee sitting in New York. British representatives on this committee are Dr. J. Gaunt, Mr. D. J. Littler, of Harwell, and Mr. L. F. Lammerton, of London University.

Over 70 papers from Russian scientists will be read, and about 170 from the US. Some of the countries presenting papers are:— France, Belgium, Australia, Yugoslavia, Czechoslovakia, Japan, Argentine, India, USSR (including the Ukraine and Byelorussia), Canada, Norway, Poland, Brazil, Switzerland, Holland, Sweden, Israel and Portugal.

The subjects discussed will include world requirements for power and the rôle which nuclear energy will play, the building of nuclear energy enterprises, health and safety aspects and the production of isotopes.

Seven models of atomic reactors (or piles) one of them more than 19 ft. by 15 ft. and 5 ft. 6 in. high, will be among the many Authority items in the two exhibitions which

will run concurrently with the Conference. Many other aspects of the British programme, including specialised instrumentation developed in this country, and the latest applications of radioactive isotopes for industry, medicine and agriculture, will also be demonstrated.

Scientific Exhibits

One of the exhibitions, in the Palais des Nations, is purely scientific and intended principally for members of delegations. Here the Atomic Energy Authority's display covering 3,000 sq. ft. will be mainly concerned with nuclear reactors for research and for generation of power, and with specialised instrumentation developed in this field. Models of one of the Calder Hall reactors (3ft. 11 in. by 2 ft. 6 in.) of the Harwell heavy water reactor E 443 now being built (7 ft. 6 in. sq. by 8 ft. 6 in. high) and of the second Harwell heavy water reactor RE 775 also now under construction (4 ft. 6 in. sq. by 5 ft. 6 in. high) are included. These last two reactors have now been given the names DIDO and PLUTO.

There will be great scientific interest in the instruments on view, which have been developed in the Authority's Research and Industrial Groups for reactor control, special recording work and for dealing with the raw materials of the atomic age.

The second exhibition, in the Palais des Expositions, is designed for the general public as well as delegates. The United Kingdom Atomic Energy Authority exhibit, which has been expanded from 5,000 to over 7,000 sq. ft. will be a comprehensive survey of the peaceful applications of atomic energy in this country. Mr. James Gardner, O.B.E., well known for his work in the Festival of Britain exhibition, has designed the lay-out in a way that will make it easy for visitors to follow the story of British achievements in building up a complete atomic organisation and the efforts now being made to exploit peaceful uses to the full. A detailed model of the Calder Hall power station will be 17 ft. 2 in. by 4 ft. 3 in. and one of the breeder reactor experimental power stations at Dounreay will be 7 ft. 6 in. by 6 ft. 6 in. DIDO (or E 443) the Harwell heavy water experimental reactor, will be shown in a model 19 ft. by 15 ft. 4 in. and 5 ft. 6 in. high.

A wide and spectacular variety of models and working apparatus will tell of the latest advances that have been made in the uses of radioactive isotopes, of which Britain is the largest exporter in the world. Much of the display is devoted to industrial and medical devices for making radioactivity serve man, and reference is also made to agricultural research. There is also a display of surveying equipment.

The Authority's exhibits have been designed to integrate closely with those of British firms associated with atomic development, which cover an area of nearly 20,000 sq. ft. They are divided into two sections, one concerned with the instrument industry and the other with heavy industry. A central inquiry desk with interpreters and secretarial staff will serve the whole United Kingdom exhibition.

Mr. N. C. Pratt is the honorary co-ordinator of the industrial section and Mr. N. H. Campbell the honorary organiser at 9/15 Oxford Street, London W.1.

S.S. *Chemical Transporter*

STORAGE facilities for about 4,000,000 gallons of chemicals to enable quicker distribution to customers in north-eastern US are being established at Newark, New Jersey, by the Celanese Corp. of America. Newark will now become the largest chemical distribution point in the US. The project follows the opening of a new tanker service between Texas ports and the Atlantic coast.

With Monsanto Chemical Co., Commercial Solvents Corp., and Columbia-Southern Corp., Celanese Corp. of America have contracted with Chemical Tankers Inc. for the use of the S.S. Chemical Transporter in regular runs from the Gulf coast to the East. Celanese will ship more than 1,000,000 gallons of chemicals on each voyage.

By using the S.S. Chemical Transporter, Commercial Solvents Corp. will be able to transport the equivalent of 100 railway tank cars (1,000,000 gallons) of methanol on each voyage. The service will greatly speed distribution of methanol to the East coast, although shipment by barge from Commercial Solvent Corp.'s petrochemicals production centre at Sterlington, Louisiana, to the Harvey plant at New Orleans will continue.

Columbia-Southern Chemicals Corp. will participate in the new tanker service by shipping caustic soda on all trips.

Tectal Cordage Preservatives

Product of Mond Producer Gas Plant

FOR over a quarter of a century the tar obtained from the Mond Producer Gas Plant at the works of Melanoid Ltd., Dudley Port, Tipton, Staffs, has been used as a basis for the manufacture of Tectal Cordage Preservatives. Mond tar is absolutely unique and is produced by the Mond Producer Gas process operating under ammonia recovery conditions requiring an air blast saturated with water vapour at about 81°-82° C. This is equivalent to the passing of about 2 tons of steam through the producer fuel bed per ton of coal gasified. It is the use of this large amount of steam which accounts for the great differences in the properties of Mond tar and other tars.

When Mond tar is distilled benzol, toluol, naphthas, naphthalene, carbolic acid and cresols are absent. On the other hand, the Mond oils obtained contain over 30 per cent of phenolic substances which, for the most part are not true homologues of phenol but more hydrogenated hydroxy-carbocyclic compounds of a very high molecular weight.

It is the practice when distilling Mond tar to divide the oil into fractions, *viz.* light and heavy. The light oil has a specific gravity between 0.98 and 1.00 and a boiling range between 185° C and 360° C. It is a clear oil which deposits no naphthalene on cooling. This Mond oil is used as the basis for the manufacture of Tectal cordage preservatives and the reason for their success is due to the unusual nature of the phenolic content (over 30 per cent).

The outstanding reasons for the superiority of Mond oils for cordage preservation are said to be:—

The treatment of cordage with wood tar or creosote generally causes an initial loss of tensile strength of from 10-20 per cent owing to what is known as the tendering effect of these substances—this loss of strength being, of course, before any exposure to the elements has taken place. The following is a typical example of a test carried out:—

Hemp Rope

Tensile breaking strain before treatment	7,848 lbs.
After treatment with a tar preservative ..	6,424 lbs.
The initial loss of strength is considerable.	
The same rope after treatment with Tectal had a breaking strain of	7,910 lbs.

It will be noted that there is no loss of strength after Tectal treatment but a slight gain.

The reason for the superiority of Tectal in producing no initial tendering is entirely due to the difference of the phenolic bodies it contains when compared to those in wood tar and coal tar creosotes. In general, rope preservatives derived from tar all depend for their preservative action on the presence of phenolic substances or tar acids.

It is due to the toxic action of these substances on the micro-organisms and fungoid growths that cause rotting that the life of cordage is enormously increased after treatment.

Everything else being equal, therefore, it is desirable from the point of view of inhibiting microbial and similar attacks that the proportion of tar acids should be as high as possible. There is, however, a difficulty here; the tar acids in wood and ordinary creosote oils produce a certain amount of chemical attack on the vegetable fibres of which cordage is composed and cause the initial tendering already referred to. Consequently it becomes necessary to strike a balance between the amount of initial tendering and the final preservative action.

It is useless to increase the percentage of tar acids to get a longer life due to freedom from microbial attack if the initial tendering is thereby made too great and the cordage unduly weakened before any exposure at all has taken place.

With the oil from Mond tar however (i.e. Tectal base) the situation is quite different. The tar acids in Tectal have no such attack on the fibres and cause no initial tendering. This has been proved repeatedly.

The result is that with Tectal, in spite of a content of over 30 per cent of phenolic compound, there is no initial tendering and because of this high percentage there is a superior preservative action.

The following table illustrates the results obtained in the use of Tectal:—

Fishing Nets

Untreated	100% loss
Wood tar treated	47% loss
Tectal treated	10% loss

Many tests have been undertaken on Tec-

tal treated cordage by various Ministries and large cordage manufacturers confirming the excellent preservative action of Tectal on cordage. In addition, laboratory tests over a period of years in which the cordages have been kept in contact with cellulose-destroying bacteria under optimum growing conditions, have demonstrated the preservative value of Tectal.

We give below a selected set of rot-proofing tests carried out on cordages according to draft British Standard Method CK(T)442:

(a) *Cotton twine*

Untreated cotton twine

	Average tensile strength lbs. per single thread	Strength
As received	5.85	—
After incubating ..	0.38	93.5% loss
After incubating and leaching	—	—

Cotton twine treated with 'Tectal Standard Brown Preservative.'

	Average tensile strength lbs. per single thread	Strength
As received	6.47	—
After incubating ..	6.75	Slight gain
After incubating and leaching	6.04	6.5% loss

(b) *Hemp cordage*

Untreated hemp cordage

	Average tensile strength	Strength
As received	873	—
After incubating ..	222	75% loss
After incubating and leaching	—	—

Hemp cordage treated with 'Tectal Standard Brown Preservative'

	Average tensile strength	Strength
As received	788	—
After incubating ..	669	15% loss
After incubating and leaching	648	18% loss

(c) *Hemp twine*

Untreated hemp twine

	Average tensile strength	Strength
As received	87.8	—
After incubating ..	20.7	76.5% loss
After incubating and leaching	—	—

Hemp twine treated with 'Tectal Standard Brown Preservative.'

	Average tensile strength	Strength
As received	95.4	—
After incubating ..	74.4	22% loss
After incubating and leaching	68.5	28% loss

(d) *Sisal twine*

Untreated sisal twine

	Average tensile strength	Strength
As received	164	—
After incubating ..	82	50% loss
After incubating and leaching	—	—

Sisal twine treated with 'Tectal Standard Brown Preservative"

	Average tensile strength	Strength
As received	163	—
After incubating ..	161	1.25% loss
After incubating and leaching	153	6% loss

(e) *Sisal cordage*

Untreated sisal cordage

	Average tensile strength	Strength
As received	531	—
After incubating ..	347	35% loss
After incubating and leaching	—	—

Sisal cordage treated with 'Tectal Standard Brown Preservative'

	Average tensile strength	Strength
As received	505	—
After incubating ..	497	2% loss
After incubating and leaching	529	Slight gain

(f) *Cotton cordage*

Untreated cotton cordage

	Average tensile strength	Strength
As received	402	—
After incubating ..	77	81% loss
After incubating and leaching	—	—

Cotton cordage treated with 'Tectal Standard Brown Preservative'

	Average tensile strength	Strength
As received	378	—
After incubating ..	409	Slight gain
After incubating and leaching	391	Slight gain

(g) *Cotton twine*

Untreated cotton twine

	Average tensile strength	Strength
As received	87.6	—
After incubating ..	47.4	46% loss
After incubating and leaching	—	—

Cotton twine treated with 'Tectal Standard Brown Preservative'

	Average tensile strength	Strength
As received	86.6	—
After incubating ..	86.4	0.25% loss
After incubating and leaching	86.4	0.25% loss

[*continued at the bottom of page 136*

Uranium Industry in SA

Boost to Chemical Trade

RAPID development has taken place during the past few years in the extraction of uranium from the gold bearing ores of the Witwatersrand and Orange Free State. The presence of the mineral uraninite in the ores had be detected as far back as 1923 but until the advent of the atomic era the matter was only of academic interest.

Active steps were first taken to extract uranium when a pilot plant was completed in October 1949 at the Blyvooruitzicht Mine. This plant, together with similar units at the Western Reefs and Sub-Nigel Mines, paved the way for large scale production by establishing the economics of the process and confirming experimental methods of separation by flotation and acid extraction using dilute sulphuric acid.

A Major Rôle

South African manufacturers and chemical engineers then played a major rôle in the urgent fabrication and erection of large scale plants so that by October 1952 the first uranium producing unit at West Rand Consolidated Mine was able to go into operation. By the end of 1954, eleven mines in the Transvaal were already producing uranium and in all, permission has now been granted to 26 gold mines to extend their processing to the extraction of uranium, including eight of the new mines situated in the Orange Free State.

The economics of gold mining have been greatly improved by the additional revenue derived from uranium and indeed in some cases the additional profit has enabled mining to continue where gold alone could no longer be produced profitably owing to high working costs and low payability of the gold ore. An example of this type is the Bird Reef series of the West Rand Mines which was found to contain payable quantities of uranium.

Details of uranium yield and production methods are still covered by strict security restrictions but from facts already released, the importance of this new industry and the secondary industries benefiting from it, can be gauged.

Ore residues after gold extraction are treated with dilute sulphuric acid to dissolve the uranium content and this has created a very large demand for sulphuric acid. To meet these requirements, acid is already produced in plants at two mines in the Transvaal, Daggafontein and Western Reefs, which have capacities of at least 200 metric tons each per day. Four more large sulphuric acid plants including one near Virginia in the Orange Free State are due to commence production shortly.

Raw Materials Available

Fortunately, the raw material needed for acid production is readily available in the spent ore at many of the mines. In some cases, up to four per cent or so iron pyrites is contained in the residues and this can be recovered by a normal method of concentration by flotation. Sulphur dioxide is produced by roasting the recovered pyrites in a Fluo-Solids plant and subsequently oxidised by the standard contact method using a vanadium oxide catalyst.

The large scale use of sulphuric acid has created severe corrosion problems at the mines where uranium is extracted and to combat this, large sections of plant have had to be rubber lined in one of the biggest jobs of this type ever undertaken anywhere in the world. Filtration of uranium-bearing solutions is carried out in batteries of large rotary filters and the solid residues are afterwards discharged to slime dams in the usual manner. It has been found necessary at one stage of the processing to add bone glue to the liquor to improve filtration and so the Union's glue industry has had to make a rapid expansion to cope with a sudden large increase in the demand for glue. Other chemical industries such as manganese, lime, etc., also received a big boost from the needs of the uranium extraction process.

'Bright Yellow Mud'

After various stages of purification, uranium is finally precipitated from solution and leaves the mines as a bright yellow mud. It is then sent to a central plant where it is converted by calcining into a dry uranium oxide, U_3O_8, which is despatched to aid the atomic programmes of Britain and the US.

IN THE EDITOR'S POST

Organic Reagents for Metals

SIR,—As one of the authors of the monograph dealing with Karl Fischer reagent in our new volume of 'Organic Reagents for Metals and Other Reagent Monographs' I should like to answer Dr. West's criticisms that appeared in 'The Chemist's Bookshelf' section of your issue of 18 June (see THE CHEMICAL AGE, 1955, **72**, 1346).

Dr. West's observations on our simplified equation for the reaction between water, sulphur dioxide and iodine suggest that he did not read the relevant text. The sentence immediately preceding the equation in question states quite unequivocally that 'Although the stoichiometry of the reaction is now known to be quite complex (references given to relevant papers) it will be convenient, here, to represent it as though it were based on the following simple equation':

$$I_2 + SO_2 + 2H_2O = H_2SO_4 + 2HI$$

The convenience referred to is that of picturing the process as analogous to one within the young analyst's everyday experience; namely, the reaction between iodine and sulphur dioxide in aqueous solution. Sulphur trioxide seems less conveniently pictured as an end product than sulphuric acid and since neither equation has the merit of enabling the student to prepare a conventional Fischer reagent of accurately predetermined water equivalence, our choice still seems to us to be the better in the circumstances.

The paragraph immediately following the equation, as well as completing the simple analogy, again directs the readers' attention to original literature sources for a precise treatment of the mechanism, so we find it difficult to believe that a misleading impression will be easily gained by the reader.

Yours faithfully,

J. T. YARDLEY,

Head of Analytical Laboratory,
Hopkins and Williams Ltd.

* * *

The Quantometer

SIR,—I have read the article headed 'The Quantometer' in the current issue of THE CHEMICAL AGE with a mixture of awe, amazement and I dare say—some amusement. Awe at the incredible quality of brain work that must have gone into the design and making of this machine; amazement at the description of the machine itself—automatic tuner attenuators and switching mechanisms, etc.; but some traces of amusement must be confessed to when the claim is made that this modern wonder machine only takes 10 minutes to do tests and also inform (electronically of course) the hub of the melting shop.

Some 30 years ago in a small stage-laboratory on Tees-side while special non-conductivity steel was being produced by the 1,000 tons an analyst was considered somewhat slow if he did not analyse, accurately, a steel sample in seven minutes and the result delivered by hand to the melting shop assistant manager! The analysis done was for total carbon, manganese and sulphur, with an extra two minutes allowed for a volumetric phosphorus. Samples after analysis were later sent down to the main analytical laboratory for checking gravimetrically and woe betide the poor analyst if there was any discrepancy. The smelters also took a poor view of inaccurate analysis of stage samples as their quality-bonus could be jeopardised.

I myself have witnessed tests for manganese and carbon done, most accurately as it proved later, in two minutes. The whole apparatus including a sample driller did not cost more than £100.—Yours faithfully,

R. L. SHACKLEY.

Senior Chemist,
United Steel Co.,
Colsterworth.

Milestone

SINTERED Products Ltd., a subsidiary of Sheepbridge Engineering Ltd., have recorded the manufacture of the 100,000,000th Durasint sintered powder metal structural part at their Sutton-in-Ashfield factory. The first sintered metal powder part made at the factory was a bronze water meter wedge weighing one gramme. The 100,000,000th part was a 3 in. diameter piston rod guide weighing over 1 lb. with a tensile strength of 18 tons per sq. in.

Durasint powder metal parts are made in many alloys and mixtures which can be obtained by no other method of manufacture. Tensile strengths range from 10 to 60 tons per sq. in., and present production is over 1,000,000 parts a month.

A New Insecticide

Potent Impurity in Phosphorus Compound

A NUMBER of experiments have recently been conducted on the insecticidal properties of various vapours by A. M. Mattson, J. T. Spillane and G. W. Pearce at the Technical Development Laboratories, Savannah, US, by passing air over materials and then releasing flies in the treated air. One of the organic phosphorus compounds killed an unusually high number of flies initially, but continued aeration of the sample produced no very toxic vapours. This suggested that the effectiveness was due not to the compound itself but to a highly volatile impurity.

Analysis showed a relatively high phosphorus content in the air which decreased after being subjected to prolonged aeration. The total of impurity present was calculated to be 0.1 to 0.2 per cent based on the weight of the material aerated and the total material in the air during the period of high mortality.

The material in which the highly toxic impurity was found, Bayer L 13/59 (Dipterex), is a commercial preparation of O,O-dimethyl 2,2,2-trichloro-1-hydroxyethyl phosphonate.

Efforts were made to isolate the toxic impurity in amounts large enough to identify it.

Impurity Volatile

Because the unknown impurity was volatile, its recovery from air passed over relatively large quantities of O,O-dimethyl 2,2,2-trichloro-1-hydroxyethyl phosphonate appeared feasible. Generally, the results were disappointing and the product recovered was still highly impure. Microanalysis indicated that the material probably had an atomic ratio of chlorine to phosphorus of less than three.

Concentration of the active impurity by fractional crystallisation was then attempted, but it could not be isolated in a sufficiently pure state.

The most successful concentration was accomplished by washing an ether solution repeatedly with water, which removed most of the O,O-dimethyl, 2,2,2-trichloro-1-hydroxyethyl phosphonate, leaving the highly toxic impurity in the ether phase. The product obtained was subjected to countercurrent distribution studies using an ether-acetone-water mixture and also a Skellysolve A-water mixture. With these solvent pairs a highly potent fraction exhibiting constant distribution characteristics was isolated. The amount of potent material obtained amounted to approximately 0.03 per cent of O,O-dimethyl 2,2,2 - trichloro - 1 - hydroxy - ethyl phosphonate.

Synthesis Undertaken

As the material seemed to be a degradation product containing less than 3 atoms of chlorine, the possibility of synthesising the unknown material by partially dechlorinating O,O-dimethyl 2,2,2-trichloro-1-hydroxyethyl phosphonate was considered. The slow addition of 1 mole of sodium hydroxide to 1 mole of O,O-dimethyl 2,2,2-trichloro-1-hydroxyethyl phosphonate in aqueous solution resulted in an oily material separating out.

It proved to have insecticidal properties against houseflies comparable to that of the material isolated directly from O,O-dimethyl 2,2,2-trichloro-1-hydroxyethyl phophonate.

Subsequent efforts were devoted to the chemical identification of this alkaline degradation product. Molar quantities of the product were prepared by slowly adding 1 litre of 5M sodium hydroxide to a vigorously stirred solution of 5 moles of O,O-dimethyl 2,2,2-trichloro-1-hydroxyethyl phosphonate dissolved in 15 litres of water at room temperature. After the product had been allowed to settle, most of the clear water layer was removed.

The remaining water and product were separated and the latter taken up in ether. The ether solution was washed several times with equal volumes of water dried over anhydrous sodium sulphate and filtered, the ether was then distilled, the last traces being removed under vacuum. Fifty per cent yields of a good grade of technical material were obtained by this technique. It was purified by distillation. In general the product appeared to be sensitive to heat so that short distillation periods at low pressures were required.

These data confirmed the preliminary ob-

servation that the atomic ratio of chlorine to phosphorus was less than 3 to 1. The vapour pressure characteristics indicated that no great change in molecular size was involved.

It was evident that the alkaline degradation of O,O-dimethyl 2,2,2-trichloro-1-hydroxyethyl phosphonate consisted in the loss of one atom of chlorine and probably one atom of hydrogen. Therefore, a dehydrohalogenation was considered to be the major change in the empirical composition of O,O-dimethyl 2,2,2-trichloro-1-hydroxyethyl phosphonate when treated with one mole of alkali.

The compound is about equivalent to parathion and about ten times more toxic than its parent against houseflies. It has shown particular promise in spray and poison bait formulations for fly control.

It is probable that its higher esters would also be toxic. The ethyl ester was made in this laboratory by dehydrohalogenation of the corresponding ethyl ester of O,O-dimethyl 2,2,2-trichloro-1-hydroxyethyl phosphonate, and found to have an LD_{50} of about 0.1 γ per fly for topical application.

An LD_{50} of around 0.1 γ per fly for topical application was found for a technical grade sample of this compound supplied to this laboratory.

Change in Lactic Acid Prices

A REVISION of lactic acid prices has been made by Bowmans Chemicals Ltd., of Widnes, Lancashire, and came into effect on 1 July. The company also decided to standardise price quotes, and now all grades are quoted in pence per lb.

The new prices are:

		1-ton lots	cask lots
Dark technical ..	44% wt.	8¼	8½
(ex-works) ..	75% ,,	14	14½
Chemical quality	44% ,,	12¼	12⅝
(ex-works) ..	80% ,,	22¼	22¾
Pale technical ..	44% ,,	14	14½
(ex-works) ..	80% ,,	25¼	25¾
Edible quality ..	44% ,,	16½	17⅛
(delivered) ..	80% ,,	30	31½

Insecticides in Doubt

DR. ERIC COCKER, M.A., Ph.D., F.R.I.C., director of Cocker Chemical Co. Ltd., of Oswaldtwistle, told members of Rochdale Rotary Club that so far as some insecticides were concerned, it might be that saturation point had been reached in the matter of their efficacy. That meant something else would have to be found, although manufacturers were still carrying on with DDT and others.

Stressing the high cost of research, Dr. Cocker said that after a considerable time spent in testing and experimenting, it might be found that only one compound out of 1,000 would be found to possess an indication of practical use. Before plant was set up for its production it had been estimated that average expenditure would be about £175,000.

Speaking of the remarkable progress in the last ten years in combating disease borne by insects, Dr. Cocker said DDT was evolved in 1942, primarily through a Swiss firm, though it had been discovered 70 years before. Four firms were making it in this country, and since 1943, 14,000,000 lb. had been produced.

Tectal Cordage Preservatives

continued from page 132

The fact that Tectal is applied cold means a considerable saving in fuel, and its ease of application and quick drying when centrifuged—whereby all excess is returned to the Dipping Bath—are important factors of cost. Even when centrifugal drying is not practical, the excess Tectal is fairly rapidly drained back into the tank as it is fluid at atmospheric temperature and slight pressure through rollers is effective in removing the surplus material.

In the case of thin cordage, e.g. nets, hanging up to allow the excess Tectal to drain back into the tank is a method which usually suffices, but centrifuging is by far the quickest and most reliable method.

It is important also to point out that Tectal itself does, in many cases, take the place of a batching oil, and at the same time it can be used in admixture with various grades of batching oils to give the results required by cordage manufacturers.

The properties of Mond tar were very carefully investigated in the Mond Laboratories at Dudley Port, Tipton, about 1910 and it was after a period of approximately eight years of research work that the most suitable fractions were selected for the manufacture of Tectal Cordage Preservatives and over a quarter of a century has now passed since Tectal Cordage Preservatives were first introduced to the market. This product has survived, during this period, the most exhaustive tests.

Oxyacetylene Competition

Prizes to be Awarded by International Commission

A SECOND international competition for a paper on the applications of the oxyacetylene flame is to be set by the 'Commission Permanente Internationale de l'Acetylene de la Soudure Autogene et des Industries qui s'y rattachent', in accordance with the following rules.

1. *Subject*

The paper must deal with one or several practical applications of the oxyacetylene or air-acetylene flame, such as welding, soldering or brazing, bronze welding, oxygen cutting, surface hardening, building up, metal spraying, heat treatments, etc., or with problems relating to one or more of these applications, for example questions of cost price, organisation of workrooms, safety, etc. It should be unpublished or published only after 1 January, 1956.

2. *Participation*

The competition is open, with the exception of members of the Bureau, to any person or body and to any group of persons or bodies of any country. The same competitor can enter several papers for the competition.

3. *Presentation of the Paper*

The papers must be written in English or in French and furnished in five copies typed on one side of the paper only, on paper size A4 (21 by 29.7 cm.). Illustrations, diagrams, etc., which may if necessary accompany the papers, should also be submitted in five copies.

The maximum length of the papers must not exceed 20 typewritten pages in single spacing (excluding illustrations). A synopsis briefly describing the subject of the work described and the results obtained must be submitted with the papers.

Papers must not bear any indication which might reveal their origin and author but must be provided with an emblem.

4. *Despatch of Papers*

The five copies of each paper, accompanied by the illustrations, are to be placed in a wrapping bearing only the emblem chosen by the competitor and the word 'Paper'. This wrapping, together with a sealed envelope marked on the outside only with the emblem of the competitor, but containing a slip with his name, address and emblem, are to be sent in an outer wrapping marked '1956 International Competition' and addressed to the General Secretariat of the Commission Permanente Internationale de l'Acetylene et de la Soudure Autogene, 32 Boulevard de la Chapelle, Paris 18e.

5. *Period of the Competition*

The competition is open from 1 January, 1956, to 31 December, 1956. Entries must reach the address shown above not later than 6 p.m. Central European Time on 31 December, 1956.

6. *Prizes*

The total prize money available for the competition is about 500,000 French francs which will be divided, subject to the reservations contained in Article 9. The minimum value of each prize will be 50,000 French francs.

7. *Jury*

The judging of the papers entered and the award of the prizes are entrusted to a jury of the five permanent members of the committee 'Oxyacetylene Welding' of the CPI who formed the jury for the first competition and who are empowered to co-opt, by unanimous decision, any person whose assistance seems to them of value.

8. *Award of the Prizes*

The decisions of the jury are taken by a majority vote. Its decisions, on the award of the prizes, are final and it may withhold in part or in whole the award of the prizes, which will be carried over for a future competition, if it does not consider that the entries merit awards.

9. *Rights of the Authors*

The prize winning papers become the property of the CPI which thus acquires the publication and translation rights, in which case the name of the author must however always be mentioned.

The copies of the papers not awarded prizes remain at the disposal of their authors.

Patents remain the property of their authors who will have to ensure personally that their work is protected.

The CPI declines all responsibility as regards claims for prior discovery or industrial property.

Key Industry Duty

Many Chemicals Added to List

THE Board of Trade have made The Safeguarding of Industries (List of Dutiable Goods) (Amendment No. 8) Order, 1955, adding the following chemicals to the list of chemicals liable to Key Industry Duty:

Adrenochrome *mono*semicarbazone, *mono*bromo*mono*chloromethane, γ-4-chloro-2-methylphenoxybutyric acid, *p*-chlorophenoxyacetic acid, *p*-chlorophenyl benzenesulphonate, *p*-chlorophenyl *p*-chlorobenzenesulphonate, chlorotrifluoromethane, choline dihydrogen citrate, cyanogen chloride, 3:5-diacetamido-2:4:6-tri-iodobenzoic acid, γ-2:4-dichlorophenoxybutyric acid, diethanolammonium 4-chloro-2-methylphenoxyacetate, diethanolammonium 2:4-dichlorophenoxyacetate, diethanolammonium 2:4:5-trichlorophenoxyacetate, 2:5-diethoxyaniline, diethylammonium γ-4-chloro-2-methylphenoxybutyrate, diethylammonium γ-2:4-dichlorophenoxybutyrate, 2:5-dimethoxyaniline, dimethylammonium 4-chloro-2-methylphenoxyacetate, dimethylammonium 2:4-dichlorophenoxyacetate, dimethylammonium 2:4:5-trichlorophenoxyacetate, *NN*-dimethyl-*N'*-phenylurea, *n*-dodecyl methacrylate, ethylenediaminetetraacetonitrile, *N*-hydrozinocarbonylmethylpyridinium chloride, hydrazinocarbonylmethyltrimethylammonium chloride, 4-hydroxycoumarin, *N*-(2-hydroxyethyl)ethylenediaminetriacetic acid, methacrylic acid, 17-methylandrostene-3β:17β-diol, *N*-methylglucamine 3:5-diacetamido-2:4:6-tri-iodobenzoate, paramethadione, pentaerythritol diacetate dipropionate, potassium γ-4-chloro-2-methylphenoxybutyrate, potassium γ-2:4-dichlorophenoxybutyrate, *tri*potassium *N*-(2-hydroxyethyl)ethylenediaminetriacetate, sodium γ-4-chloro-2-methylphenoxybutyrate, sodium *p*-chlorophenoxyacetate, sodium cyclamate, sodium 3:5-diacetamido-2:4:6-tri-iodobenzoate, sodium γ-2:4-dichlorophenoxybutyrate, *tri*sodium *N*-(2-hydroxyethyl)ethylene diaminetriacetate, sodium *mono*ethylaminoacetate, sodium pentachlorophenoxide, sodium 2:4:5-trichlorophenoxyacetate, sorbitan *mono*laurate, sorbitan *mono*palmitate, sorbitan *mono*stearate, sorbitan tristearate, tetracycline, thialbarbitone sodium, 2:4:5-trichlorophenoxyacetic acid, 1:1:2-trichloro-1:2:2-trifluoroethane, trimethylammonium 4-chloro-2-methylphenoxyacetate, trimethylammonium γ-4-chloro-2-methylphenoxybutyrate, trimethylammonium 2:4-dichlorophenoxyacetate, trimethylammonium, γ-2:4-dichlorophenoxybutyrate, trimethylammonium 2:4:5-trichlorophenoxyacetate, troxidone.

The Order, which came into operation on 8 July, 1955, was published on 5 July as Statutory Instruments 1955 No. 950. Copies may be obtained direct from HM Stationery Office, Kingsway, London W.C.2, price 2d. net, by post 3½d.

Coalite Has Good Year

Commander Buist Presides at AGM

COMMANDER Colin Buist, the chairman, presided at the annual general meeting of Coalite & Chemical Products Ltd. in London, on 7 July. In his statement he said there is a steady demand for the company's chemical products although increased competition is resulting in lower profit margins in certain sections.

The company's expansion plan calls for three new batteries at Bolsover to be in production by the end of this year, and three more to be built on the same site. Substantial additions to the ancillary plant are required in consequence. The resultant increase in the output of crude oil and spirit will be such that the capacity of the central refinery will have to be greatly expanded.

In addition, and following up the work of the research department, it is planned to install a series of new refinery units which will increase the range of chemical products. The estimated cost of the programme will approach £900,000, which includes £364,000 shown as outstanding capital commitments.

When all is completed, which is expected to be by the end of next year, the Bolsover plant will have trebled its original capacity, and the two works together will be carbonising about 720,000 tons of coal a year.

Trading results for the year ended 31 March compared with the five previous years. After allowing for tax amounting to £263,886 the net profits total £238,650, compared with the record of £265,552 in 1952, and £183,267 last year. After deducting £6,087 profits retained in the accounts of the subsidiary companies, and adding £116,429 brought forward from last year, there is £348,992 for appropriation. Of this £150,000 has been transferred to general reserve. The interim dividend on the ordinary stock of three per cent, less tax, accounted for £26,454.

• HOME •

New Address

The Council of British Manufacturers of Petroleum Equipment have moved from 79 Buckingham Palace Road to 2 Princes Row, Buckingham Palace Road. The telephone number remains the same: VIC 0017/19.

Corporation Complains of Chemical Fumes

Because Middlesbrough Corporation have complained about chemical fumes emanating from their factory, Sadler & Co. have temporarily curtailed the production of sulphuric acid. In a letter to the Corporation the company said it was a temporary measure until new plant for reducing the fumes could be installed.

Dangerous Goods & Explosives in Ships

The 13th list of Amendments to Appendix A of the 1951 Report of the Departmental Committee on the Carriage of Dangerous Goods & Explosives in Ships can now be obtained from HM Stationery Office, price 2d. Further amendments will be published by HMSO as and when necessary.

'British Chemicals & their Manufacturers'

The Association of British Chemical Manufacturers, of Cecil Chambers, 86 Strand, London W.C.2, have just published the 1955 edition of 'British Chemicals & their Manufacturers', a directory containing 12,000 products, cross-indexed, with their manufacturers. The book, 192 pages, is free to all persons and companies interested in the purchase of chemicals.

Nylon Output Still Rising

I.C.I. are to step up the production of nylon chips by 10,000 tons a year. Until recently the output of nylon chips was 5,000 tons a year from the nylon works at Billingham. Recent extensions raised the output to 15,000 tons a year, and now Wilton is to have a plant to add a further 10,000 tons yearly. The newly-sanctioned Wilton plant will cost about £9,000,000.

Addition to Family

Latest addition to the group of trade and technical journals published by Benn Brothers Ltd., proprietors of THE CHEMICAL AGE, is *The Indent Gazette*. Founded in 1895, this widely-known weekly journal provides a valuable service to British manufacturers and export merchants in notifying the requirements of overseas buyers in its pages.

Royal Party Visit I.C.I. at Grangemouth

Her Majesty The Queen and the Duke of Edinburgh visited I.C.I.'s dyestuffs division at Grangemouth during their recent tour of central Scotland. They saw a display of dyed fabrics, and inspected the plant where caledon jade green is produced. Mr. P. K. Standring, I.C.I. director, conducted the Queen during the visit, and Dr. J. Avery, chairman of the dyestuffs division, accompanied the Duke.

Branch to be a Company

Dunford & Elliott (Sheffield) Ltd. announce that the department of their company which operates from London will be formed into a separate subsidiary company on 1 August and will be called Dunford & Elliott Process Engineering Ltd. This company will handle the rotary louvre dryers, coolers and roasters among other activities.

No Miracle Fibres

Addressing members of the Wholesale Textile Association's summer school at Oxford, Dr. B. P. Ridge, a member of the I.C.I. Terylene Council, said that to fight increasing world competition in the textile trade, Britain must study not only what types of fabric can be obtained from the new synthetic materials, but how price ranges can be adjusted to fit in with world as well as home markets. It is nonsense, he said, to regard any of the new fibres as a miracle fibre.

Industrial Diseases

The number of industrial disease cases reported in the United Kingdom in May under the Factories Act, 1937, or the Lead Paint (Protection Against Poisoning) Act, 1926, were: lead poisoning (1), aniline poisoning (3), mercurial poisoning (1), compressed air illness (1), and one case of anthrax. Twelve cases of epitheliomatous ulceration (skin cancer) were reported, and 22 cases of chrome ulceration. One death from epitheliomatous ulceration was reported.

SCI Annual Meeting

The annual meeting of the Society of Chemical Industry was opened at Birmingham on 11 July. An account of the proceedings will be given in next week's issue.

• OVERSEAS •

Indian Government Ban

The Government of India has decided to ban the export of oleo resin.

To Increase Production of Butvar

Shawinigan Resins Corporation, of Springfield, Mass., one of the companies associated with The Shawinigan Water & Power Company, of Montreal, is to build a multi-million dollar plant at Trenton, Mich., to increase its production of Butvar, a vinyl resin used in the manufacture of safety glass. At the same time, the Monsanto Chemical Co. will build a new plant on an adjoining site to convert Shawinigan Resins' product to the plastic sheeting which becomes the interlayer in safety glass.

Hydroquinine Protection

The Government of India has accepted the recommendation in the Indian Tariff Commission's report that protection of the hydroquinine industry should be continued for a further four years till 31 December, 1959, and that protective duty at existing rates, nearly 50 per cent preferential and 60 per cent standard, should be levied.

Facts & Figures

Last year there were 1,095 establishments operating in the Canadian chemical and allied industries. Between them they employed 51,000 workers whose salaries and wages for the year totalled $175,000,000. Production was concentrated mainly in Ontario and Quebec. Ontario having 542 establishments; Quebec 357.

Munition Plant to be Hurried

The Australian Government is to build an £18,000,000 ammunition filling station at St. Mary's, 30 miles west of Sydney. The factory will adopt US production methods, and has been declared 'an urgent project' to be completed by December 1957.

Mombasa May Have Oil Refinery

The Kenya Ministry of Commerce reports that Amoseas, an exploratory subsidiary company of the Caltex group, is interested in the discovery of crude oil in East Africa. The Ministry considers that an oil refinery will be built in Mombasa as developments in some Middle East countries have made investment unattractive.

France's Growing Plastics Industry

The output of 75,000 metre tons of plastics in France last year outlines the tremendous strides the industry has made since the war. In 1938 the total production was 8,000 tons. Consumption in 1954 amounted to 85,000 tons, 27,000 tons more than in the previous year. To meet demands, 18,000 tons of plastics materials had to be imported, although 8,000 tons of French-made plastics were exported.

Canadian Petroleum Figures

At the end of 1953 Canada had 37 petroleum refineries with a daily capacity of 509,300 barrels of crude oil, as compared with 34 refineries with a capacity of 448,400 barrels per day at the end of 1952.

New Ammonia Plant

The Quebec Ammonia Company and the Olin-Mathieson Company of Baltimore will have a joint interest in a $9,000,000 ammonia plant to be built within the next year at Varennes. The new plant is expected to produce 155 tons of ammonia daily.

Boom in Austrian Chemical Industry

In 1954 the production of the Austrian chemical industry was twice that of 1937. Compared to 1953, the value of Austrian chemicals production rose by 14 per cent, reaching a total of $4,900,000, to become Austria's third largest industry. The steep rise in production as compared to the pre-war level is due to the setting up of new industries and to the expansion of existing ones. In 1937 hardly any synthetic cotton was produced in Austria; in 1948 production totalled 9,700 tons. Up to 1954 production increased four times and reached 36,700 tons. Similarly, many times as much plastics and other synthetic materials are being produced as in pre-war days.

West Bengal Plans Coke Oven Plant

The West Bengal Government will shortly set up a coke oven plant at Durgapur, near Calcutta, at a cost of Rs.55,000,000. The plant will be capable of handling 1,300 tons of coal and coke breeze a day. An auxiliary plant will be set up for the recovery of by-products from coke-oven gas, as well as a coal tar distillation plant with a daily input of 50 tons of coal tar.

• PERSONAL •

MR. JOHN G. CRONK has been appointed managing director of Amber Chemical Industries.

PROFESSOR JOHN BIRCH, Professor of Organic Chemistry in the University of Sydney, has been appointed to the chair of Organic Chemistry in Manchester University. He succeeds PROFESSOR E. R. H. JONES, recently appointed Waynflete Professor of Chemistry at Oxford University. A graduate of Sydney University, Professor Birch took his Ph.D. degree at Oxford in 1940, where subsequently he did research work as an I.C.I. Fellow. Last year he was elected a Fellow of the Royal Australian Academy of Science and of the Royal Australian Chemical Institute. Another appointment at Manchester University is that of DR. KENNETH BULLOCK, Reader in Pharmaceutical Chemistry, who succeeds PROFESSOR HARRY BRINDLE as Professor of Pharmacy. Dr. Bullock was a research and technical chemist for some years, returning to the University as a demonstrator in the Pharmacy Department in 1932. After holding a Lectureship and a Senior Lectureship in the department, he was appointed Reader in 1950. He is on the executive committee of the British Pharmaceutical Conference.

Borax Consolidated Ltd. announce that THE RT. HON. LORD CLITHEROE, P.C., has succeeded the late MR. JAMES GERSTLEY as deputy chairman of the company. Lord Clitheroe has been a director of Borax Consolidated Ltd. since 29 April, 1947.

MR. W. R. HAWTHORNE, M.A., Professor of Applied Thermodynamics at Cambridge University, has been appointed a member of the Scientific Advisory Council which advises the Minister of Fuel and Power on the scientific aspects of his statutory duties.

MR. LEAONARD GALE, personnel director of the Nobel Division I.C.I. Ltd., has retired after 36 years with the company. He is a past-president of the Institute of Personnel Management, and a member of Ayr County Council. Mr. Gale is succeeded by DR. A. C. RICHARDSON, formerly works manager at Ardeer. New works manager at Ardeer is MR. RALPH ASHCROFT.

MR. E. G. FISHER, Ph.C., the consultant in thermoplastics, has moved to 4 Palace Court, Bayswater Road, London W.2 (Tel.: BAYswater 3271).

MR. FRED THORNHILL has been appointed technical manager of J. M. Huber Corporation's export department, it has been announced by MR. PETER SCHOENBURG, director of export. Mr. Thornhill will establish his office in Paris, as part of Huber's programme for its expanding overseas markets. He will offer technical assistance on the use of Huber rubber chemicals and paper clays to Huber's agents and cutomers in 16 nations which he will visit in the next few months. Mr. Thornhill has a wide chemical background, having 15 years' experience in research and development on both black and white rubber pigments. Formerly with Columbia Southern Chemical Corp., Akron, Ohio, a subsidiary of Pittsburgh Plate Glass Co., he joined Huber in February. Born in Germany, he came to the US in 1940. He holds a Master of Science degree as chemical engineer from the Munich Technical Institute.

MR. G. A. DICKENS, B.Sc., F.Inst.Pet., has been appointed assistant manager of the technical department at Vacuum Oil Co.'s headquarters in London. Mr. Dickens was formerly superintendent of the company's central laboratories at Wandsworth, London. MR. V. H. RUMBLE, B.Sc., has been appointed superintendent of the Wandsworth central laboratories and will also continue to direct the activities of the products division. MR. F. J. PATMAN and MR. P. E. B. VAILE have been appointed assistant supervisors of this division. MR. T. PATERSON, formerly supervisor of the lubricant and allied products section, central laboratories, has been transferred to the headquarters where he will be responsible for matters concerning greases, patents, and industrial hazards.

Thomas Tilling Ltd. announce that MR. P. H. D. RYDER, M.B.E., commercial director of their subsidiary company, James A. Jobling & Co. Ltd., of Sunderland, manufacturers of Pyrex glassware, has been ap-

pointed to Tilling's staff at Crewe House, Curzon Street, London W.1. Mr. Ryder will remain on the board of James A. Jobling & Co. Ltd. but will relinquish his executive duties as commercial director. MR. C. L. SONGHURST has been appointed general sales manager of James A. Jobling & Co. Ltd. MR. L. D. WOOD retains his position as sales manager of the consumer products division, being responsible for the marketing of Pyrex ovenware and Jobling 'double-tough' Opalware. MR. G. MANN remains as sales manager of the industrial products division.

Wills

MR. FRANCIS BARTLETT RICHARDS, of Little Court, Fairmile, Cobham, Surrey, former chairman of Woodall-Duckham, left £88,193 (£86,125 net).

MR. WILLIAM LAURENCE ARTHUR LENNARD, of Knights Place, Pembury, Tunbridge Wells, Kent, late of Charles Page & Co. Ltd., chemical merchants, left £40,912 (duty £12,327).

MR. WILLIAM STOTT, of Tesco, Danesway, Prestwich, Lancashire, managing director of Henry Cochrane & Son, piece dyers, Newton Heath, left £15,530 (£15,420 net).

Effect of Strikes

A STATEMENT on the dock and rail strikes issued by the Manchester Chamber of Commerce is being placed before the Minister of Transport and Civil Aviation and the Minister of Labour and National Service.

Reviewing reports from its members, whose business activities have been 'gravely interfered with' during the rail and dock strikes, the resolution says that fortunately the railway strike was not of such duration as to cause extensive damage to long-term trading prospects. It is hoped that the arrangement now made will preclude any recurrence of difficulties between labour and the Transport Commission.

A more serious view is taken of the dock strike, the cumulative effect of hold-ups of inward and outward cargo having caused dislocation and losses to trade. 'The resultant lack of confidence abroad in Britain's ability to fulfil seasonal or other contractual obligations can only do serious harm to British interests', says the statement, which concludes by urging that all the facts relating to dock employment should be fully investigated.

New Standard Weight

AN ORDER for the South African Government has just been completed by L. Oertling Ltd. which involved the manufacture of an International Standard 1 Kilogramme Weight having an exceptional degree of accuracy. This weight has been manufactured to a very stringent specification which included a tolerance of only plus/minus 0.15 mg. on the finished mass. The weight was made from an alloy containing 90 per cent platinum and 10 per cent iridium supplied by Messrs. Johnson Matthey Ltd., of Hatton Garden, and is in the form of a cylinder of equal diameter and depth with a slightly concave base so that the weight rests on an annular ring.

This weight, which becomes one of the world's International Kilogrammes, was certified by the International Bureau of Weights & Measures at Sèvres, near Paris, and was shown to be well within the permitted tolerance. Production involved a weighing accuracy of two parts in 100 million.

The company believe that weighing to this degree of accuracy has not previously been carried out as part of a commercial undertaking.

The manufacture of this standard weight involved a protracted series of accurate weighings coupled with the removal of successively smaller and smaller amounts of material from the weight, so that the correct nominal mass and the optimum surface finish were achieved simultaneously.

Oertling completed last year the manufacture of a primary standard 10 Tola Weight for Pakistan.

West German Chemical Plan

PLANS to invest £33,000,000 in the expansion of the West German chemical industry have been reported by the Cologne correspondent of *The Financial Times*. Professor Haberland, chairman of the Bayer Works gave details of the expansion following a meeting of leading West German chemical combines in Cologne.

A pilot plant for oil cracking has now started production, and a large sum of money will be spent on producing fully synthetic fibres. The output of sulphuric acid is to rise from 460,000 to 600,000 tons a year, and caustic soda from 90,000 to 110,000 tons. The production of chlorine will rise from 80,000 to 100,000 tons a year.

Publications & Announcements

WATER pollution by oils and tars is the subject of Water Pollution Abatement Manual (W-4) published by the Manufacturing Chemists' Association Inc., 1625 Eye Street, Northwest, Washington 6, DC. After discussing the various forms in which oil can exist in water, floating film, colloidal suspension and solution, the manual goes on to an account of some of the methods of treatment of oil-polluted waters. Where emulsions are absent and oils and tars are present in small quantities only, simple filtration using the so-called 'hay' filter may be used. In more difficult cases some kind of chemical treatment is often necessary. The disposal of oily wastes is also discussed. Care should be taken to see that waste is not left where it could be a possible source of contamination, the manual says.

* * *

DEVELOPMENTS in vacuum research and engineering are discussed in *Vacuum* which is published four times a year by Edwards High Vacuum Ltd., Crawley, Sussex. Included in the latest addition are original articles on 'The Importance of High Vacua to High Energy Nuclear Physics', and 'Methods and Techniques for the Determination of Specific Surface by Gas Adsorption'. This reviews the experimental procedures available and describes and compares gravimetric and volumetric procedures as well as giving an account of the methods used for calculating surface areas from adsorption data.

* * *

THE LATEST edition of *The Seal*, published by the Audley Engineering Co. Ltd., Newport, Shropshire, contains an interesting account of the large scale production of Terylene. Audco valves are used in the two British Plants and in the Canadian plants. All the main line and automatic valves on the pipe line from the Sui gas field to Karachi were also manufactured by Audley Engineering.

* * *

CATALOGUE No. 7 just issued by H. J. Elliott Ltd., of Treforest, Glamorgan, Wales, lists an extended range of standard and new laboratory glassware equipment. The catalogue covers the range of E-Mil low actinic laboratory glassware products now available at revised prices.

ALTHOUGH the hollow cathode lamp (see Tolansky, 'High Resolution Spectroscopy', Methuen & Co., London, 1947) is an ideal line source for general work, it has hitherto found little application outside the high energy field because of the complicated auxiliary equipment previously found necessary, which included a vacuum system with various traps, an auxiliary discharge tube, and a special diffusion pump to maintain a steady circulation of an appropriate rare gas through the system. Hilger & Watts are now able to supply these lamps in a permanently sealed off form. So far only copper and iron lamps have been produced in any number, but the company say that a variety of other lamps have been made experimentally. Cathodes can be made of any element that can be formed into a cylinder and which does not have too low a melting point. Alloys can be used, and in this way it is possible to incorporate elements that would not otherwise be suitable. About 750 volts are required for the operation of these lamps together with their ballast resistors and a suitable power unit for AC mains can be supplied. Inquiries should be made to the company at 98 St. Pancras Way, London N.W.1.

* * *

GRINDING or dispersing of materials in one-tenth of the time taken by an orthodox ball or pebble mill is claimed for the Steel-Shaw High Output 'Smalls' Department Mill (Mark II). It will mill to semi-paste consistency, grind materials wet or dry, and if necessary process four different formulations simultaneously. A leaflet issued by the company, Steele & Cowlishaw Ltd., Cooper Street, Hanley, Stoke-on-Trent, says that characteristics of finish obtained in grinding or dispersing a given formulation are identical to those obtained in an orthodox mill and there is no difficulty in matching up samples. In addition to the high rate of mixing and dispersion, a complete change over of materials can be effected in two or three minutes and the mill can be run almost continuously for the whole working period. The company offer to demonstrate the machine, using the customer's own materials, and to place their testing laboratories at his service.

Company News

Increase of Capital

SHARDLOW MALT EXTRACT CO. LTD., 30 Union Street, Burton-on-Trent, increased by £40,000 beyond the registered capital of £10,000.

Change of Name

MARGROS CHEMICALS LTD., manufacturers of varnish, white lead and zinc, etc., 12 Hillside Avenue, Wembley, Middlesex, to Margros Ltd., on 14 April.

New Registration

Dunford & Elliott Process Engineering Ltd. Private company (551,686.) Capital £70,000. To engage in the invention, design, manufacture, assembly, sale, erection and operation of equipment, machines and articles connected with chemical and food process plants of all kinds, etc. Directors: John B. Talbot-Crosbie, Herman Lindars and Charles W. Heathcote. Reg. office: Attercliffe Wharf Works, Sheffield 9.

Company News

Borax Consolidated Ltd.

At a board meeting held on 6 July the directors of Borax Consolidated Ltd. declared an interim dividend on the deferred ordinary stock of five per cent, less tax, to be paid on 9 September for the year ending 30 September, 1955, as against a four per cent interim last year.

Edwards High Vacuum

Edwards Alto Vuoto S.p.A., the firm in which Edwards High Vacuum has a controlling interest, has been incorporated with its offices in Milan in association with Societa Apparecchi Electtrici e Scientisici, with whom Edwards High Vacuum has had agency relationships for many years.

Diamond Alkali Co.

Earnings of the Diamond Alkali Chemical Co. of the US last year totalled $5,528,600, equivalent, after preferred dividends, to $2.21 per common share outstanding. This compares with $5,939,189 ($2.39) for the previous year. During the year the company spent $7,750,000 on expansion and modernisation of plant. In March this year the company acquired the Government-owned chlorine-caustic soda plant at Muscle Shoals, Alabama, which was built after the last wear at a cost of $21,000,000.

Simon-Carves Ltd.

The results for 1954 of Simon-Carves Ltd. are a record. Since the war the value of work carried out by the company has increased each year. In 1954 it approached £16,000,000, and indications are that this figure will be surpassed in 1955. Profits for 1954, after deducting all expenses, were £933,003 compared with £459,928 in 1953. Net profit after taxation was £434,954 compared with £138,025 in 1953. After transfer of £205,000 to reserves, the directors recommended a final dividend of 10 per cent, making 30 per cent for the year. In his statement the chairman, Mr. R. B. Potter, M.I.Mech.E., said: As regards the chemical plant department, Simon-Carves are probably the most important and experienced specialists in Britain in sulphuric acid plant construction. Besides being responsible for the majority of the modern contact sulphuric acid plants in this country, this department has a very profitable export business. Perhaps the department's most interesting work over the last few years was the construction of two large anhydrite plants for I.C.I., and the United Sulphuric Acid Corporation Ltd.

Ugine (Paris)

The year 1954 was one of marked progress for Ugine (Paris), manufacturers of electrochemical, electro-metallurgical, and electric steel products. Net profit for the year was Fr.1,232,429,044, as against Fr.806,780,463 in 1953, after appropriations of Fr.1,736,197,754; Fr.91,000,000 more than in the preceding year. It was proposed to distribute a dividend of Fr.550 per share of Fr.5,000, compared with Fr.470 in 1953.

C. C. Wakefield & Co.

For the second year in succession the C. C. Wakefield Company achieved record results. The group trading profit for 1954 was £3,860,107, an increase of £585,657 over 1953. Recently the company acquired a bulk installation, blending and oil filling plant in New Jersey, US.

Borax Interim

Borax Consolidated will pay an interim dividend on deferred ordinary of five per cent

[continued on page 146

Company News

continued from page 144

on 9 September. This is for the year ending 30 September, 1955, and goes against a four per cent interim last year. The bid by a US group for the firm's capital last January was rejected by the board.

Shawinigan Co.

At a recent meeting of the board of directors of The Shawinigan Water & Power Co. dividends were declared on the two issues of preferred shares and on the no par value common shares of the company. On the series A four per cent cumulative redeemable preferred shares the dividend was 50 cents a share, and on the series B four-and-a-half per cent cumulative redeemable preferred shares, 56¼ cents a share, both for the quarter ending 30 September, 1955, payable 2 October to shareholders of record 2 September, 1955. On the no par value common shares, the dividend was 30 cents a share for the quarter ending 30 June, 1955, payable 25 August, to shareholders on record 15 July.

Goodlass Wall & Lead Industries Ltd.

Group profits of Goodlass Wall & Lead Industries Ltd. for 1954, before taxation at £2,713,185, increased by £240,399. After deducting £1,360,106 in respect of taxation and certain adjustments for earlier years, and £65,488 representing the interests of outside shareholders in subsidiary companies, the net consolidated profit amounts to £1,287,591. The year was one of reasonable and steady activity, and the policy to develop the use of modern types of ready mixed paints based upon white lead was justified. Earnings of the Liverpool paint business showed a substantial increase over 1953, itself a record year. The zircon and special chemicals divisions completed their development stage and satisfactory progress in output was made. Income from trade investments was £215,000. The principal contributors to this sum being, British Titan Products Co. Ltd., and BALM Paints Pty. Ltd., Sydney (the new name of British Australian Lead Manufacturers' Pty. Ltd.), who had a record year. A final dividend of 11¼ per cent, less tax, on the ordinary stock, making a total for the year of 14 per cent, less tax, was recommended.

Jenson & Nicholson Group Ltd.

The profit of the Jenson & Nicholson Group Ltd., manufacturers of paint, before United Kingdom taxation, increased from £407,877 to £525,238, and the holding company's proportion after tax was £241,813 compared with £193,722. The available balance in the holding company is £206,759. Preference dividends and the interim dividend on the ordinary shares paid during 1954 absorb £29,752. The general reserve receives £60,000, and the pension reserve £25,000. A final dividend increased to 15 per cent, making 20 per cent for the year, was recommended.

Market Reports

LONDON.—There have been no outstanding changes on the week as regards either conditions or prices. Whilst the usual seasonal trend has reduced turnover in some sections, notably fertilisers and textile chemicals, the overall demand for industrial chemicals remains good. The effect of the recent strikes is likely to be felt for some time, particularly in the export field. Quotations generally are steady at recent levels, but some advance in prices would appear inevitable in the face of rising production costs. Business in the coal tar products market remains steady with a good call for crude and refined tar. Cresylic acid is moving well at the recently advanced quotation and there is a steady call for the light distillates.

MANCHESTER.—Holiday influences in textile and other consuming works in Lancashire continue to exert their usual seasonal influence on the demand for chemicals, but apart from this factor a steady movement of supplies of the leading heavy products has been reported on the Manchester market during the past week. Fresh inquiries and actual new bookings have been on a fair scale and have covered a wide range. Prices generally are firm and it is feared that the direct and indirect consequences of the sharp rise in fuel costs must inevitably be reflected in quotations for chemicals. Fertilisers continue on the quiet side, but a steady call for most of the by-products has again been experienced.

GLASGOW.—The Scottish heavy chemical market has been rather quiet during the past week due to the annual summer vacations. Some orders, however, are being placed for forward delivery. Prices on the whole have remained steady. A fair volume of inquiries are being received for the export market, with prospects good.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive, or a woman aged* 18-59 *inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order,* 1952.

INDUSTRIAL CHEMIST required by leading container closure manufacturers in Midlands. Progressive position requiring knowledge metal printing, varnishing, stoving, and metallurgy, associated with food packaging industry, Maximum age 35 years.—Written applications, with details of experience previous appointments, etc., to **P. A. METAL CLOSURES LTD., BROMFORD LANE, WEST BROMWICH, STAFFS.**

CHEMISTS, capable of occupying responsible positions in Australia, required by **LEWIS BERGER & SONS (AUSTRALIA) PTY. LTD., SYDNEY.** Minimum qualifications B.Sc. Age 30-40. Senior posts require at least 8 years' experience in the Paint, Varnish and Lacquer Industry. Applicants must have had service in a position of responsibility calling for organising ability and initiative. Suitable applicants will be interviewed in London during July or August. Apply in strict confidence, giving full details, to **PERSONNEL OFFICER, BERGER HOUSE, BERKELEY SQUARE, W.1.** marking applications "Australia."

THE DISTILLERS COMPANY LIMITED.

THE COMPANY has the following vacancies for staff in its Research, Development and Production Units situated at or near London, Hull, Cardiff and Liverpool.

(a)– CHEMISTS—research, production and control
(b)– CHEMICAL ENGINEERS—design and development, production control
(c)– MICROBIOLOGISTS—research, production and control
(d)– MYCOLOGISTS—production and control
(e)– PHARMACISTS—production and control

These posts involve work on organic chemicals, plastics or antibiotics. Applicants should have good professional qualifications and preferably some experience. Realistic salaries, opportunities for advancement. Non-contributory pension scheme and good general conditions of service. **Apply: Staff Manager, The Distillers Co., Ltd. 21 St. James' Square, London, S.W.1. Please quote: Ref. 35/55.**

ENGINEER, CHEMICAL ENGINEER OR CHEMIST with Engineering, Chemical & Technical Sales experience for developing and marketing Petroleum Chemical Plant, required by **THE POWER-GAS CORPORATION LTD., STOCKTON-ON-TEES.** Age about 30 years. The appointment will be confirmed on a permanent basis if satisfactory after a trial period of twelve months. It is anticipated that the post will involve periodic journeys abroad and in making the appointment emphasis will be placed on ability to grasp new ideas and techniques, together with initiative and commonsense.

CHEMIST with experience of synthetic detergents wanted for formulating and testing of detergent blends for wide range of industrial uses. The post offers excellent prospects and, depending on experience, can immediately carry a four figure salary. The Company have a well equipped laboratory situated in South Midlands and operate a five day week, pension fund, social club and canteen. All applications treated in strict confidence. Write **BOX C.A.711. c/o 191, GRESHAM HOUSE, E.C.2.**

UNILEVER LTD. has vacancies for **CHEMISTS** and **BIOCHEMISTS** in its Food Research Laboratory situated in a country estate near Bedford.

The Laboratory carries out research and development work on a wide range of human and animal foods of interest to Unilever Ltd. in the U.K. and overseas. The problems are both fundamental and applied, and the staff includes experts in the fields of chemistry, biochemistry, bacteriology, agriculture and nutrition.

The Laboratory investigations are supported by field studies in the well stocked animal houses on the 1,200-acre estate in which the laboratory stands. The research work is interesting and satisfying and offers plenty of scope for initiative and imagination. There are opportunities for promotion, not only in the Food Research Laboratory itself but also in Unilever production units all over the world.

The positions and the salaries will appeal to first class honours graduates with two or three years' research experience.

Successful candidates will be eligible for membership of the Company's Superannuation Fund and Widows' Pension Scheme.

Please apply, giving full information of age, qualifications and experience, to: **PERSONNEL DIVISION (WAD 89), UNILEVER LTD., UNILEVER HOUSE, BLACKFRIARS, E.C.4.**

FOR SALE

CHARCOAL, ANIMAL AND VEGETABLE horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "INVICTA" WORKS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH LONDON." TELEPHONE: 3285 EAST.

DEHNE FILTER PRESS—26 cast-iron plates, 25 in. by 25 in. 2 in. centre hole; screw 3½ in. diam.; 2 columns 3½ in.; overall 9 ft. by 3 ft. 4 in. by 4 ft. high.

Good condition.
THOMPSON & SON (MILLWALL), LTD., LONDON, E.14.
Tel. EAST 1844.

MONEL METAL RIVETS, ⅛ in. by 5/16 in., ⅛ in. by ⅜ in., ⅛ in. by ½ in. Round head, 7s. 6d. per lb. and mixture $\frac{3}{32}$ in. diam. to $\frac{3}{16}$ in. diam. 7s. 6d. per lb. 2 lb. post free. Also send for my list of 1,000 interesting items. Nuts, bolts, screws, etc., etc. **K. R. WHISTON (DEPT. CA), NEW MILLS, STOCKPORT.**

FOR SALE Sulphuric Acid and Ammonia liquor empty drums guaranteed in first-class condition, complying with all Board of Trade regulations. Available for immediate delivery at prices well below those of new drums. Sizes 10-15-33-40-50 and 64 gallons, available in stock.
STEEL DRUMS LIMITED, 118, BURDON LANE, SUTTON, SURREY. Telephone: Vigilant 4886.

MORTON, SON AND WARD LIMITED offer **TWO** 50g **STAINLESS STEEL AUTOCLAVES,** 50 lb. p.s.i. internal pressure 20g stainless steel **JACKETED PAN,** bottom outlet, 40 lb. p.s.i., w.p. **NEW** stainless steel **CONTAINERS,** outlets optional, closed or open. **MIXERS 'MORWARD' 'U'** shaped **TROUGH MIXERS** in s.s. or m.s. made in all sizes, jacketed or otherwise. Scroll or paddle type agitators. 3 cwt. **TROUGH MIXER** by **CHALMERS,** s.s. lined tilting trough. 3 cwt. **TROUGH MIXERS** by **GARDNER,** s.s. lined troughs. **STRUCTURAL** and general **FABRICATION** requirements catered for **PUMPS.** A selection of new **MONO** and other second hand **PUMPS** in stock. 2" to 5". **ENQUIRIES INVITED, MORTON, SON AND WARD LIMITED, WALK MILL, DOBCROSS, NR. OLDHAM,** Lancs. Telephone: Saddleworth 437.

PHONE 98 STAINES

WELDED STEEL PRESSURE TANK—3,350 gal., 22 ft. 6 in. by 5 ft. 6 in. by ½ in. plate.
STAINLESS STEEL JACKETED PANS—100, 35 and 25 gal.
UNUSED STAINLESS STEEL PORTABLE STIRRERS or Emulsifiers ¼, ½, 1 and 2 h.p. A.C.
WELDED STEEL JACKETED PANS AND MIXERS 20, 40, 50, 75 and 100 gal.
ALUMINIUM TANKS—1,000 and 1,500 gal.
(30) **"Z" AND FIN BLADE MIXERS**—up to 38 in. by 28 in. by 31 in.
(17) **"U"-TROUGH MIXERS AND SIFTER/MIXERS** up to 7 ft. 6 in. by 3 ft. by 3 ft.
REFINERS, HYDROS, CONDENSERS, PUMPS, AUTOCLAVES, FILTER PRESSES, STILLS, BOILERS, etc.
HARRY H. GARDAM & CO., LTD., STAINES.

REDUNDANT WORKS PLANT FOR DISPOSAL

38—24 in. gauge, flat top Trucks, flange wheels 4 in. by 2 in. channel chassis, 5 ft. by 4 ft. by ½ in. thick steel top plate.
1—6 in. Gresham & Craven Compressed Air Ejector Pump.
2—Petrol driven Lewin hand controlled Factory Road Sweepers, 39 in. and 48 in. brushes.
1—Parsons Batch Weigher, dial reading 0—4,000 lb. in 10 lb. divisions.
Low offers accepted to clear from site.
BOX No. C.A. 3419, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.

TWO BRAND NEW STERILISING VESSELS—7 ft. long by 3 ft. diameter.
One S. J. WERNER MIXER with pan approx. 2 ft. by 2 ft. of the tilting type.
Two steam jacketed **CAST-IRON FILTER PRESSES**—each with 38 s.j. plates and 39 frames, cake size 2 ft. 4 in. square.
Several JOHNSON CAST-IRON FILTER PRESSES—various sizes and types.
GARDNER MIXERS and Mixers and Sifters combined, sizes "E," "G," "H" and experimental.
HYDRO EXTRACTORS—24 in., 30 in. and 36 in.
Two Gardner "H" size Steam-jacketed **MIXERS.**
Two 18 in. **KEK PLATE MILLS**—with feeders delivery bins, motors and entablature.
Two No. 4 **SUPER MIRACLE MILLS** with motors and starters.
Three Single-effect **EVAPORATORS** by Scott with pumps and motors.
RICHARD SIZER, LTD. ENGINEERS, HULL.
Telephone: 31743.

600

HORIZ. Steam Jacketed **DRIER** by Passburg, 23 ft. by 4 ft. diam. Fitted revolving reel of ten 4 in. diam. tubes around central tube, steam heated. Intermediate paddles for agitator. Jacket W.P. 2 ats. With Condenser, Wet Vacuum Pump and fittings.
Steel lined, water jacketed **BALL MILL** by Torrance. Int. dimens. 7 ft. 2½ in. by 5 ft. 8½ in. diam. Pebble charge. Motorised 25 h.p. through Reduction Gear.
4 Unused **DIGESTORS** or **CARBONATORS** CO^2 impregnation, by Hopkins. Copper constr. 42 in. long by 18 in. diam. fitted Agitator, geared motor drive 400/3/50. In steel frame and with all fittings.
Horiz. **AUTOCLAVE** 54 in. diam. by 8 ft. 3 in. Riveted M.S. constr. dished end. Chamber suitable for 50/70 lb. sq. in. and jacket 50 lb. sq. in. pressures.
NEW PORCELAIN AND SILEX LINED BALL MILLS, capacities ranging from 9 galls. to 260 galls.
NEW STAINLESS STEEL STORAGE VESSELS AND TANKS, capacities ranging from 8 galls. to 1,000 galls.
GEORGE COHEN SONS & CO. LTD., WOOD LANE, LONDON, W.12.
Tel.: Shepherds Bush 2070 and
STANNINGLEY, NR. LEEDS.
Tel.: Pudsey 2241.

SACK AND BAG MERCHANTS AND MANUFACTURERS. New and reconditioned for Home and Export. (Use JUTEX for sack repairing). ALTRINCHAM JUTE LTD., WRIGHT STREET, BROADHEATH, ALTRINCHAM, CHESHIRE. ALTrincham 4360.

SELWOOD FOR PLANT. STORAGE TANKS FOR SALE
SECTIONAL TYPE 1,200 gallon to 24,000 gallon
HORIZONTAL CYLINDRICAL 500 gallon to 12,000 gallon, new and secondhand.
VERTICAL CYLINDRICAL 250 gallon TVO to 9,000 gallon.
RECTANGULAR ENCLOSED 100 gallon to 1,200 gallon, new and secondhand.
OVAL LORRY MOUNTING 200 gallon to 4,000 gallon, all types.
FULL LIST ON REQUEST. WILLIAM R. SELWOOD LTD. CHANDLER'S FORD, Hants. Phone 2275.

TEFLON! Ask for our price list for Joints, Strips, Rods, Discs, Valves and the newest cloth made of TEFLON. **MACHINERY (CONTINENTAL) LIMITED, 175,** Brompton Road, London S.W.3. Telephone: Kensington 6228 (three lines).

STORAGE

12—Excellent All Welded M.S. Tanks, 30 ft. by 9 ft. diam. by approx. ⅜ in. plate. Capacity 12,000 galls. Ready for use. Prompt delivery.
MADEN & McKEE, LTD., 317, PRESCOT ROAD, LIVERPOOL, 13
Tel.: Stoneycroft 2727-8. Grams: "Maden" Liverpool.

WANTED

INDUSTRIAL BY-PRODUCTS, LTD., 16, Philpot Lane, London, E.C.3, will be pleased to receive particulars of any by-products, waste materials and residues for disposal.

PROCESS SALVAGE, LTD., offer the highest prices obtainable in this country for 40/45-gallon bung type and full aperture **STEEL DRUMS.** We are interested in purchasing any quantities of either type you may have available for disposal and can arrange for cash payments and immediate collections.— Please ring Advance 1676 (four lines) or write **PURCHASING DEPARTMENT, PROCESS SALVAGE, LTD., 79/83 COBORN RD., BOW, LONDON, E.C.3.**

Wanted—*continued*

WANTED—MANESTY No. 3 AND No. 2 TABLETTING MACHINES OF POST-WAR MANUFACTURE. WRITE TO BOX No. C.A. 3420, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.

PATENTS

THE proprietor of British Patent No. 621480, entitled "**VITREOUS COMPOSITIONS OF MATTER, AND METHODS OF MAKING THE SAME**" offers same for license or otherwise to ensure practical working in Great Britian. Inquiries to **SINGER, STERN & CARLBERG, 14 E. JACKSON BLVD., CHICAGO 4, ILLINOIS, U.S.A.**

THE proprietor of British Patent No. 621897, entitled. "**METHOD AND APPARATUS FOR SEPARATING GASES OR VAPORS FROM MIXTURES THEREOF**" offers same for license or otherwise to ensure practical working in Great Britain. Inquiries to **SINGER, STERN & CARLBERG, 14 E. JACKSON BLVD., CHICAGO 4, ILLINOIS, U.S.A.**

IT is desired to secure the full commercial development in the United Kingdom of British Patent No. 672851, which relates to "**PROCESS FOR THE PRODUCTION OF ALIPHATIC ANHYDRIDES,**" either by way of the grant of licences or otherwise on terms acceptable to the Patentee. Interested parties desiring copies of the patent specifications, should apply to **STEVENS, LANGNER, PARRY & ROLLINSON, 5 to 9, QUALITY COURT, CHANCERY LANE, LONDON, W.C.2.**

INVITATION TO TENDER

CAUSTIC POTASH

THE BOARD OF TRADE invites tenders for the following :—

(1) For the sale of : (*a*) approximately 39½ tons net solid Caustic Potash, 88/90 per cent grade, of French origin ; (*b*) approximately 18½ tons net solid Caustic Potash, 90/92 per cent grade, of West German origin ; (*c*) approximately 28½ tons net Caustic Potash Pellets, BP grade, of Swedish origin.

The above quantities are located at various depots in South Wales.

(2) For the purchase of : (*a*) 28 tons 7 cwt. Caustic Potash Pellets, BP grade, in specified packings ; (*b*) 58 tons solid Casutic Potash, 95 per cent grade, in specified packings.

The above quantities are to be delivered to the Board of Trade Depot, Gilwern, near Abergavenny, Monmouthshire.

Full details and Forms of Tender may be obtained from the **BOARD OF TRADE, C. & G. DIVISION 8(B), ROOM 317, LACON HOUSE, THEOBALDS ROAD, LONDON, W.C.1** (telephone : Chancery 4411, extension 329).

AUCTIONEERS, VALUERS, Etc.

EDWARD RUSHTON, SON AND KENYON (Established 1855).

Auctioneers, Valuers and Fire Loss Assessors of CHEMICAL WORKS PLANT AND MACHINERY
York House, 12 York Street Manchester.

Telephone 1937 (2 lines) Central Manchester.

WORK WANTED & OFFERED

CRUSHING, GRINDING, MIXING and DRYING for the trade.
THE CRACK PULVERISING MILLS LTD
Plantation House,
Mincing Lane,
London, E.C.2.

GRINDING, CRUSHING AND GRADING
FINE GRINDING LTD.,
BLACKHOLE MINE, EYAM
TELEPHONE : EYAM 227

PULVERISING of every description of chemical and other materials for the trade with improved mills, wharfage, and storage facilities. **THOS. HILL-JONES, LTD., "INVICTA" WORKS, BOW COMMON LANE, LONDON, E. TELEGRAMS : "HILL-JONES, BOCHURCH LONDON." TELEPHONE : 3285 EAST.**

BUSINESS OPPORTUNITY

EXTRUSIONS BY MARLEY

BUYERS requiring rigid and flexible tubes and sections in thermoplastic materials, should ask for a quotation from

MARLEY EXTRUSIONS, LTD.,
DEPT. 153
LENHAM,
MAIDSTONE,
KENT.
Harrietsham 381.

INDEX to advertisers in this issue

Printed in Great Britain by THE PRESS AT COOMBELANDS LTD., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154 Fleet Street, E.C.4, 16 July, 1955. Registered at the General Post Office. Entered as Second Class Matter at the New York U.S.A., Post Office.