THE Chemical Age

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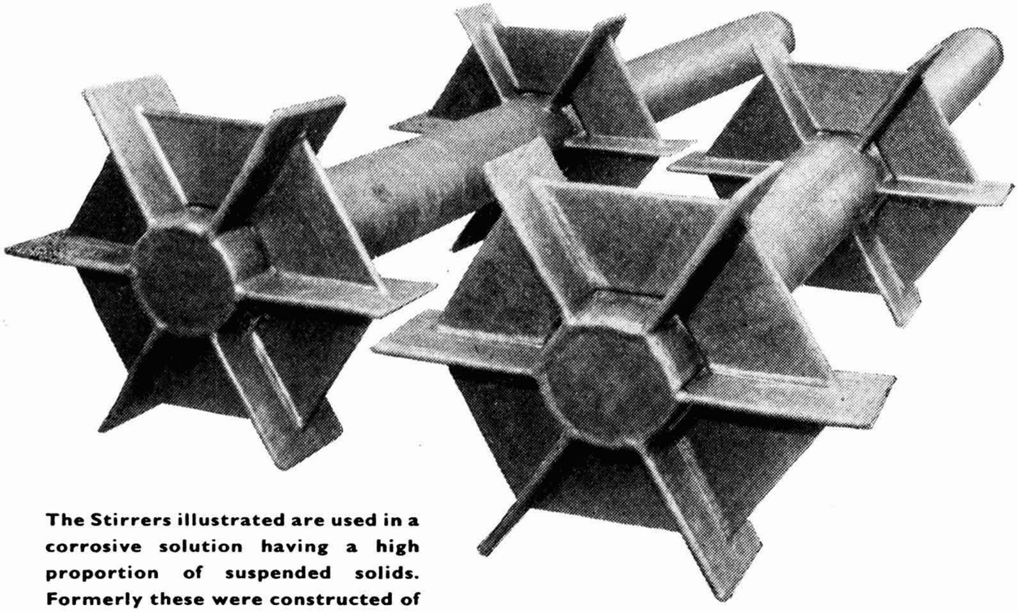

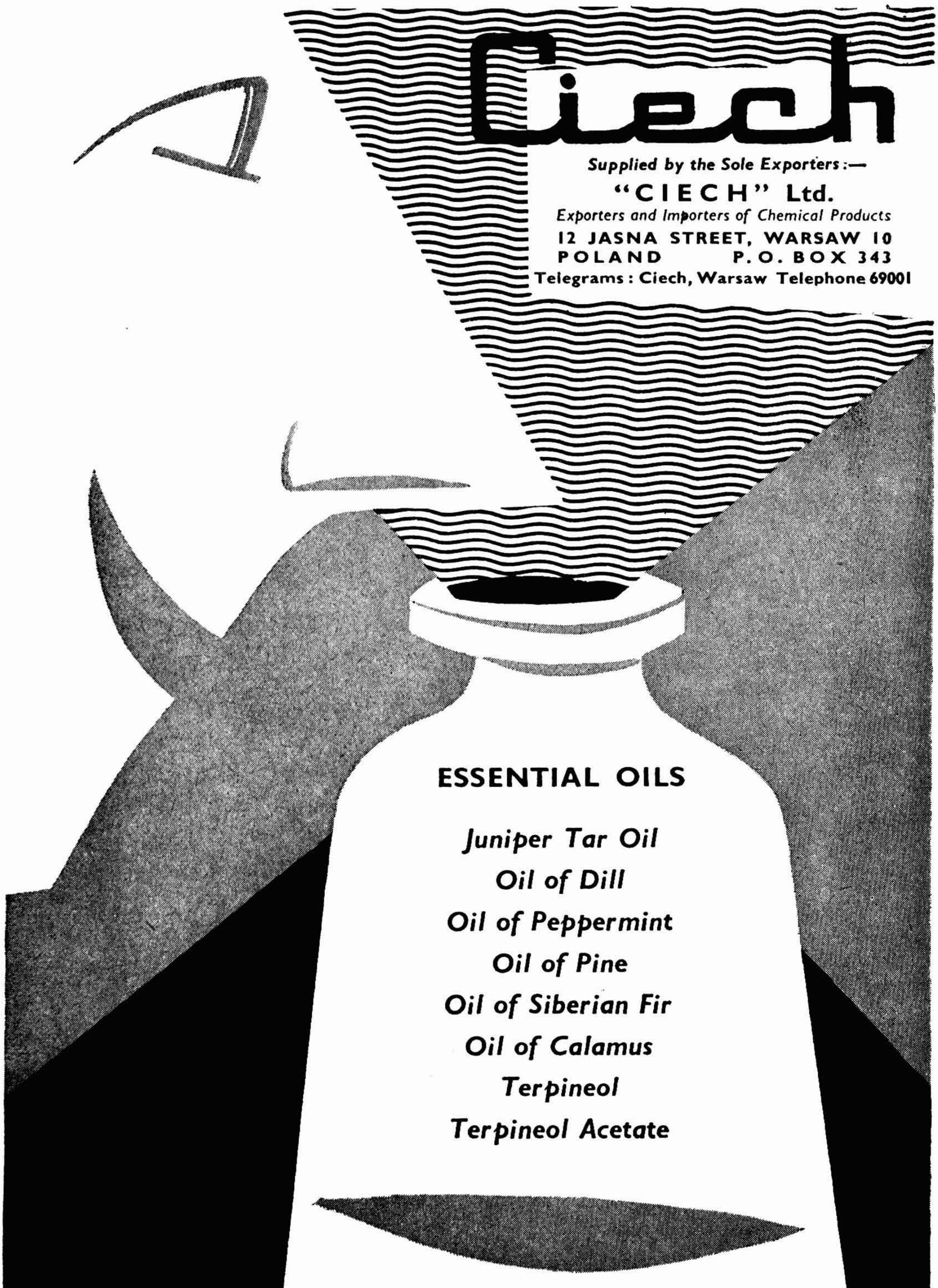
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# The Chemical Age

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# 'Mr. Therm'

THE Gas Council's Report for 1954-55 is as satisfactory an account-rendering as post-war nationalised industry has yet produced. In approximate figures, a profit of £2,500,000 has been made from a gross income of £325,000,000. Making £2 10s. on every £325-worth of sales is certainly modest enough, but those who believe that nationalised industry should aim at providing public services at near-cost rather than with high profit will regard this as an excellent profit/income ratio. A second point for respect is the reduction in number of employees from 145,031 at the end of the previous year to 143,378; this fall has been accompanied by rises in the production of gas, coke, and other products.

However, our interest in the Gas Council's Report is not so much commercial-cum-political as technical. The gas industry is trying hard and persistently to become less dependent upon its nationalised brother, the coal industry. Three non-coal-using routes to gas are being pursued, the gasification of heavy oil, prospecting for natural gas, and the importation of liquefied natural gas. The first of these is already in practice, the second and third are being explored. Heavy oil is being gasified at five plants; 16 more such plants are on order or being erected; nine more are under consideration. With the first 21 plants in operation a saving of 364,000 tons of coal per year is estimated—alas, that the fuel position of this country must make us think in terms of saving and not in terms of adding to our basic resources! The exploration programme for natural gas has continued, but as yet there are no notes of triumph to be sounded—the Midlothian source has been disappointing enough to be temporarily forgotten, but the Ashdown Forest area in Sussex is still encouraging. The Gas Council deserve a little luck in this venture, but it looks as if any ultimate success will have to arrive the hard way. We must not forget that over 20 per cent of continental Europe's gas production is derived from natural gas; indeed, the British gas industry is almost unique in having to produce all its gas by converting non-gaseous fuels (though there is now the exception of methane recovery from coal mines at Whitehaven and Flintshire). The idea of importing liquefied natural gas is new. An American project to conduct liquefied natural gas from the Gulf of Mexico to Chicago would seem to be the inspiring prototype. Liquefaction by cooling and keeping the liquid at normal pressure are the contemplated conditions, and the large quantities of wasted natural and oilfield gases in the Middle East the potential sources. Transporting and handling such a material can hardly be technically simple; various hazards must first find their scientific safeguards. Nevertheless, it does not seem beyond the bounds of modern 'know-how' to bring about an economic development of this idea. The attempt to develop it for Britain should proceed even if the Mexico-Chicago project in the Western Hemisphere fails, for there the economic impulse is not as pressing.

The more chemical aspects of the industry are somewhat thinly treated in the Report. There may in this be some error of emphasis, for nothing so strengthens the gas industry's claim for priority in fuel supply as the fact that otherwise wasted chemical by-products can be recovered. A new point raised—new at any rate in our reading—is that the bog ore type of iron oxide commonly used for removing $H_2S$ from gas and chiefly supplied by Holland and Denmark is approaching exhaustion. Research is investigating the possibilities of using other and more readily available iron oxide forms, and at the same time the cumbersome type of plant often used is being studied for simplification. Ferrous sulphate is available as a large-scale by-product of the titanium pigment industry; treating this with ammoniacal liquor yields ammonium sulphate and iron oxide. A plant to handle 10,000 tons of ferrous sulphate is to be erected at a North Thames Board works. This certainly suggests that imported bog ore is not indispensable.

Tar, crude or refined, and ammonia, whether as liquor or sulphate, have not had to search for markets either at home or abroad. Tar sales have risen despite competition from oil refinery products; lessening demand for road tars at home has been readily balanced by increased export selling to both dollar and sterling areas, and this, of course, is a technico-economic trend that suits our present national economy. Creosote sales to the US have also been high. The tendency in America to use more and more natural gas creates an expanding market for the by-products of coal-based gas manufacture. Benzole production by the gas industry has risen again—by about 4 per cent—and this must be regarded as particularly commendable when the overall limitation to benzole by-production is the restricted coal supply. The fertiliser use of ammoniacal liquor has continued to expand, and this material now ranks for fertiliser subsidy payment.

By far the most important aspect of the Coal Board's affairs, however, is the question of priority for coal supply. If this needed further emphasis, the Beaver Report surely has been sufficient. Air pollution has been estimated to cost the nation some £250,000,000 per year in terms of losses to which monetary value can be ascribed. The true loss is even larger. Coal gasification provides two kinds of smokeless fuel—gas itself, and the cokes or semi-cokes. In the badly polluted areas of the country, remedy depends upon replacing with equivalent smokeless fuels 19,000,000 tons of coal now burnt domestically. Yet when the coal industry is tightly rationed for its supply of the best coke-making coals, this same type of coal is heavily used to create smoke from household chimneys. If the gas industry is to produce more coke—and also better coke so that this becomes a more popular fuel for open grates—it must use less coke for water-gas production and it must have more coal for carbonisation. The drives to use heavy oil in gas-making and to find or import natural gas are perhaps more likely to increase coke supplies (by reducing secondary use of coke for gas production) than to save coal. Yet this kind of progress must be small now and slow for years to come. Similarly, it is being suggested that industrial users of gas-coke should use hard coke, oil, or small coals instead so that coke supplies for the domestic market can be increased. This would transfer the smoke-control problem from many chimneys to a few, but it would surely be a harsh and retrograde dictate for the factory that converted itself from coal to coke some years ago in order to reduce air pollution. Again, progress towards cleaner air by this means must be small and slow.

The true solution cannot be found in these reshufflings of coke use. They are trivial palliatives when set against the full-scale background of Britain's dirty civic air. What is needed, and what has been so short-sightedly neglected, is a large expansion of the gas industry. It should handle more of the coal that is brought up from the mines whether or not the country's coal output remains disappointingly static. When the gas and electricity industries were both nationalised, the 'popular' view that gas is old-fashioned and electricity is 'modern' was given far too much elbow-room. Huge capital injections were permitted for power-stations, and by contrast the gas industry was allowed only a snail-paced amount of development. We have said this before, but it seems to need constant repetition—coal is a chemical storehouse and the least wasteful way of treating it is to dissociate its various constituents.

# Notes & Comments

## Patronage & Productivity

A NEW note in industrial grants for educational establishments has certainly been struck by the US firm, Eastman Kodak. Privately supported schools and colleges will receive yearly grants scaled according to the number of former students and graduates who have entered Eastman Kodak employment. It is stated (*Chemical & Engineering News*, 1955, **33**, 4192) that about $300,000 will be granted to some 50 educational establishments. The determining factor will be the number of graduates who joined Eastman Kodak five years before and who are still in the firm's service. Schools, if privately funded, will receive $500 for each year the graduate was a pupil. It can hardly be denied that this scheme is an open, employment-selling venture, as closely relating payments with recruitment as any incentive scheme in a factory. If it is true that American higher education is needing more and more financial aid, the inducement for headmasters and college deans to guide promising material towards Eastman Kodak is powerful without being subtle. No doubt both in this country and in America a good deal of the voluntary assistance given by firms to educational centres has had some connection with the value of graduates as recruits. Hitherto, this *motif* has been concealed and limited by broader and less precisely calculated considerations. We doubt if this new development is an improvement and we hope that it will not be imitated by British companies here. When bread is cast upon well-chosen waters, there should be no need to measure out the crumbs according to receipts.

## Penicillin & Pork

ADDING antibiotics to the diets of pigs or poultry seemed to have passed from debate to established practice, but a new paper from the Cambridge School of Agriculture (R. E. Evans, *J. Agric. Science*, 1955, **46**, 329) has thrown in another spanner of doubt. In the research reported, tests (with pigs) have been conducted by the individual-feeding method; for as the benefits from antibiotic additions are in any case small, the group-feeding method of comparison can be said to be insufficiently sensitive. The standard error in group-feeding work may be as high as 12.5 per cent; yet additions of antibiotics are not claimed to bring weight advantages which are as large as this margin of error. Where the basic diet contained white fish meal, and therefore was not an all-vegetable diet, the new tests failed to show any benefit (from penicillin additions) that reached statistical significance. All that could be said was that the 'trend' was in favour of the antibiotic supplementation. However, there is no practical gain in that for the commercial pig-raiser. With all-vegetable diets, however, penicillin additions increased eagerness of appetite and efficiency of food conversion. The penicillin-fed pigs reached 190 lb. liveweight 5.3 days sooner and on 19 lb. less meal. But it was felt that the full benefits of adding penicillin were not likely to be gained unless pigs had an *ad lib* all-vegetable diet, i.e., enabling them to take maximum advantage of the stimulated appetite. When this supposition was put to test, strikingly good early gains were made by penicillin-fed pigs, but as time went on this differential faded. After 11 weeks, in fact, the pigs not receiving penicillin supplements had slightly higher weights, suggesting that at some point in development the earlier stimulus was checked by some negative influence, perhaps the simple one of over-eating.

## A Disturbing Development

THE general conclusion drawn from this very thorough study is that penicillin additions are not sufficiently beneficial to be economically worth while, assuming that pigs are healthy and fed on a normally balanced diet. This finding is published at a time when antibiotic supplements are being extensively advertised and, to judge from commercial data, are being also widely used. Is there some divergence between the conditions of research and the average conditions of pig-farming? This might well be the explanation. It seems a pity that penicillin was chosen as the test antibiotic, for there is considerable evidence that aureomycin and terramycin give larger benefits, sometimes exceeding those of penicillin by half as much again. Aureomycin is already much used here for this purpose and the new factory in Kent (see THE CHEMICAL AGE, 1955, **73,** 773) for terramycin will no doubt widen the use of the other. Even so, it is disturbing that research verdicts of this doubting nature should emerge at so late a stage in commercial development. An independent survey of *commercial* results should be initiated by the Ministry of Agriculture.

## *Russians See Petrochemicals*

PETROCHEMICALS Carrington, Manchester, plant was included in the itinerary of the Russian trade delegation which visited this country earlier this month to study British industry. Heading the party of visitors to the works at Carrington was Mr. A. N Kosygin, deputy chairman of the Soviet Council of Ministers. Also in the delegation was Mr. D. P. Novikov, the deputy minister for chemical industry.

The Russians showed interest in the processes by which Petrochemicals Ltd., a wholly-owned subsidiary of Shell Chemical Co. Ltd., produce their range of petroleum-derived organic chemicals.

Guides to the party during the visit were Mr. W. E. Huggett, works manager, Mr. S. W. A. Patterson, assistant works manager, Mr. G. F. Dutton, chief engineer, and Mr. C. Powell, office services manager. Through an interpreter, the Soviet engineering representative commented on the stress placed upon the development and use of new materials by British industry. This was, he said, also a feature of Soviet industry.

### Kwinana Opening Ceremony

Among the guests who attended the official opening of BP's £32,000,000 Kwinana Refinery by Field Marshal Sir William Slim, Governor-General of Australia, on 25 October, were the Premier of Western Australia (the Hon. A. R. G. Hawke) and members of his Cabinet, the Leader of the Opposition (Sir Ross McLarty), and Lord Strathalmond, BP's chairman. The refinery, which has been operating since February, is employing a new bitumen process developed by BP chemists in Britain, as mentioned some time ago in THE CHEMICAL AGE.

### British Chrome & Chemicals

British Chrome & Chemicals Ltd., 6 Arlington Street, London S.W.1, are proceeding with plans for the erection of a new factory outside the boundary of Hull City, on a site to the south of Hedon Road.

***Mr. A. N. Kosygin, Deputy Chairman of the Soviet Council of Ministers, signs Petrochemicals' Visitors' Book during the recent visit of the Russian trade delegation to the Company's plant at Manchester. On his right is Mr. W. E. Huggett, works manager of the company***

# Chemical Exports for September

## Australia, India and SA Still Principal Buyers

AUSTRALIA was by far the largest importer of British chemicals last month, being the first country to exceed the £2,000,000 mark for some time. The total value of exports is less than for August but is appreciably up on the corresponding month last year. One of the most striking features is in exports to Mauritius which have increased by over 300 per cent compared with last month.

Noticeable among exports of individual products is the steady increase shown by sulphonamides. The various alcohols taken as a group have also shown a substantial increase. Plastics materials, which formerly have shown steady increases, are almost the same for last month.

There have been no significant changes in exports of basic inorganic compounds. Amounts in general are slightly down on August. One notable exception to this is aluminium oxide which increased from two tons in August to over 1,000 tons in September. The results of the dock strike, which are still being felt by many exporters, may possibly account for this anomalous figure.

EXPORTS : PRINCIPAL COMMODITIES

| | Sept. 1955 | Aug. 1955 | Sept. 1954 |
|---|---|---|---|
| Acids, inorganic (cwt.) | 17,678 | 16,717 | 22,384 |
| Copper sulphate (tons) | 1,956 | 4,587 | 607 |
| Sodium hydroxide (cwt.) | 358,986 | 441,696 | 288,180 |
| Sodium carbonate (cwt.) | 421,967 | 413,220 | 357,855 |
| Aluminium oxide (tons) | 1,009 | 2 | 1,513 |
| Aluminium sulphate (tons) | 4,669 | 3,759 | 2,629 |
| Ammonia (cwt.) | 11,554 | 9,391 | 8,530 |
| Bismuth compounds (lb.) | 22,406 | 24,543 | 17,565 |
| Bleaching powder (cwt.) | 29,162 | 52,424 | 29,023 |
| Hydrosulphite (cwt.) | 11,378 | 15,488 | 7,450 |
| Calcium compounds, inorganic (cwt.) | 44,696 | 29,969 | 31,550 |
| Lead compounds, inorganic (cwt.) | 5,362 | 6,416 | 5,769 |
| Magnesium compounds (tons) | 2,593 | 1,259 | 2,083 |
| Nickel salts (cwt.) | 7,394 | 7,615 | 3,624 |
| Potassium compounds (cwt.) | 6,221 | 5 610 | 1.935 |
| Acids, organic, & derivatives (value in £s) | 73,227 | 85,498 | 79,805 |
| Ethyl, methyl, etc. alcohols (value in £s) | 158,010 | 109,373 | 132,745 |
| Acetone (cwt.) | 10,381 | 5,297 | 12,675 |
| Citric acid (cwt.) | 2,385 | 3,157 | 2,020 |
| Sulphonamides, unprep. (lb.) | 143,383 | 129,358 | 41,858 |
| Dyestuffs intermediates (cwt.) | 8,286 | 9,678 | 4,027 |
| **Total for elements & compounds in £s** | **£4,694,381** | **£5,196,703** | **£3,900,476** |
| Coal tar (tons) | 13,450 | 17,586 | 19,416 |
| Cresylic acid (gal.) | 244,732 | 336,847 | 127,687 |
| Creosote oil (gal.) | 1,184,730 | 1,526,730 | 1,087,395 |
| **Total for tar products in £s** | **£309,170** | **£407,774** | **£309,134** |
| Indigo, synthetic (cwt.) | 2,805 | 1,801 | 1,404 |
| **Total for synthetic dyestuffs (cwt.)** | **18,167** | **23,707** | **17,576** |
| **Total for paints, pigments & tannins in £s** | **£1,955,594** | **£2,058,582** | **£1,386,409** |
| **Total for medicinal & pharmaceutical products in £s** | **£3,053,274** | **£3,226,612** | **£2,642,836** |
| **Total for essential oils, perfumes, etc. in £s** | **£2,420,088** | **£2,526,821** | **£1,742,367** |
| Ammonium nitrate (tons) | 847 | 307 | 1,077 |
| Ammonium sulphate (tons) | 24,172 | 15,884 | 27,109 |
| **Total for all fertilisers in £s** | **£535,171** | **£341,229** | **£554,854** |
| **Total for plastics materials (cwt.)** | **143,646** | **149,010** | **128,594** |
| Disinfectants, etc. (cwt.) | 15,294 | 23,727 | 14,657 |
| Insecticides, fungicides (cwt.) | 52,881 | 63,043 | 33,330 |
| Rodenticides & weedkillers (cwt,) | 2,753 | 5,914 | 2,944 |
| Lead tetra-ethyl (gal.) | 342,658 | 642,497 | 407,494 |

VALUE OF EXPORTS IN £ : PRINCIPAL BUYERS OF CHEMICALS

| | Sept. 1955 | Aug. 1955 | Sept. 1954 |
|---|---|---|---|
| Australia | 2,121,669 | 1,731,750 | 1,837,361 |
| India | 1,628,320 | 1,867,198 | 1,139,976 |
| South Africa | 1,048,040 | 1,074,505 | 623,363 |
| New Zealand | 918,890 | 665,125 | 645,738 |
| Netherlands | 685,011 | 465,909 | 595,127 |
| United States | 679,247 | 676,792 | 558,887 |
| Canada | 656,761 | 769,778 | 422,093 |
| Sweden | 508,323 | 424,910 | 442,003 |
| Nigeria | 504,496 | 595,527 | 262,273 |
| Italy | 481,439 | 467,550 | 377,945 |
| Belgium | 481,320 | 455,892 | 357,713 |
| Eire | 478,617 | 489,999 | 498,147 |
| Malaya | 474,537 | 372,246 | 245,901 |
| Western Germany | 462,270 | 438,340 | 391,642 |
| Indonesia | 420,165 | 181,285 | 161,835 |
| France | 402,654 | 415,028 | 443,797 |
| Singapore | 402,108 | 432,920 | 331,901 |
| Gold Coast | 356,153 | 453,249 | 307,973 |
| Denmark | 316,518 | 275,695 | 296,269 |
| Pakistan | 294,256 | 551,962 | 304,237 |
| Burma | 286,556 | 300,844 | 205,157 |
| Ceylon | 262,689 | 311,123 | 289,980 |
| Mauritius | 258,930 | 83,486 | 98,520 |
| **Total value of chenical exports** | **20,383,688** | **22,605,720** | **16,558,951** |

## *BLSGMA Dinner*

PRINCIPAL guest at the annual dinner of the British Lampblown Scientific Glassware Manufacturers' Association Ltd. at Plantation House, Mincing Lane, London, on 19 October, was Mr. E. A. S. Alexander, president of the Glass Manufacturers' Federation.

In his speech, Mr. Alexander said that despite the introduction of mechanical means of production a high degree of craftsmanship was still required to produce many scientific glassware products. From 1939 to 1945, he added, the output of the scientific glassware industry was doubled, but the present time was a period of increasiing competition.

Replying to Mr. Alexander, the president of the Association, Mr. I. B. Throndsen, paid tribute to the work of Mr. Alexander for the Glass Manufacturers' Federation, and in the creation of the new headquarters at 19 Portland Place, London. The Federation, which provided the secretarial services for the BLSGMA, had an active publicity policy and he wondered whether the members of the Association should not direct their thoughts towards that field of activity.

Among the guests were Mr. H. Wilkinson, Ministry of Health, who replied on behalf of the guests, and Mr. R. W. H. Cook, Ministry of Health, Mr. R. A. Humphreys, Ministry of Supply, and Mr. Verney Stott.

## *Timber Preservative*

### Advantages Claimed for Tanalith C

TIMBER used by the CEA in water cooling towers and by some African public utility companies as transmission poles was found to break down after only a short period of service although it had been adequately treated with commercial preservatives. Samples of damaged timber were examined by the Forest Products Research Laboratory and after extensive research they decided that the breakdown was due to some form of fungal decay, probably a mould.

This particular mould had never previously been observed, but after 18 months the FPRL succeeded in isolating the cause of the breakdown—*Chaetomium globosum*, a mould quite often found in rotted paper, straw and other cellulosic material. It was the first time that moulds of this type had been recognised as causes of timber decay.

This type of timber decay became known as 'soft rot'.

As a result of this discovery Hickson's Timber Impregnation Co. (GB) Ltd. decided that it was necessary to examine the individual constituents of Tanalith U, a preservative which hitherto had proved successful in areas where soft rot did not occur. It was finally decided that a major alteration of formulation was necessary and the result was Tanalith C which is said to be a mixture of copper sulphate, arsenic pentoxide and a dichromate.

Important features of this new preservative, say the company, are that it is a free flowing powder which does not cake or gum, and which is soluble in water with only a small quantity of sludge. Tanalith C, it is claimed, will not wash out even under extreme leaching conditions and there is no risk of staining.

According to Mr. C. D. Cook, Hickson's chief chemist, Tanalith C is less corrosive than tap water. Rapid and accurate methods of analysis for the powder, the treatment solution and treated timber have been devised.

The cost of treatment is about 10 per cent of the cost of the timber.

## *Sodium Monofluoroacetate*

SODIUM monofluoroacetate may be crystallised from water at a concentration of about 50 per cent w/v says a report from Dr. M. A. Phillips and Associates, London consulting chemists and chemical engineers. The resulting polyhedral crystals are now being examined crystallographically.

The salt so obtained forms a monohydrate, $F.CH_2COONa.H_2O$, which loses its water of crystallisation quantitatively on heating at 90°C.

### Copper Sulphate Increase

In August for the first time since December 1954 production of copper sulphate in the US exceeded shipments says a report from the US Bureau of Mines. Production figures were 27 per cent higher than those for July and stocks on 31 August were 43 per cent higher than at the beginning of the month.

# Continuous Fluidised Carbonisation of Bituminous Coal

UNITED Engineers & Constructors Inc. of Philadelphia, US, has recently completed a pilot plant for the continuous carbonisation of bituminous coal at the Schuylkill station of the Philadelphia Electric Company. Approximately one barrel of liquid products, 1½ tons of char, and 18,000 cu. ft. of gas can be produced per day when the pilot plant operates at its full capacity of two tons of coal per day. Details of the plant were given recently by Ronald G. Minet, of United Engineers, to the American Coke & Coal Chemicals Institute.

The over-all height of the unit is 26 ft. from floor to coal hopper. Processing is continuous from the latter to the devolatilised char receiver, and grinding the coal through a number 8 mesh in a hammer mill is sufficient to reduce it to the degree of fineness required for fluidised carbonisation. Table I gives a sieve analysis of the coal as it leaves the hammer mill.

TABLE I.—*Sieve Analysis of Solids*

| *Mesh* | *Coal* (Wt. per cent) | *Char** (Wt. per cent) |
|---|---|---|
| 8 | 0.0 | 1.0 |
| 16 | 2.4 | 12.2 |
| 30 | 18.0 | 36.0 |
| 50 | 31.6 | 35.4 |
| 100 | 24.4 | 12.4 |
| 200 | 12.6 | 2.4 |
| 325 | 5.4 | 0.4 |
| Pan. | 5.6 | 0.2 |
| | 100.0 | 100.0 |

* Pittsburgh coal.

The basic technique is as follows: A quantity of ground coal, with the sieve analysis given in Table I, is placed in a glass pipe fitted with a screen. Air can be introduced beneath the screen.

As an example, assume that 10 lb. of coal is inserted in a six in. glass pipe, and that air can be blown at a velocity of about two ft. per sec. through the empty pipe. As the flow of air through the bed of coal is gradually increased, a manometer connected beneath the screen indicates a rapidly increasing pressure differential which is approximately proportional to the velocity squared. When the drop in pressure equals the weight of the coal per unit cross sectional area, in this instance 10 lb. divided by 28.2 sq. in., or 0.35 lb. per sq. in., the mass of coal will be supported by the flowing air.

A further increase in the flow of air will, under the proper conditions of air distribution, and with the correct size of vessel, result in the coal resembling boiling liquid or, in other words, becoming fluidised. Bubbles of gas rise rapidly through the powdered coal creating an intense circulation and resulting in efficient mixing. The velocity of gas can be very substantially increased without causing further substantial increase in pressure drop, just as bubbling gas through water at a constant level will maintain a constant back pressure.

## Two-stage Process

Very large tonnages of powdered coal in this fluidised condition can be rapidly heated, mixed, passed through pipes and valves, and reacted with oxygen with moderate sized equipment. In the process developed by United Engineers & Constructors Inc., coal is carbonised in two stages, both of which involve reaction between carbon and oxygen at relatively low temperatures. A flow diagram of the pilot plant is given in the diagram. Bituminous coal, caking, coking or non-coking, is crushed to pass through ½ in. mesh in a hammer mill, and is continuously fed into the fluidised bed maintained in the pre-oxidiser; here it is rapidy mixed with partially devolatilised char. It is then dried, heated to from 700° to 800°F and rendered non-coking. The heat is supplied both by internal combustion in the fluidised bed and by electric strip heaters on the shell of the vessel. In a commercial plant the heat would be supplied by internal combustion and the heat of the inlet air.

A controller, which measures the pressure differential across the fluidised bed and thus the weight of material present, operates a slide valve to regulate the flow of partially devolatilised char to the carboniser. Carbonisation takes place at a temperature between 800° and 1,200°F, depending on the type of operation. The heat for carbonisation is provided by reacting carbon and oxygen in the fluidised bed. Steam is used to control the temperature at the desired level and help mixing. The devolatilised char passes continuously into weighing drums which are periodically replaced; to avoid spontaneous combustion the char is sealed from air until it is sufficiently cool.

The tar and gas leave the carboniser through cyclone separators, which collect the char dust, before it enters the product recovery train. The pitch, tar, middle oil and light oil are in turn removed from the gas stream by direct cooling, indirect cooling, refrigeration and absorption. The resulting gas is sampled and sent to a stack for disposal.

Several different bituminous coals have been successfully processed in the pilot plant, including Pittsburgh seam coals from Ohio and West Virginia, Kentucky coal and Colorado non-coking coal. A simple method has been developed for determining the operating conditions required to handle a coal successfully. All coals tested to date have possible operating ranges which can be exploited, although many have not yet been processed in the pilot plant.

Some typical yields for differing processing conditions and different coals are given in Table II. They range from 20 to 30 gallons of liquid products per ton of coal processed. An average of from three to five per cent of coal by weight is consumed to supply heat for the process. The quantity of gas produced is generally small and relatively low in heating value. However, by careful control of operating temperatures most of the gas can be removed in combustible form and used at the carbonisation plant for steam raising or pre-heating air.

Continuous fluidised carbonisation may now be considered a working process showing promise of being universally adaptable to all bituminous coals. Whether a plant can pay for itself in a reasonably short time has yet to be established, but United Engineers claim to have evidence that a minimum sized plant with a capacity of 1,500 to 2,000 tons per day could be paid for out of profits before taxes in less than four, and possibly three years, assuming relatively cheap coal is available.

Where char is used for fuel, or as a raw material for gas production, certain factors must be considered. Char is very reactive to oxygen, carbon dioxide and steam, and will thus accelerate the combustion and gasification processes. It is also relatively friable, and its sulphur content is usually 20 to 30 per cent less than that of raw coal. Char is free-flowing, dry, and a surprisingly clean material to handle. Sales of tar are an important consideration in the use of char.

On the basis of very preliminary estimates, a continuous fluidised carbonisation plant using a two-stage process and a simple tar recovery system can be erected for approximately \$500 per ton per day. If three years is taken to be the minimum acceptable period for paying for the plant, at least \$50 (before taxes) must be realised on each ton of coal processed. On average, one ton of coal will yield 25 gallons of liquid products, 1,400 lb. of char, and a small amount of excess gas which may be neglected for the purpose of this calculation.

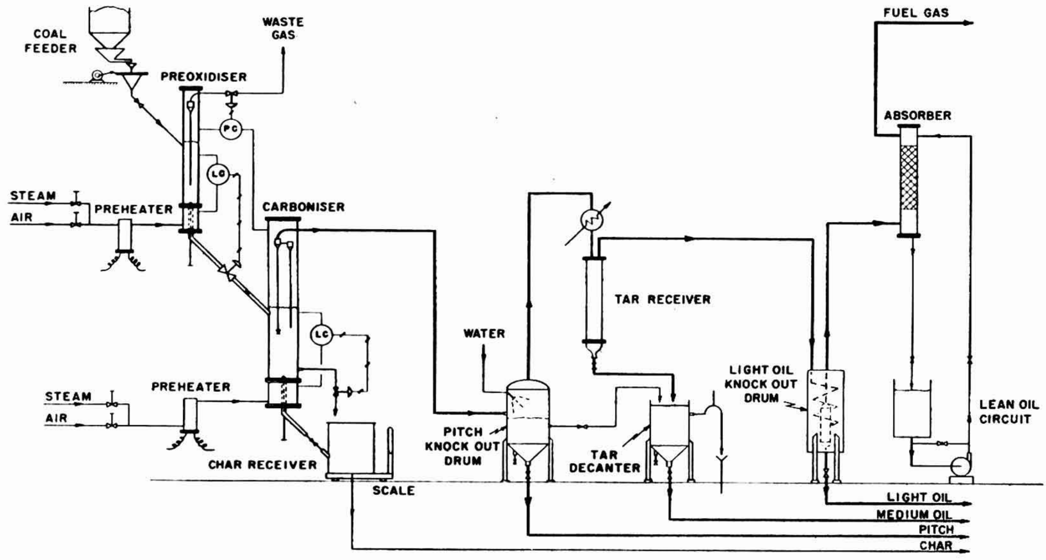
Processing costs, including labour and fixed charges, but excluding the cost of coal, are approximately \$0.50 to \$1.50 per ton, depending on the plant size. Assuming an average of \$1.00 per ton for a medium-sized plant, if the coal costs \$X per ton, and the char and coal have roughly the same heating value, then the tar must bring

$$\frac{0.30\ X + 1.50}{25} = 0.012\ X + 0.06 \text{ cents per}$$

gallon. Thus, \$4.00 coal could be processed if tar brought 10.8c per gallon, while \$10.00 coal would require 18c per gallon before the plant could be paid for in three years.

TABLE II.—*Typical Yield Data*

| *Coal Source* | *Ohio* | *Pittsburgh* | *West Virginia* | *Colorado* |
|---|---|---|---|---|
| Pre-oxidiser, °F. | 750 | 730 | 800 | 650 |
| Carboniser, °F. | 850 | 840 | 1,050 | 970 |
| *Yields, per ton (dry basis)*— | | | | |
| Tar, gal. | 25 | 22 | 27 | 25 |
| Light oil, gal. | 3 | 3.5 | 4 | 3 |
| Char, lb. | 1,400 | 1,450 | 1,300 | 1,350 |
| *Properties of products*— | | | | |
| Char, volatile per cent | 20 | 22 | 10 | 17 |
| Char, BThU/lb. | 12,500 | 12,200 | 12,800 | 12,750 |
| Tar, specific gravity | 1.05 | 1.06 | 1.10 | 1.03 |
| Gas, BThU /cu. ft. | 350 | 300 | 600 | 500 |




CONTINUOUS FLUIDISED CARBONISATION
PILOT PLANT

## *Forticel Propionate Plastic*

THE Celanese Corporation of America plans to inaugurate the first large-scale commercial production of cellulose propionate plastics at its Belvidere, NJ, plant. It will be marketed under the name Forticel.

This cellulose propionate operation will give the company another line of plastics products in addition to cellulose acetate, polythene, polyvinyl acetate emulsions and polyester resins.

Assured sources of high-quality propionic acid now available for the first time at the Celanese chemical plant at Pampa, Texas, and of high alpha cellulose at affiliated plants in Canada and Mexico, are primarily responsible for the decision to go into commercial production, says Mr. Bjorn Andersen, president and general manager. The field was first explored by the company in 1945, with a pilot plant operation.

Production in volume of Forticel will start in November. Meanwhile, sample quantities of the plastic are being evaluated by moulders in such applications as fountain pens, telephones, appliance housings, football helmets and other end uses where Forticel established its superiority during pilot operations.

## *Clean Air Bill Puny*

IN A leading article, the *Medical World* describes the Clean Air Bill as a 'puny measure'. There are too many escape clauses, it says, and industry is to be allowed too many years within which to comply. The article continues:

'So much in the bill is permissive and there is no sense of urgency in its measures. The health of people is being sacrificed to the overriding fear of harming industry'. Referring to the 'omissions' of the bill, the article says that the most serious is the failure to mention the problem of sulphur.

'The nationalised undertakings producing gas and electricity are to be transferred to the Government Alkali Inspectorate, and thus removed from effective criticism by local authorities. The desirability of ridding the air of concentrated sulphur fumes from these major installations is not mentioned. The maximum cost would be 10s. per ton of coal used. We should insist on this being a national charge'.

# *Treating Trade Effluents*

**Effective Chlorination by New Process**

A METHOD of treating trade effluents by chlorine has been developed by the Paterson Engineering Company.

One of the greatest difficulties in the use of chlorine as a sterilising agent is that the moist gas is extremely corrosive, attacking the metal parts of the apparatus and reducing them to an unserviceable condition in a very short time.

In the Paterson Chloronome a barrier is placed between the control apparatus and the water supply and all metallic parts are thus kept free from the possibility of corrosion. The essential parts of the apparatus are the pressure reducing, flow control and metering mechanisms.

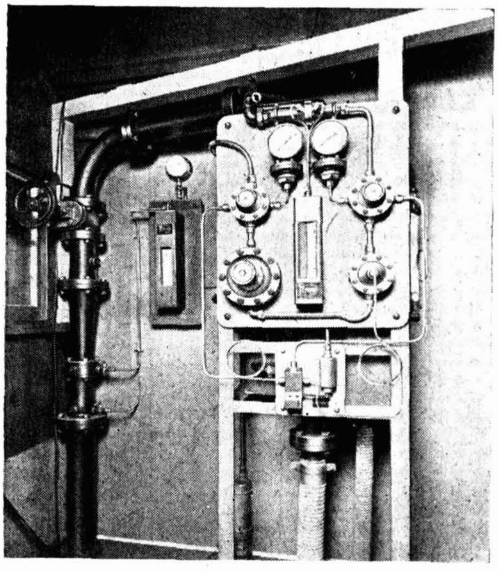
Chloronomes have been installed to purify gaseous effluents from factories and processes which result in noxious smells. Many industries discharge gaseous effluents into the atmosphere; some of these cause nuisance to the local residents, and very often chlorine is successful in reducing or eliminating this.

The equipment necessary for the control and administration of chlorine includes apparatus for the measurement of quite small quantities of chlorine gas (and other chlorine reagents, such as sodium hypochlorite and bleaching powder) as well as large capacity chloronomes which can be calibrated to give direct readings in pounds or kilograms per hour or day and can be fitted with any required form of automatic control.

The effluents for example from certain manufacturing processes, particularly those handling organic materials, are often very foul or become foul after delivery into the local authority's sewers. In certain cases the sewerage authority may refuse to accept effluents which might cause rapid putrefaction. Chloronomes can be installed to add chlorine to such effluents before they reach the sewers thus preventing the onset of putrefaction and removing the objection to the delivery of works effluents into the sewers.

Chlorine is also very effective when applied to sewage to prevent it becoming septic either in the form of permanent treatment or temporarily while reorganisations or extensions of work are being carried out.

Another apparatus is the Chlorograph (recording Chloronome) which enables continuous records to be given which can be referred to at any time to satisfy any inquiries that treatment has been applied on a particular date. The Chlorograph also enables the management to know that the treatment is continuously given, and that any interruption due to the replacement of cylinders of chlorine is of the shortest possible duration.



*A large capacity Chloronome*

### Head Wrightson Sign Agreement

Head Wrightson Processes Ltd., of London, have signed an agreement with D. Bonaldi & Co. for the manufacture in Italy of the Head Wrightson air cooled heat exchangers.

### Institute of Metals Symposium

Professor Cyril S. Smith, Sc.D., Director of the Institute for the Study of Metals, the University of Chicago, will lecture on 'The Shape of Grains in Single-Phase & Two-Phase Alloys' by invitation of The Institute of Metals at the Royal Institution, Albemarle Street, London W.1, at 8.30 p.m. on Tuesday, 8 November. The lecture will precede an all-day symposium (admission without ticket) on 'The Mechanism of Phase Transformations' which will be staged at the Royal Institution on Wednesday, 9 November, from 10 a.m. to 12.30 p.m., and from 2.15 p.m. to 5 p.m.

# 'Enforced Order' Crusher & Mixer*

*by DR. M. S. FRENKEL*

THIS article starts with the representation of a further embodiment of the 'enforced order' mixer and extruder introduced in a previous article (**1**), which has the additional feature of a continuously conical interface between the inner and the outer screws (Fig. 1), to permit relative axial motion between them. This provides the foundation for developing the mixer into a crusher, and provides for the mixer and extruder as such the feature of easy adjustability of clearance according to requirements which makes the construction less dependent on close tolerances, and enables wear to be taken up, etc., together with the feature of easy disassembly for cleaning, etc.

It is shown, both for the mixer and for the crusher, that all parts of the operating surface enclosing the material worked upon simultaneously take effective part in the operation, and that the effective operating surface area is brought to a maximum relative to the volume worked by the complementary screw configuration. The mixer is seen to have some of the essential properties of a crusher, as it crushes smaller material (lumps) in 'enforced order'.

### Relative Axial Motion

The development from the mixer to the crusher proceeds by addition of constructional features providing relative axial motion between the two screws. In this way the volume containing the material to be worked is decreased as a function of time, so developing, by an approach of opposite operating surfaces, a crushing pressure increasing as a function of time simultaneously all over the operating surface, bringing all parts thereof into simultaneous crushing action increasing with time (Figs. 9, 7 for intermittent, Fig. 8 for continuous throughput).

At the same time this axial motion provides the further feature important for crushing that the two opposite operating surfaces have velocities relative to one another in three mutually normal directions, i.e. a velocity of approach producing the pressure as function of time which is required for crushing, and two mutually normal velocities tangential to the operating surface to produce the relative motions required as minimum conditions for effective crushing.

### Processes Adjustable

All the processes in the mixer as well as in the crusher are adjustable to requirements by adjustment of speeds of rotation of components, to make different parts of the operation complementary. In the crusher, the reciprocating motion, the rate of which can be adjusted, is made elastic by means of springs. The speed and the stroke are also made adjustable to take into account different properties of materials, and by reduction of stroke to zero, to effect conversion into a mixer and crusher for smaller material.

It is shown how in this way mixers and crushers are obtained which provide uniformity of output, maximum specific performance, most effective utilisation of power input per unit volume and minimum wear.

The article comprises three sections:—

*Section* (A) Illumination of the features of the mixer, with reference to Figs. 1-6, which are important for crushing;

*Section* (B) Addition of further features (Fig. 1) providing the foundation (common root) for development in different branches of engineering, crushers, turbines, etc.;

*Section* (C) Description of the properties of the developed crushers, as continuation of the development of the common root into different branches of engineering such as crushers (Figs. 7-11).

(A) The common properties of the 'Enforced Order' Mixer (Fig. 1) or as described in Ref. 1, with a crusher, etc., are as follows:—

(1) Since the inner and the outer screws (1 & 2) both rotate and produce the material transfer between them in the alternative roles of giver and taker (in sections 7 and 8 respectively), all parts of the surface enclosing

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* *Covered by patent applications.*

the material to be worked do effective work not only one after another, but simultaneously.

Hence:—

(a) every part of the operative surface contributes simultaneously to the total work, so that the total work done per unit time is a maximum;

(b) the power-input per unit volume of the mass worked is large;

(c) since, on account of the simultaneous action, the work is distributed all over the operative surface, the specific forces per unit area are kept relatively small, providing minimum wear per unit time.

(2) On account of both rotating components having the geometrical configuration of complementary screws, the effective area of operating surface, in relation to the volume of material enclosed, is made large, and this operating surface is made to penetrate all through this volume, so that the operating properties 1(a), (b) and (c) above are further improved.

(3) Both screws, owing to their rotation, separately work and move the material forward, and furthermore, due to being opposite-handed screws with opposite rotations, they interact to improve the forward motion in each towards the same exit.

(4) To clarify the crushing effects in the mixer, consider the occurrences to a lump of material which at entry is somewhere in the depths of the groove of the inner screw. Through the rotation of the screw this lump, in its forward transport, proceeds in the

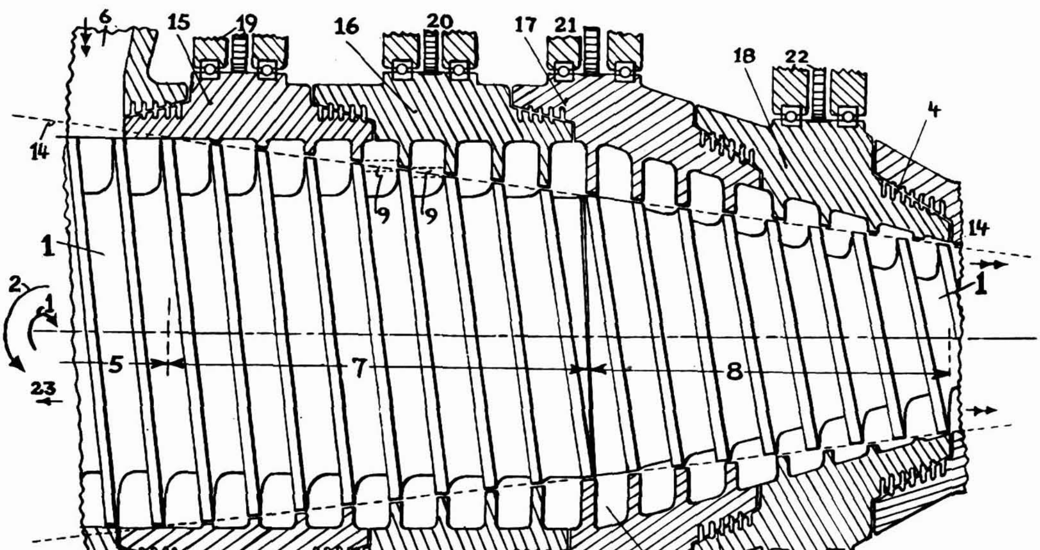



Fig. 1.—Diagrammatic section of continuous 'enforced order' mixer-extruder with axially adjustable inner screw: 1 Inner screw. 2 Outer screw (opposite thread to inner screw) in four sections. 3 Casing. 4 Gland for sealing joint between casing 3 and outer screw 2 and between sections of outer screw 2. A dynamic gland as in Fig. 10 of Ref. 1 is shown, though for certain purposes other types might be used. 5 Feed-section of inner screw. 6 Entry-funnel. 7 Reducing groove cross-section of inner screw, increasing groove cross-section of outer screw, material-transfer from inner screw as giver to outer screw as taker. 8 Increasing groove cross-section of inner screw, complementary reducing cross-section of outer, material-transfer from outer screw as giver to inner as taker. 7 and 8 combined make one mixing-cycle. 9 Zone of intense mixing (shear-mixing in three mutually normal planes) between opposite screws (see *Figs. 2, 3, 4 and 5*). 14 Interface between inner and outer screw, here conical with a straight generating line, although this could be curved. This makes possible withdrawal of the inner screw for cleaning, etc. and adjustment of clearance by adjusting means not shown. *15, 16, 17, 18* Sections of outer screws. 19, 20, 21, 22 Mounting and gear provisions for independently driving the outer screws and for independently adjusting their angular velocities. The sections of screw cover from the beginning of material-transfer to the cross-section at which opposite grooves each contain about the same mass, section 15, from there to the cross-section of nothing in the inner groove, section 16, and corresponding extent for sections 17 and 18. The number of starts of screw, groove-profiles, land-shape of interface, clearance, etc. may be varied to suit requirements

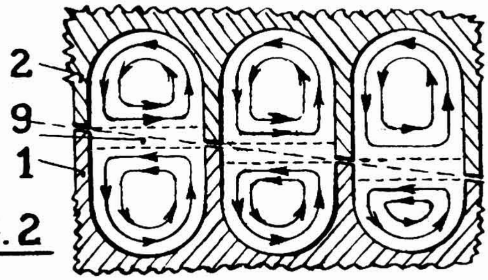



FIG. 2

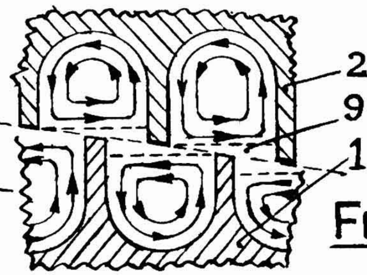



FIG. 3

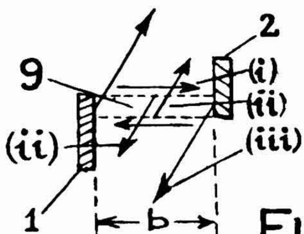



FIG. 4

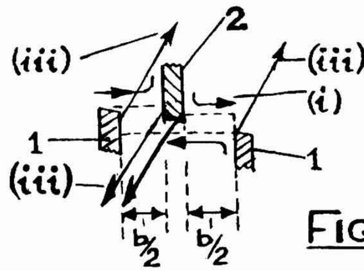



FIG. 5

Fig. 2.—Detail section through opposite threads of inner screw (1) and outer screw (2) in the relative position as in Fig. 1, showing the vortices within the grooves and how these change along the axis through the material transfer (compare with Fig. 6 for effects in conventional extruder screw). 9 indicates the zone of intense mixing with couples and rotations in three mutually normal planes

Fig. 3.—Detail section through opposite threads of inner and outer screw in the same plane as Fig. 2, after relative rotation of the screws by $\pi/4$. This shows the lands cutting into the material in the opposite groove and sweeping across its width, during the rotations of the screws

Fig. 4.—Detail for Fig. 2, showing the couples (i), (ii), (iii) producing the shear-mixing and milling in three mutually normal planes in the zones 9

Fig. 5.—Detail for Fig. 3, showing the shear-mixing couples (iii) operating with only half the arm (b) of the couple in Fig. 4

groove of continually reducing cross-sectional area until in some axial position on the way to the zero depth position it arrives at the surface of the groove and becomes involved in the material transfer to the outer screw.

With the opposite grooves of the screw gripping the lump like claws, the opposite rotations of these grooves lead to the crushing of the lump. Furthermore, the fragments which still remain situated partly in one groove and partly in the opposite groove, are subjected to the tendency of the two screws to move this fragment forward towards the same exit along different helical paths which cross one another, which leads to the crushing of these fragments. Any remains of the lump deeper in the groove will be similarly crushed in the further transport towards the zero depth where finally nothing is left in the inner groove, and so on.

Furthermore, the material transfer from one screw to the other in the intermixing zones 9 proceeds with couples in three mutually normal planes (see Figs. 2-5, treated in Ref. 1), and, as seen in Figs. 2 and 3, the tops of the lands cut into the contents of the opposite grooves and also sweep across the grooves. This takes place simultaneously all over the conical interface (14) from the top of the grooves to the zero depth position and back again, providing not only mixing, but also crushing in 'enforced order'.

(5) The material transfer proceeds until at the cross-section of zero depth the giver-groove is empty and the taker-groove full, after which the transfer is reversed, with the roles of giver and taker reversed between the screws. Thus, owing to the complementary construction of co-acting screw components, every differential of the mix has to pass, in 'enforced order' along a path providing a series of different treatments where each of these paths provides the same complementary treatments—as is necessary for uniformity of crushing and mixing.

(6) In contrast to a one-piece screw (in a conventional extruder) where a change of speed can only improve the effects in one section along the axis, while worsening the effects in all other sections, in this construc-

tion (Fig. 1) the independent adjustability of the speeds of the sections 15, 16, 17, 18 produces the complement of the effects of these sections, with regard to producing. the required different states of intermixing, density, temperature, pressure, etc., along the axis, as suited to the properties of the plastic or other material and to the required extrusion conditions (speed of throughput, etc.). Hence precision of performance for various end requirements can be obtained by adjusting speeds, so that the construction need not be built to such close tolerances and hence the outer screws, for example, can be castings.

(B) The mixer construction of Fig. 1 has further the following additional properties beyond the embodiments of the first article (**1**), which point the way to the transition from this root development to the branch developments of crushers, etc.

(1) On account of the interface (14) between the complementary screws (1 & 2) being here a continuous cone mantle, this construction permits a relative axial motion between the inner and the outer screw, which is an important feature for crushers as treated later. For mixers and extruders this is very important since it enables the inner screw to be taken out easily for cleaning, etc.

(2) At the same time, this axial movability enables the clearance between the lands of opposite screws to be adjusted according to requirements, thereby making the construction more independent of precision of tolerances.

(3) This axial adjustability also enables wear to be compensated for, etc.

(4) The conical shape of the inner screw enables this to be divided into sections along the axis with considerably greater cross-sections of internal shafts than are possible in a cylindrical screw (**1**), (Fig. 8) to transmit the torques required.

(C) The Enforced Order Crusher.

(1) The additional feature of a reciprocating axial velocity of, for example, the inner component (21 in Fig. 7; 61 in Fig. 9) can be brought about by different means, mechanical, etc., these means being provided by elastic springing devices (see Fig. 10, detail) which may have adjustable rates (**2**), (**3**). Figs. 7, 8 and 9 indicate diagrammatically double eccentrics (41 on Fig. 7; 51 on Fig. 8; 73 on Fig. 9) having adjustable strokes and speed as examples of such reciprocating machinery.

(2) The significance of this feature of reciprocating axial velocity of the inner component for enforced order crushers is as follows:—

In the enforced order mixer construction (Fig. 1) the pressure for working and transport of the material increases continuously along the axis owing to the rotation of the screws, from a minimum pressure at the entry to a maximum pressure at the end (pressure $p_s$ as function of axial distance $s$), where a considerable length of the screw therefore does not contribute to the compression type of crushing. It is, however, important for the operation of crushing to provide an additional considerable pressure which increases as function of time $t$ ($p_t = f(t)$), and that this additional pressure $p_t$ should act simultaneously on all parts of the surface area enclosing the material to be crushed, i,e, substantially equal increases of this pressure $p_t$ (as function of time) should occur simultaneously for each part of these operating surfaces, so that each part of these surfaces, from beginning to end, should contribute to the crushing.

However, pressure changes the shape of the pieces and splits them, but does not divide the fragments. Therefore, in connection with this increase of pressure $p_t$ it is important for crushing that the two opposite operating surfaces should have velocities relative to one another in three mutually normal directions all over their surface areas, i.e. a velocity of approach producing the pressure $p_t$ required for crushing, and

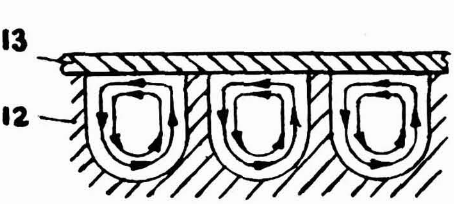



FIG.6.

Fig. 6.—Diagrammatic sketch of a screw 12 rotating in a cylindrical housing 13, showing how the same vortex of material persists in the groove throughout, with stratifications of the material accordingly in the conventional extruder (ref.4)

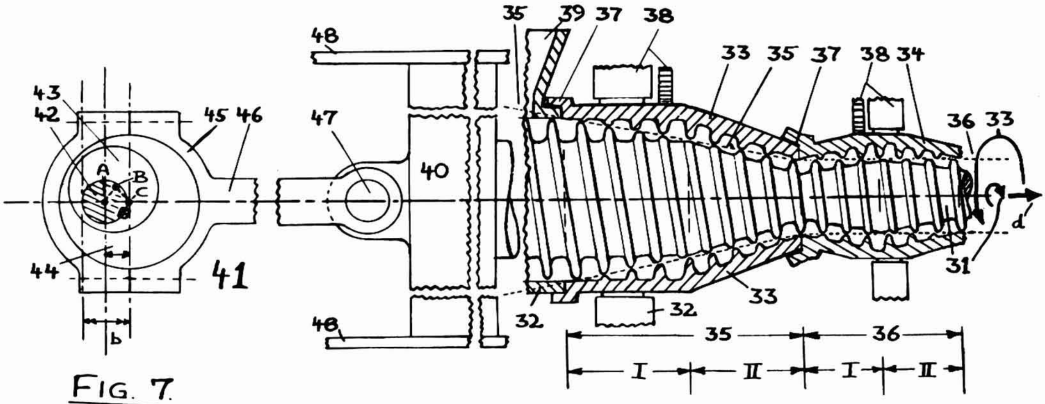



FIG. 7

Fig. 7—Diagrammatic crusher on 'enforced order' mixer principle with reciprocating motion of the inner screw: 31 Internal screw. 32 Fixture. 33 First section of outer screw, opposite hand to inner screw. 34 Second section of outer screw, opposite hand to inner screw. 35 Mixing-cycle with conical interface. 36 Mixing-cycle with cylindrical interface; this enables the inner screw to be moved axially to change clearance for crushing in the conical section, while maintaining minimum clearance in the cylindrical section. 37 Dynamic or other glands. 38 Bearing and gear-driving mechanism for outer screw-section 23. 39 Bearing and gear-driving mechanism for outer screw-section 24. 40 Driving mechanism for inner screw or screws. 41 Adjustable double eccentric, diagrammatic representation of some suitable means for giving the inner screw an axial reciprocating motion. 42 Eccentric driving shaft, centre A. 43 Disc of internal eccentric, centre B. 44 Disc of outer eccentric. 45 Rim of eccentric—adjusting mechanism for the stroke (b) is not shown. 46 Connecting rod. 47 Joint to guided connection with axially moveable and rotated inner screw. 48 Guide-provision, on fixture. Spring-means, for example as indicated in the detail Fig. 10 of Fig. 9 for the mounting of the driving shaft of the eccentric is provided for making the axial reciprocating motion elastic. When this is adjusted to zero, the machine operates as a mixer and crusher for small material, (b) is the stroke of the eccentric, (d) indicates the direction of the axial motion of the inner screw just before dead centre

two mutually normal velocities tangential to the operating surface to obtain the relative motions required for dividing the fragments in all directions.

(3) The importance of these additional properties will be shown, for the sake of simplicity, with reference to Fig. 9 to start with, in which a plunger 61 without grooves only reciprocates axially (without rotating) while the outer screw components 66, 67 and 68 rotate, in contrast to the examples of Figs. 7 and 8 where the reciprocating plunger likewise is a screw and also rotates.

To keep down wear, the impulses which occur on sudden change of $p_t$ due to the plunger meeting pieces of material of different size, hardness, etc., are taken up elastically, e.g. by spring means on the reciprocating drive (see detail Fig. 10).

In operation, on the in-stroke of the plunger 61 the reduction of the volume enclosing the material, owing to the conical plunger shape, proceeds evenly all over the operating surface due to the simultaneous approach of the conical surface to the opposite screw surface. This approach brings about the substantially equal increase of pressure $p_t$ simultaneously all over the operating surface as function of time.

The same in-stroke of the plunger produces the relative velocities between all the corresponding parts of the opposite operating surfaces in three mutually normal directions, *viz.* the velocity of approach normal to the cone surface, producing $p_t$ required for splitting, a velocity component along the generating lines of the cone and velocities in the circumferential directions normal to both, required for the dividing, and resultant crushing.

(4) In the even and simultaneous approach of the conical plunger surface to the screw surface, different parts of the material will be subject to different treatments, according to their size, shape and disposition, of which four main cases will be treated here. This is apart from the further significance of the simultaneous pressure increases $p_t$ taking place all over the operating surfaces, as described in Section A, parts 1 and 2.

(i) For pieces of material which are in contact with the lands, the increase in pressure $p_t$ with time produces indentations by these lands which deepen with the continuous approach of the plunger surface to the screw surface—leading to crushing. Further, with the rotation of the outer screw, these indentations by the lands broaden in the directions of the lands, which spreads crushing effects in different positions in various directions.

(ii) For pieces of material which are contained within the cross-section of a groove of the outer screw, the rotation of the screw transports these into continuously decreasing cross-sectional areas of groove towards the smallest cross-section—so that in this way under the continuously increasing pressures $p_s$ and $p_t$ through the decreasing cross-sections of groove the pieces are crushed.

(iii) (a) Pieces of material which are partly within the cross section of a groove and partly embedded in the material outside, are subjected to crushing effects on account of the rotation of the groove of the outer screw and on account of the axial motion of the plunger, and furthermore, the rotating screw tends to transport the piece towards the exit on a helical path which crosses the axial direction of motion of the plunger, which provides a further crushing effect.

(b) Alternatively, due to the approach of the plunger surface, such pieces, or fragments of pieces crushed as under (iii) a, are pushed into the groove cross-section altogether, where they are crushed according to case ii above.

(iv) Pieces of material not within contact of the screw nor within a groove are brought to crushing according to one of the cases (i-iii) above during the approach of the plunger towards zero clearance.

(5) The four main states of crushing operation which were described with reference to Fig. 9 were shown to arise owing to the axial velocity of the conical plunger and the rotation of the conical outer screw members. In the examples of Figs. 7 and 8 there are the additional features (a) that the plunger 21 is formed as a conical screw (in 35, having decreasing cross-sectional areas of groove in part I and increasing cross sectional areas of groove in part II, with outer screw to complement), and (b) the inner screw is made to rotate in the opposite direction to the outer screw. Therefore, the four

Fig. 8.—Diagrammatic broken view of two crusher-units of Fig. 7 in complementary axial arrangement. The two units are numbered I and II, with like numerals denoting like parts as in Fig. 7, and the suffixes denoting the unit concerned. 51 Common eccentric for axial motion of the inner screws of the two crusher units. 52 Driving shaft of inner eccentric, centre A. 53 Disc of inner eccentric, centre B. 54 Disc of outer eccentric, centre A. 45(I) and 45(II) are the two rims of the double eccentric connected to units I and II respectively. The adjustment means for the stroke (b) of the eccentric is not shown. Spring-means, for example as indicated in the detail of Fig. 10 for the mounting of the driving shaft 52 of the eccentric, is provided to make the axial reciprocating motion elastic. In the position shown, unit II has compressed the material contained in it, while unit I is in the expanded position, with clearance (a). Arrows (d) indicate the directions of axial motion just before dead centre, and the rotary arrows indicate the opposite rotations of the screws

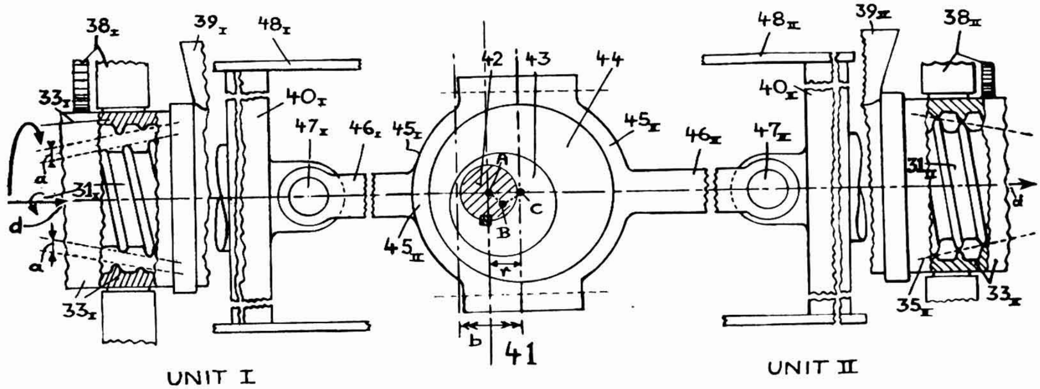
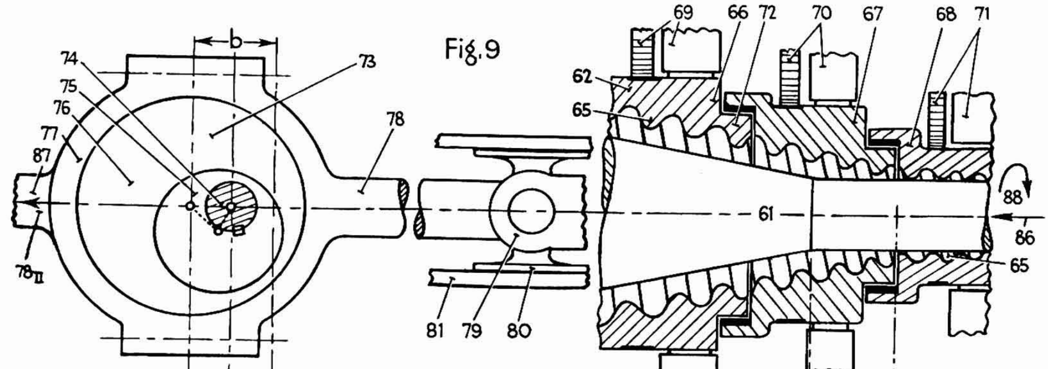
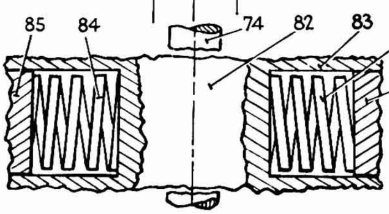



FIG. 8



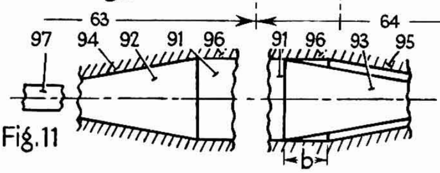




Fig. 9—Diagrammatic crusher: 61 Inner plunger. 62 Outer screw, rotatable in sections. 63 Conical part of p'unger. 64 Cylindrical part of plunger. 65 Rounded screw thread in the outer screw, having continuously reducing cross-sectional area of grooves. 66, 67, 68 Axial sections of the outer screw 62. 69, 70, 71 Mountings and driving means for these sections. 72 Glands for sealing relatively rotating sections. 73 Means for producing axial reciprocating motion with adjustable stroke, diagrammatically shown as double eccentric, here set for stroke 'b'. 74 Driving shaft for inner eccentric. 75 Disc of inner eccentric. 76 Disc of outer eccentric. 77 Rim of eccentric. 78 Connecting rod. 79 Cross-head having shoes 80 on guides 81, the cross-head connecting to the plunger 61. 78(II) A second connecting rod from a second rim for driving an opposite unit of crusher, according to the arrangement indicated on Fig. 8. 88 Indicates rotation of outer screw, 86 axial velocity of plunger just before dead centre

Fig. 10.—Detail of the elastic mounting of the eccentric driving shaft: 74 Driving shaft of the eccentric. 82 Diagrammatic bearing means for shaft 74. 83 Guides extending from bearing means. parallel to plunger-axis. 84 Spring-means acting on the bearing. 85 Fixed abutments for spring means

Fig. 11.—Diagrammatic double crusher: 91 Plunger-body. 92, 93 Conical sections of plunger at either side. 94, 95 Conical sections of outer casing, which is rotatable. 96 Rotatable outer casing. 97 Connection to reciprocating provision for plunger

cases of crushing described for Fig. 9 for rotation of the outer screw only, in this case apply not only for the outer screw but also for the inner screw separately, so that hence one obtains roughly double the crushing effect due to these four types of occurrences from both screws simultaneously.

Beyond these, however, the examples of Figs. 7 and 8 have several more important crushing effects of which two will be represented.

(6) Any piece of material not contained in any groove of either screw will be brought by the gradual approach of the two conical screw surfaces into touch with these surfaces in the following two ways: (a) it is gripped by two opposite grooves like claws, or (b) it is gripped between two opposite lands.

In the case (a) of two opposite grooves of the screws gripping a piece (like claws), the opposite rotation of these grooves leads to the crushing of this piece, and further to that the axial motion of the inner screw relative to the outer screw leads to crushing. Furthermore, the fragments which still remain situated partly in the one and partly in the opposite groove, are subjected to the tendency of the two screws to transport these forward towards the same exit along different helical paths which cross one another. This leads to further crushing of the pieces the fragments of which will finally be transported in separate grooves, where their further crushing proceeds according to case (ii), down to the groove cross sections of zero areas.

In the case (b) of a piece gripped by two opposite lands, opposite indentations into the piece are formed which deepen with the approach of the conical screw-surfaces, so that the extremities of the indentations approach one another—and simultaneously, on account of the opposite rotations, these deepening indentations are broadened in two crossed directions, *viz.* the directions of the lands, leading to crushing in different directions. The fragments are further crushed according to one or another of the cases already described. Space does not permit going into descriptions of further cases of crushing occurrences.

(7) The adjustability of speeds of rotation of all the sections (such as 35 and 36, Fig. 7) along the axis, permits:—

(a) making the effects of all the sections along the axis of the apparatus complementary to one another;

(b) the operation of crushing generally to be adjusted for different materials having different hardness, consistency, size of pieces, etc., as also does the adjustability of the mean speed and of the stroke of the reciprocating motion. The 'rate' of the spring effect of the elastic mounting (see detail Fig. 10) may also be made adjustable, by means described in (**2**) and (**3**).

(8) In all three examples shown, the end sections with cylindrical interfaces (36 in Fig. 7, 65 in Fig. 9), serve to maintain the compression of the material in the conical sections at required magnitudes, which can be adjusted by adjustment of the rotational speeds of the cylindrical components.

(9) Furthermore, the cylindrical sections serve to complete the finer crushing operations, for Fig. 9 according to case ii, and for Figs. 7 and 8 to case iii and 6.

(10) The double arrangement of two units (either of Fig. 7 or of Fig. 9) as indicated in Fig. 8, has the advantage of providing complete continuity of crushing relative to a common input and a common output. A further advantage is that the work of the reaction forces arising in the forward transport of material effected by the inner screw in the expanding unit, which is otherwise lost, goes to assist the compression in the other unit. Although energy is taken from these reaction forces in accelerating the reciprocating masses (i.e. the inner screws, etc., and any material contained in their grooves) from dead centre to maximum axial velocity, the greater part of this energy is transferred to the compressing unit during the reduction of velocity from maximum to the other dead centre.

(11) In all the units described, even distribution of mechanical work throughout reduces the operating temperature. Further factors in this are the periodic expansion of the operating volume in the reciprocating constructions, the material transfer from one screw to the other in the complementary constructions, etc. Furthermore, on account of the complementary construction the material transfer from one screw to the other together with the considerable difference of velocity in the axial direction between the components produces further considerable crushing between the lands and opposite sides of grooves.

(12) It will be seen from Fig. 1 that the minimum constructional features characteristic of the enforced order mixer are that it comprises at least two operative components of which one, at least in part, surrounds the other one and of which at least one is rotatable, this rotatable component comprising sections along the axis of rotation the angular velocities of which are independently adjustable.

Fig. 11 indicates diagrammatically an extreme case of a construction having the minimum features fulfilling the fundamental principles for crushing as set out in section C (1) above, and which hence provides a foundation for development of crushers for various requirements.

A construction with minimum constructional features for crushing comprises at least two components (91 and 96, for example), one of these (e.g. 96) at least in part surrounding the other one, at least one of said components (e.g. 96) being rotated and at least the other component (e.g. 91) being made movable along the axis of this rotation. Furthermore, this diagram illustrates one component (91) operating as a conical plunger at each end (92 and 93) thus providing simultaneously compression of operating space at one end and expansion of operating space at the other end.

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### Moving to Bigger Factory

The growing demand for industrial electronic controls has decided Elcontrol Ltd. to move into a new and larger factory, although they went into their present premises at Hitchin, Herts, only three years ago.

# Sedimentation of Powders in Liquids

## Results of Some Recent German Research

IF a finely divided powder is uniformly dispersed in a fiquid and is not of colloidal fineness it begins to settle practically at once, and forms a sediment of volume S, which varies, according to the medium, in rate of settlement, size and structure. Among the governing factors, besides density and viscosity of medium, are the forces between the particles and between these and the medium. Rate of settlement, in media of about equal viscosity, may be greater in the heavy than in the lighter liquids, e.g. greater in carbon tetrachloride than in alcohols or esters. In the full range of mixtures of water/dioxane from 0 to 100 per cent, density may only vary by a few per cent, and viscosity just as little, yet volume of sediment and deposition rate may exhibit wide variation. Other factors are pretreatment of the powder, particle shape, crystal forms and presence of surface active agents.

Starting with these well known and elementary facts, Professor K. L. Wolf and coworkers of the Laboratorium f. Physik u. Chemie der Grenzflächen, Kirchheim-Bolanden, describe some of their recent work in this field, following that already described elsewhere (**1**) (*Deutsche Farben Zeit.* 1955, **9**, 377-387).

### Sedimentation Volumes Vary

This earlier work had shown that crystalline or other forms of ion-bonded powders, in nonpolar liquids such as saturated hydrocarbons, benzol, or carbon tetrachloride, produce comparatively large values of S of a coarse-flaky structure which tends to be thixotropic, and to have relatively high sedimentation velocity. In dipolar liquids with easily accessible polar groups, such as the primary aliphatic amines and alcohols, the volume and rate of deposition are small, the sediment fine-grained and mobile, and the upper liquid often turbid. If the polar groups are accessible only with difficulty, as in esters, ketones, ethers and nitriles, or have little outward activity, then the sediment volumes are only of medium size.

These three cases are exemplified with a set of test-tubes for kieselguhr in the three different kinds of media. All this is definite enough if the test material has polar constituents with attraction between them and the polar liquids used as media. But it remained to be seen whether similar behaviour would be met in the sedimentation of substances which, like certain solid hydrocarbons, have few polar groups or none at all.

### Several Media Tested

To this end some typical materials of a non-salt type, namely paraffin and other waxes, were pulverised and sieved to a grain size of 0.1 mm.; then dispersed and sedimented in the same liquids as before (**2**). The media used were: carbon tetrachloride, cyclohexane, hexane, benzole, ether, tetrahydrofurane, dioxane, methyl acetate, acetone, acetonitrile, butyronitrile, *t*-butanol, propanol, butylamine, methanol, water, formamide. Most or all of these were used in subsequent tests, with 1.5 g. of powdered material. In the present case behaviour was quite different from that of salts or salt-like material. Volumes now differ little in polar and non-polar media, even in the strongly polar liquids, water and formamide, by which the paraffinic powders were only slightly wetted or not at all. Structure of the sediments was also different. After prolonged standing there was considerable swelling of the gelled sediment. As compared with the salt group, strongly sediment-active substances have no marked effect on the waxes.

With the salt group there were structural or lattice differences. Both hexahedral and octahedral forms of rocksalt and sylvine were studied showing small differences, while rutile and anatase exhibited larger differences (**2**). At the same time the typical behaviour of ion crystals was invariably noted. In view of their importance and manifold uses it appeared particularly useful to study the silicic acids in various forms, as these show wide variations in wetability etc. (see below).

The following preparations of kieselguhr in one form or another were provided by different firms:

I. Active silicic acid Klosterfrau-Köln, soft and very fine-grained, of particle size

0.3 to 3 μ, that may aggregate to average of 20 μ, *p*H 6-7.

II. Aerosil Degussa, soft and feathery, of grain size about 0.1 μ, aggregating to average 70 μ, *p*H 6-7 .

III. Fissan-Kolloid, spherical particles of 0.5-1.5 μ, aggregating to about 30 μ, *p*H 3-4.

IV. Silipur VEB-Wolfen-Bitterfeld, 0.1-0.5 μ, aggregate about 60 μ, *p*H 8-9.

V. Kieselgelsorte $E_1$-Hermann Köln, somewhat rough to the feel, particles round or angular 0.3 to 15 μ, *p*H 6-7.

VI. Silargel of Heyden-München, somewhat similar to V, of average grain size 12 μ, and *p*H 7-7.5.

VII. Kieselguhr, natural, Reye-Hamburg, a somewhat coarser, rough-feeling material, of grain size 3 to 30 μ, *p*H 6.5-7.

VIII. Kieselguhr refined (free from iron) with alkali, Reye-Hamburg, somewhat similar to VII, of grain size 3 to 12 μ, *p*H 6.5-7.

IX. Kieselguhr, calcined and refined, Reye-Hamburg, similar to foregoing but softer, with particles of various forms 2-100 μ reducing to 0.2-3 μ on rubbing, *p*H 6-7.

X. Kieselguhr, Reye-Hamburg, similar to, but perhaps somewhat finer than, IX.

These were tested in carbon tetrachloride, cyclohexane, dioxane, acetone, methanol, water, air, and the results graphed and tabulated, showing in most cases (1) colour of sediment, (2) condition thereof, (3) condition of upper liquid. For the air test are given (a) colour of the material, (b) external structure, (c) behaviour on shaking. Other details are shaken volume in cc, heaped volume in cc, and settling time in water in seconds. This last ranged from 14 (VIII) to 370 (IX), with the exceptional case of 4000 (III), which is of course colloidal. Test samples were 1 g. powder, except with Aerosil (II) where only ¼ g. was used.

As already intimated, the addition of small amounts of surface-active agents often affects sedimentation to a remarkable degree, mostly by reducing the volume. In rare cases, however, as with the addition of water to dioxane, previously noted, there is an increase in volume and change in structure, e.g. from fine to coarse, with more rapid rate of deposition. With further addition of water the sediment again becomes finer-grained and settles more slowly. This reduction in volume is due to adsorptive enrichment of the active agent at the interfaces of solid particles and liquid medium. The case of simple adsorption is discussed in connection with the Langmuir adsorption isotherm and relevant formulae.

Another formula is $K = n \cdot \frac{S - S_{min}}{S_{min}}$ where K is the equilibrium constant of the 'boundary reaction' and n the concentration of active agent in the solution, as confirmed by several examples (**3**). Just as heat of reaction may be found in chemical reactions —from the temperature relation of the mass action constant—so, in the present case, heat of adsorption may be determined from measurements of temperature relation of sediment activity. Some measurements of S in ml. are tabulated for various materials and media at temperatures up 60°C, e.g. $CaCO_3$, sylvine, $PbCrO_4$ and powdered glass, of which the first were:

| *Powder* | *Medium* | *Sediment vol. ml.* 15°C | 30°C | 45°C | 60°C |
|---|---|---|---|---|---|
| $CaCO_3$ | Benzol .. .. | 7.0 | 7.15 | 7.3 | 7.6 |
| | Octanol .. .. | 2.0 | 2.1 | 2.3 | 2.35 |
| | Caprylic acid .. | — | 2.1 | 2.1 | 2.2 |
| | Butyronitrile .. | 2.1 | 2.05 | 2.0 | 2.0 |

Measurements of temperature relation to sediment activity, as previously described (**4**) yield corresponding results, as indicated in the isotherms shown and in accordance with the equation above. Data are included for various combinations of media, e.g. of varying concentrations of octanol in benzol. In a further series of combinations the heats of adsorption could not be calculated, as the relation between S and concentration (n), in the equation, no longer holds.

After discussing the possible effect of very large molecules and some other cases in which the equation is not valid—owing to the fact that the displacement of the adsorption equilibrium with temperature exceeds that of association equilibrium, and distribution of the various super-molecules at the boundaries differs from that in the medium—the authors observe that the case of the α-methylated amines is of special interest, because they differ markedly from the behaviour of the normal isomers; and the true explanation has yet to be discovered. It should be noted, too, that, in regard to sedimentation and flotation, a mixture of normal and branched isomers no longer behaves as an additive. The nitriles also require further study in connection with formation of very large molecules as exemplified in the triple combination: butyronitrile-$PbCrO_4$-benzol.

A further related subject for study is that of adsorption of methylene blue by powders, also wetability in connection with the rate at which the powders absorb liquid, and the times that elapse before they sink after being sprinkled on the surface. Some experimental tests in this direction are described with graphs for calcium carbonate, chrome yellow, and various powders. In this last case the medium was water, and in the other two various solvents or homologous alcohols. The various keiselguhr preparations I to X were also tested for water absorption rates, and showed some remarkable differences; as they did also in methylene blue adsorption.

A further characteristic to be studied is the sedimentation rate, in which two different types of behaviour were observed: (a) the opaque mixture due to shaking up cleared above downward with clearly marked boundary between turbidity and liquid, as shown with lead chromate in hexane, or (b) the sediment piled up under continued residual turbidity from below upwards and had a clear surface contour (Fig. 19B), as shown with lead chromate in water. This 'piling up' of the sediment was only observed hitherto in polar liquids, while normal deposition was found in both polar and non-polar liquids. Both may be seen together in the case of NaCl in methyl acetate.

An average or approximate measure of rate of settling or piling up is provided by the half-rate-time $T_H$, defined as the time in which the surface of the deposited powder traverses or reaches half the deposition height, i.e., half the path between the lower liquid mirror or surface (bottom of vessel) and the surface of the completely deposited mass. Some values for $T_H$ are tabulated for 1 g. lead chromate in different liquids, reckoned in minutes, both for downward travelling or settling which range from 0.7 in ether to 15 in water, and for upward or piling up ranging from 84 in acetonitrile to 3000 in octanol. The one exception in this column (butylamine) is shown with the downward arrow, and a $T_H$ of 1,100.

In conclusion some further points are discussed in connection with the $T_H$, and the rate of settlement in relation to amount of powder, to amount of liquid, and to particle size, and to temperature.

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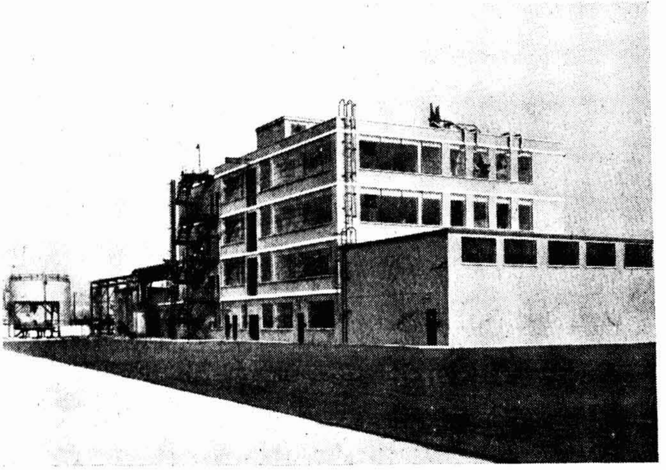
## Want Duty Put On Fuel Oil

The use of fuel oil in Australia in place of coal is affecting the position of miners in New South Wales. To protect workers, a trades union deputation has asked the Minister of Labour, Mr. Holt, and the Minister for National Development, Senator Spooner, to put an excise duty on fuel oil and to investigate the possibilities of using more coal for chemicals manufacture.



*The new factory of Distrene Limited for manufacturing 'Styron' brand polystyrene. The rated capacity of the plant, which recently went on stream only 10 months after construction began, is 6,000 to 7,000 tons per year. Distrene is jointly owned by The Distillers Co., Ltd., and the Dow Chemical Co. (see THE CHEMICAL AGE of last week, page 903)*

# *Seamless Metal Hose*

### Joint Anglo-American Company

A NEW Anglo-American company, Power Auxiliaries Ltd., has been formed for the production of seamless flexible metal hose for immediate and widespread use in aircraft and fighting vehicles.

The new product, to be known as 'Plessiflex', is claimed to meet the long felt demand for a flexible hosing with the ability to withstand, over long periods, the high temperatures and pressures associated with the high-powered engines of to-day. The outstanding feature of this new technique is the prolonged life of the hose couplings which is considerably in excess of methods at present in use.

Power Auxiliaries Ltd. is a joint company formed by The Plessey Co. Ltd., pioneers in light engineering components, and the DK Manufacturing Company of Chicago, US. The hose is produced to material specifications of the DK Manufacturing Company of Chicago, US, and to proving specifications of The Plessey Company for the whole assembly.

In appearance, 'Plessiflex' is a continuous circular metal coil formed in seamless metal tubing. Metals generally employed are stainless steel, brass and bronze. Experiments will shortly commence with titanium, which has an extremely high melting point and outstanding resistance to metal fatigue.

The hose assemblies have been subjected to rigorous tests by one of the leading aero engine manufacturers in this country and, as a result, a limited size range has been approved for production release. Tests continue on the remaining sizes.

Other potential applications of 'Plessiflex' hosing include service on engine steam lines, both static and marine, and numerous uses in the gas and chemical industries. Experiments in its use are also being conducted in the field of guided missiles.

## *Spray Atomiser*

AN atomiser which can be attached to a bicycle pump to produce a fine vapour-like spray for applying both an insecticide and a room-refresher or smell-killer, has been patented by Ashe Laboratories of Leatherhead, Surrey.

A combination of three of the most powerful insecticides in capsule form will be sold with the perpetual atomiser; they are dieldrin, lindane and pyrethrum extract.

This kit, which has the trade name of 'Spraycap', consists of the atomiser and four capsules, and to distinguish the fly and insect killer from the odour-killer and room-refresher, different coloured packs are used.

Dieldrin, discovered in America four years ago, has proved most effective for the control of a wide range of insects. Non-volatile, it has long residual effect, up to about three months or until washed off, and has proved lethal to cockroaches and mosquitoes, pests immune to most of the regularly sold sprays or powders.

Lindane, named after the Dutch chemist Van de Linden, who isolated and described the gamma isomer of benzene hexachloride, is equally lethal but more volatile—it acts quickly and its range of effectiveness covers more than 200 species of pests. It is ten times more deadly to insects than DDT, even in low concentration and is invaluable in the control of body lice and mites in humans and for flies and parasites on cattle and dairy cows.

Pyrethrum extract, one of the oldest and still most effective of insecticides, is rapid in action and harmless to human beings.

### Zinc Oxide in the US

Production of zinc oxide (lead-free and leaded) in the US during August totalled 16,500 tons (four per cent below the July total), according to the Bureau of Mines, United States Department of the Interior. Lead-free zinc oxide production increased slightly to 13,100 tons, while the output of leaded zinc oxide decreased 900 tons to 3,400 tons. Producers' stocks of all oxide remained unchanged at 17,400 tons. Lead-free stocks dropped 700 to 12,200 tons, while the leaded variety increased 700 to 5,200 tons.

### Record Mo Exports from US

Domestic production of molybdenum concentrates in the US in 1954 was the second highest on record says the Bureau of Mines of the US Department of the Interior. Consumption of concentrates declined to the lowest level since 1949 while shipments for export reached their highest value since they have been reported in pounds of contained molybdenum.


THE CHEMISTRY OF SYNTHETIC DYES AND PIGMENTS. Edited by H. A. Lubs. Chapman & Hall Ltd., London; Reinhold Publishing Corporation, New York. 1955. Pp. 734. 148s.

The discovery of mauve, the first synthetic dye, by Perkin in 1856 led to the development in this country and later elsewhere of industries based upon the production of organic dyes. In its early stages the new dyestuff industry was not free from economic troubles, however, and the outbreak of the First World War found the German dyestuff industry immensely powerful and the British and American dye industries correspondingly weak. The hard lessons learnt by Britain and America in their war-time struggles to overcome the cessation of dye imports from Germany and the consequent near paralysis of the textile and other dye consuming industries led to the establishment in the United Kingdom and the United States of more firmly based dye industries, which were regarded as of considerable strategic as well as commercial importance. After World War II the German dyestuff industry was thoroughly investigated by various British and American missions and the findings of these investigators were made known in what are now called the FIAT and BIOS reports. A mass of information on the processes for the manufacture of dyes and intermediates, about which little had hitherto been published, thus became available.

In the preparation of this volume on dye chemistry, the editor, H. A. Lubs, has drawn on the wide experience of his colleagues in the Jackson Laboratory of the Du Pont Company. In this laboratory pioneer work has been carried out for many years on the development of synthetic organic chemicals. The 19 contributors to this monograph have been on the staff of this American laboratory, and have spent many years in the field of dyes or intermediates.

The opening chapters deal with intermediates, the first one being concerned with the many derivatives of benzene which are useful for the production of dyes. Various chemical reactions (e.g. sulphonation, nitration, halogenation, alkylation, etc.) which are important in the production of benzene intermediates are discussed.

The chapter on naphthalene intermediates is somewhat shorter. The third chapter deals with azo dyes (the largest chemical class) which are readily formed by the standard reactions of diazotisation of aromatic amines and coupling of the resulting diazonium compounds with phenols (or amines). After an account of the mechanisms of the diazotising and coupling reactions, the azo dyes are discussed in four separate sections, (a) dyes for cotton (and viscose rayon), (b) dyes for wool, (c) disperse dyes for cellulose acetate, nylon and other synthetic fibres, and (d) dyes used for the dyeing and staining of materials from solvents other than water. Azoic dyes, which are insoluble azo colours produced upon the fibre, are described separately. There is also an account of miscellaneous dyes, e.g. of the acridine, nitro, oxazine, etc., type, which do not individually merit separate chapters. Sulphur dyes of importance because of their low cost are complex in chemical constitution and in many cases their structure is largely undetermined. The account of these dyes summarises present information.

A major portion of the book is devoted to anthraquinone dyes and intermediates. After the discussion of the intermediates, the anthraquinone dyes are broadly divided into (a) acid dyes, (b) disperse dyes, (c) metallisable dyes and (d) vat dyes. The subsequent chapter deals with an important class of vat dye, indigoid dyes, which are chemically different from the anthraquinonoid vat dyes but are usually applied to textile fibres by similar methods. In the opinion of the editor the discovery and development of the phthalocyanine pigments represent a major advance in the dye field during the last generation and two separate accounts are given of their part in the field of pigments and in that of dyes.

An account is also given of organic pigments in general, various chemical classes being discussed, and there is a chapter on the relation between the colour of dyes and their chemical constitution. Two final short sections present a list of the common names of dye intermediates and a critical bibliography of publications on dyes and intermediates.

Although one cannot agree with the extravagant claim on the wrapper of this book that this is without question the most authoritative work ever published on the subject of synthetic dyes, the volume does represent an important source of information on dyes and intermediates of considerable interest and value to all engaged in the production and application of dyes.—G.S.E.

QUALITATIVE ORGANIC ANALYSIS & SCIENTIFIC METHOD. By A. McGookin. Chapman & Hall Ltd., London. 1955. Pp. 155. 15s.

There is a dearth of books on qualitative organic analysis and this one therefore claims an important place on the bookshelf of the chemistry student attending university or technical college. If ever a book was designed to hold the interest of the student and inspire a sense of enthusiasm for the subject this is it. The text is delightfully written in a clear, well set out style. A liberal sprinkling of footnotes and of most entertaining quotations from authors as diverse as Chaucer and Sir Arthur Conan Doyle enlivens the pages throughout. Here is a wealth of scientific method punched home by most erudite wit. One may pick up this book merely to refer to it, but one will almost certainly stay to read it from cover to cover. Throughout these pages the essentials of scientific method are stressed emphatically:—experiment, observation, inference.

The introductory chapter deals with the principles of identifying organic compounds, the reactions of various functional groups, solubility in water, etc. Chapter 2 details various preliminary tests such as colour, odour, physical constants, action of heat, examination of ignition residues, ignition with soda-lime, solubility in water and in dry ether, action of caustic soda solution, bicarbonate solution, concentrated and dilute sulphuric acid, tests for organic and inorganic elements, etc., and it also outlines separation methods for mixtures and reviews evidence which may be gleaned from these preliminary moves. Chapter 3 covers tests with special reagents—Fehling's solution. Tollen's reagent, Barfoed's reagent, etc. The ensuing chapter deals with acid and alkali hydrolysis, including the determination of hydrolysis products by inspection, and this is followed by a delightfully sound and intensely practical chapter on the art of 'Observation' and recording of results.

An equally important and unusual chapter then deals with 'Inference'. The author resumes in Chapter 7 on the preparation of derivatives or as he prefers to call them 'identification compounds'. The book concludes with a chapter on the general properties of the more common types of organic compound, classified in a very practical way. An unusually full and detailed index does justice to the rest of the book. The book is unweighted with tables of properties and reactions of specific organic compounds and its horizons are, therefore, not bounded by such a list.

No student who buys this book will regret the purchase. He will learn the theory and practice of organic qualitative analysis in the most elegant fashion in which the reviewer has yet seen it presented. Congratulations to Dr. McGookin on such an excellent little book and thanks to the publishers for presenting it so neatly and at such a moderate price.—T. S. WEST.

REPORTS ON THE PROGRESS OF APPLIED CHEMISTRY. Volume XXXIX. Society of Chemical Industry, London. 1954. Pp. 1125. 40s. to members of the Society, 60s. to non-members.

A full survey of the work carried out in the field of applied chemistry is contained in this volume, which is a continuation of a well-known series. The contributors are all persons of note in their respective fields and many chapters are by members of the various groups of the SCI.

The sections covered are: inorganic chemistry, metals, fuel and fuel products, organic chemistry, biological products, textiles, plastics, adhesives and paints, food and agriculture, and chemical engineering and hazards.

As is usual the book is well indexed and there are copious references.—J.S.J.

# • HOME •

### Swansea University College

Among a number of grants and gifts to Swansea University College are: the Rhokana Corporation Ltd., of Northern Rhodesia, a grant of £2,000 for research in the department of metallurgy; Mr. N. C. Ashton (N. C. Ashton Ltd., Huddersfield), a further donation of £600 for research in the department of metallurgy; the Mond Nickel Co. Ltd., a grant of £350 a year for another two years for research in the department of chemistry; Monsanto Chemicals Ltd., a maintenance grant of £300 for a further year for a research student in the department of chemistry.

### Instruments Convention

The fourth annual convention of the Scientific Instrument Manufacturers' Association will be held at the Grand Hotel, Eastbourne, 10-13 November. There will be four discussion panels: 'Financing the Firm', 'Education and Training', 'Labour-Management Relationships' and 'How to Sell Overseas'. This year, for the first time, representatives of the British Industrial Measuring and Control Apparatus Manufacturers' Association have been invited to attend and join in the discussions.

### Sole Selling Agents

Monsanto Chemicals Ltd. announce that Hygrotherm Engineering Ltd., 37 Upper Brook Street, London W.1 (Telephone: LEGation 4111) have been appointed sole selling agents in the United Kingdom for their organic silicate range of heat transfer fluids. Grades suitable for varying purposes over the temperature range of −100°F to +650°F are available, and full technical information will be provided by Hygrotherm Engineering Ltd.

### New Factory for Foxboro

Foxboro-Yoxall Ltd. have acquired a 55 acre site at Redhill, Surrey, where work will shortly start on the erection of a new factory. The continued expansion of the company's business as manufacturers of industrial control instruments has for some time threatened to outgrow the capacity of the three existing factories at Kidbrooke, Wandsworth and Merton. The new factory will provide, initially, a floor space of 120,000 sq. ft.

### Six Lectures on Glossy Surface Finishes

A course of six lectures on glossy surface finishes with special reference to polishing and polishes, will be given by Dr. L. Ivanovszky, F.R.I.C., at the Borough Polytechnic, on consecutive Friday evenings, 6.30-8.30 p.m., 11 November. The course will include the mechanism and theory of surface polishes and glass productions; methods and classification of polishes and other gloss production materials; and their applications to industries. Information is available from: The Department of Chemistry, Borough Polytechnic, London S.E.1.

### George Kent Holds Sales Conference

Commander P. W. Kent, RN, presided at a two-day conference on 12 and 13 October at Luton, Beds, when George Kent Ltd., manufacturers of industrial instruments and automatic controllers, discussed plans for expanding home and overseas marketing. Kent's world-wide sales organisation was represented at the conference by members from Australia, South Africa, India, Malaya, Austria, Belgium, France, Egypt, Sweden and Holland.

### British Firm Gets Canadian Contract

The South Durham Iron & Steel Co. has been granted a Canadian contract valued at £4,750,000 to supply 75,000 tons of 30 in. pipe for the transmission of natural gas from northern Alberta to Vancouver. The order was obtained in competition with several US companies. The pipe-line will be 250 miles long, and all the pipes will be made at the company's new fully-automatic plant at Stockton-on-Tees. The contract is to be completed by March, 1957.

### Imports of Sulphur

The Board of Trade announces that from 1 January, 1956, imports of sulphur from any country will be permitted under the Open General Licence. Individual import licences, which have been necessary since sulphur was returned to private trading at the end of 1953, will no longer be required. It is expected that the increase, if any, in imports following the removal of restrictions will be small. The relevant Notice to Importers is No. 754 dated 19 October, 1955, issued by the Import Licensing Branch of the Board of Trade.

# OVERSEAS

### Bitumen & Oil Plan Development

Bitumen & Oil Refineries (Australia), which has invested £A500,000 in a refinery plant in Brisbane, plans to spend £A1,500,000 in further development.

### Phillips To Step Up Output

Phillips Chemical Co., of the US, is to expand by 22 per cent the rubber-making capacity of its copolymer plant near Borger, Texas. The expansion is to meet increased demands for synthetic rubber.

### BP Italian Agreement

The British Petroleum Co. has entered into an agreement with the Eduardo Garrone refinery in Genoa for the refining, over a period of several years, of up to 700,000 tons of crude oil annually.

### New Gas Plant for Hamburg

A new gas recovery plant has been commissioned at BP's Hamburg Refinery. The plant has a designed output capacity of about 50,000 tons a year of butane and propane. The liquid gases will leave the refinery in bulk and will be used for domestic and general industrial purposes and also for the manufacture of chemicals. Hamburg Refinery has a capacity of 1,250,000 tons of crude oil a year.

### Glass With Strength Of Steel

The largest glass research centre in the US was opened at Toledo, Ohio, recently with the prediction that within 25 years manufacturers will produce glass with the structural strength of steel. The forecast was made by the Owens-Illinois Glass Co. which hopes, through basic research at its centre, to overcome the brittleness of glass. Company officials say that scientists have been able to realise 75 per cent of the theoretical strength of glass in the laboratory but only one per cent of this strength in commercial production.

### Shell Saved £A1,000,000

The Shell Co. of Australia Ltd.'s oil refinery recently built at Geelong, Victoria, saved Australia about £A1,000,000 in foreign exchange last year. This saving is increasing as new sections of the plant come into operation. At the end of last year Shell's total capital investment in Australia exceeded £A45,000,000.

### To Expand by a Half

Courtaulds (Canada) will expand by 50 per cent the capacity of its viscose staple fibre plant at Cornwall, Ontario.

### Yugoslavs Agree to buy Chilean Saltpetre

Under a recently signed pact Yugoslavia will import 25,000 tons of Chilean saltpetre and in return export industrial goods valued at $1,500,000 to Chile.

### Increasing Aluminium Output

Aluminium Ltd., a subsidiary of Aluminium of Canada, plans an immediate expansion of primary aluminium smelting facilities in Quebec to provide an additional capacity of 22,000 tons per annum. The additional capital investment will be about $15,000,000.

### Olive Oil Council

The United Nations Conference on Olive Oil (see THE CHEMICAL AGE for last week, p. 901) ended on 17 October. An agreement was arrived at between those taking part, and will be published as soon as possible From now on the problems of the olive oil market will be dealt with by the newly formed Olive Oil Council.

### Dow Lease Extended

All commercial output of magnesium in the US in 1954 came from the Dow Chemical Company's Freeport, Texas, plant and from the Government owned plant at Velasco, Texas, which is operated by Dow Chemical Company under lease agreement. This lease has now been extended to 31 January, 1958. Total production of primary magnesium in the US in 1954 was 69,729 tons, a decrease of 26 per cent compared with the 1953 figure.

### Appointed Agents

Harrisons & Crosfield (Canada) Ltd. have been appointed agents for the distribution of chemical fertilisers to be produced by Northwest Nitro-Chemicals Ltd. at the $22,000,000 plant being built at Medicine Hat, Alberta, Canada. Products will include ammonium nitrate and two grades of ammonium phosphate fertiliser, with a total annual sales volume in excess of $10,000,000. Northwest Nitro-Chemicals Ltd. is controlled by Commercial Solvents Corp. and the New British Dominion Oil Co. Ltd.

# · PERSONAL ·

MR. J. D. HORNER, export manager of Hickson & Welch Ltd., will visit Canada and the US in November. During the first two weeks he will call on the company's Canadian customers accompanied by MR. R. D. MORRISON, who is in charge of the company's Montreal sales office.

The Lord President of the Council has, with the concurrence of the Chancellor of the Exchequer, appointed MR. W. STRATH, C.B., at present serving as a third secretary in HM Treasury, to be a full-time member of the Atomic Energy Authority. He has also appointed as part-time members SIR ROWLAND SMITH, chairman of the Ford Motor Co., and MR. C. F. KEARTON, O.B.E., a director of Courtaulds and formerly with I.C.I.

The Federation of British Industries has sent a mission to Vienna to offer its help in connection with the re-equipment of factories and public services now restored to Austrian control under the recent State Treaty. The leader of the mission is SIR JOHN DUNCANSON. Its members include MR. C. R. DAWSON, of the diesel engine division of the English Electric Co. Ltd.; DR. E. H. T. HOBLYN, M.B.E., director of the British Chemical Plant Manufacturers' Association; SIR LIONEL KEARNS, C.B.E., chairman and managing director of H. W. Kearns & Co. Ltd.; and MR. E. H. VLIES, a director of Platt Bros. (Sales) Ltd. The industries to which the mission will devote particular attention include electronics, diesel engines, chemical plant and oil drilling and refining plant.

MR. WILLIAM LINFORD, A.R.I.C., general manager in India for The Crookes Laboratories, celebrates his 25th year with the company this Christmas and joins the increasing band of employees to have done so. He joined the company as a boy trainee in the Crookes Laboratories while continuing his studies at Birkbeck College. He went to India in 1936 as assistant manager at Bombay and travelled throughout India, Ceylon, Thailand, and Malaya on the company's business. He was in Penang when the Japanese invaded and he escaped in the last boat with only the clothes he stood up in. He joined the Indian Army, being demobilised with the rank of major.

MR. R. W. EVANS, superintendent of the Steel Company of Wales, has been installed president of the Swansea and District Metallurgical Society.

Following a recent meeting of the council of Leeds University it was announced that the following appointments had been made: MR. D. A. ARMSTRONG as Brotherton Research Lecturer in physical chemistry for a period of two years; MR. P. GRAY as lecturer in physical chemistry; MR. B. W. LANGLEY, former I.C.I. Fellow in the Department of Organic Chemistry, as lecturer in the same department; MR. R. M. TENNENT, formerly I.C.I. Fellow in the Department of Physics, as lecturer in the same department.

### British Aluminium Plan

The British Aluminium Co. Ltd. has completed plans for a $130,000,000 plant to produce primary aluminium at Baie Comeau, 200 miles east of Quebec City on the north shore of the St. Lawrence River. Clearing operations will begin immediately, with the first of four construction stages scheduled for completion by 1957. The plant will have an eventual production capacity of 320,000,000 lb. of aluminium ingots yearly. It will not attain complete production until 1965.

### Chemicals From Dead Sea Waters

A £4,400,000 factory to extract potash and other chemicals from Dead Sea waters is to be built near Jericho. This was announced by the Jordan Premier, Said El Mufti. The factory will take three years to build and the Government will put up £750,000 towards the cost. The remaining capital needed will be raised by an issue of shares in the neighbouring Arab countries. The factory will be erected on the site of the potash plant which fell into disuse during Arab-Israeli hostilities.

## *Leeds Accepts Donations*

AT a meeting of the Council of Leeds University on 19 October a gratifying response to the University's appeal for development funds was reported and it was announced that donations totalling £57,050 had so far been received for the £100,000 fund set up for the development of the Department of Fuel Science and Chemical Engineering.

The donations to the fund came from The Gas Council (£27,000), Radiation Ltd. (£10,000), Woodhall-Duckham Construction Co. Ltd. (£10,000), R. Green & Co. Ltd. (£5,000), Power Gas Corporation (£2,000), British Coking Industry Association (£1,050), W. J. Jenkins & Co. (£1,000), Whessoe Ltd. (£1,000), W. C. Holmes & Co. Ltd. (£1,000), Simon Carves Ltd. (£500), and Yorkshire Tar Distillers (£500).

It was stated that at no period in its history had the university so much building work in progress as at present. The cost of work already started is about £1,250,000.

Among the many gifts and grants to other departments, either received or promised, were the following:—Physical chemistry, £550 from Thomas Hedley & Co. Ltd. for research into long chain compounds; School of Chemistry, £300 from Monsanto Chemicals Ltd. to support a scholarship; Pharmacology, £750 for 1955-56 from The Wellcome Research Laboratories, £500 a year for three years from May & Baker Ltd., and £500 a year for two years from Smith, Kline & French International Company. All these donations were for research.

## *NIFES Issues Warning*

INDUSTRIALISTS must take energetic action to protect themselves against the possibility of a fuel crisis this winter, says a statement issued by the National Industrial Fuel Efficiency Service after a meeting on 20 October. Coal output is 3,250,000 tons down and there is little scope for augmenting supplies from overseas.

The board of NIFES drew attention to the savings, averaging 18 per cent of total fuel consumption that their engineers were making for industrial firms. As a result, industry is making an increasing demand on NIFES' services. During the past six months these have been stepped up over fourfold. The number of NIFES' engineer days spent on fuel efficiency surveys from April to September, 1955, was 6,920 compared with 1,682 for the same period in 1954.

Other NIFES' services are also designed to produce quick results. In particular the board urges industry to take advantage of their training scheme for boiler operatives. Participation in this scheme can result, it is claimed, in savings of up to 10 per cent during this winter.

Full details of NIFES' services and the course for boiler operators can be obtained from the head office at 71 Grosvenor Street, London W.1, or from any area office.

## *Beilby Memorial Awards*

CONSIDERATION will be given to the making of an award or awards from the Sir George Beilby Memorial Fund early in 1956. These awards are made from the interest derived from the fund and are given at the discretion of the administrators representing the Royal Institute of Chemistry, The Society of Chemical Industry and the Institute of Metals.

Preference is given to work on investigations relating to Sir George Beilby's special interests, fuel economy, chemical engineering and metallurgy. The awards are not made as the result of some competition but in recognition of continuous scientific work of a high standard. Younger workers will be considered rather than workers of established repute.

Applications should be made either by the candidate himself or by others and should be addressed to: The Convenor of the Administrators, Sir George Beilby Memorial Fund, The Royal Institute of Chemistry, 30 Russell Square, London W.C.1, and should be accompanied by nine copies of a short statement of the candidates career and of a list of references to papers or other works published by the candidate, independently or jointly.

### Fertiliser Research Farm

Fisons have bought a farm at North Tawton, Devon, for agricultural research purposes. To be known as the North Wyke Experimental Station, it will be governed by the company's Levington research station near Ipswich, Suffolk.

# British Chemical Prices

**(These prices are checked with the manufacturers, but it must be pointed out that in many cases there are variations according to quantity, quality, place of delivery, etc.)**

LONDON.—The market for industrial chemicals shows no decided trend, and no important price changes have been reported on the week. The flow of new business on home account has been good for the period, with interest spread over most sections of the market. The volume of export trade has been fully maintained and, with a few exceptions, supplies for shipment are readily available. Pitch and crude-tar are active items in a steady coal-tar products market. There is also a strong demand for naphthalene. No price changes have been reported in this section.

MANCHESTER.—Traders on the Manchester chemical market during the past week have reported a steady flow of delivery specifications under contracts for a wide range of products, including the soda, potash and ammonia compounds, and replacement business is coming forward satisfactorily as the need arises. Export inquiries during the week have also been on a fair scale. Quotations for most lines are on a distinctly firm basis. In one or two sections of the fertiliser market current business is on steady lines, with others seasonally slow. A good demand is reported in most sections of the by-products trade.

GLASGOW.—The past week continued to show improvement in the Scottish heavy chemical market and business generally has been brisk. The demand has been for both spot and forward deliveries although the bulk of orders received have been mostly for the former and have covered most sections of the industry. Prices on the whole have remained firm. A slight falling off in export has to be reported although inquiries received show favourable prospects.

## General Chemicals

**Acetic Acid.**—Per ton : 80% technical, 10 tons, £83 ; 80% pure, 10 tons, £89 ; commercial glacial, 10 tons, £91 ; delivered buyers' premises in returnable barrels (technical acid barrels free) ; in glass carboys, £7 ; demijohns, £11 extra.

**Acetic Anhydride.**—Ton lots d/d, £123 per ton.

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

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

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

**Ammonium Bicarbonate.**—2-cwt. non-returnable drums, 1-cwt. non-returnable kegs ; 1-ton lots, £50 5s. per ton.

**Ammonium Chloride.**—Per ton lot, in non-returnable packaging, £27 17s. 6d.

**Ammonium Nitrate.**—D/d, £31 per ton (in 4-ton lots).

**Ammonium Persulphate.** — MANCHESTER : £6 2s. 6d. per cwt., in 1-cwt. lots, delivered. £112 10s. 0d. per ton, in minimum 1-ton lots, delivered.

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

**Antimony Sulphide.**—Crimson, 4s. 4d. to 4s. 9½d. ; golden, 2s. 7½d. to 4s. 0¾d. ; all per lb., delivered UK in minimum 1-ton lots.

**Arsenic.**—Per ton, £45 to £50 ex store.

**Barium Carbonate.**—Precip., d/d : 4-ton lots, £41 per ton ; 2-ton lots, £41 10s. per ton, bag packing.

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

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

**Bleaching Powder.**—£28 12s. 6d. per ton in returnable casks, carriage paid station, in 4-ton lots.

**Borax.**—Per ton for ton lots, in hessian sacks, carriage paid : Technical, anhydrous, £66 10s. ; granular, £42 ; crystal, £44 10s. ; powder, £45 10s. ; extra fine powder, £46 10s. ; BP, granular, £51 ; crystal, £53 10s. ; powder, £54 10s. ; extra fine powder, £54 10s.

**Boric Acid.**—Per ton for ton lots, in hessian sacks, carriage paid : Technical, granular, £71 10s. ; crystal, £79 10s. ; powder, £77 ; extra fine powder, £79 ; BP granular, £85 ; crystal, £91 10s. ; powder, £89 ; extra fine powder, £91.

**Calcium Chloride.**—Per ton lots, in non-returnable packaging : solid, £15 ; flake, £16.

**Chlorine, Liquid.**—£37 10s. per ton, in returnable 16-17-cwt. drums, delivered address in 3-drum lots.

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

**Chromium Sulphate, Basic.**—Crystals, 7⅞d. per lb. delivered (£73 10s. per ton).

**Citric Acid.**—1-cwt. lots, £10 5s. cwt.

**Cobalt Oxide.**—Black, delivered, bulk quantities, 13s. 2d. per lb.

**Copper Carbonate.**—3s. per lb.

**Copper Sulphate.**—£110 15s. per ton f.o.b., less 2% in 2-cwt. bags.

**Cream of Tartar.**—100%, per cwt., about £11 12s.

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

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

**Glycerine.**—Chemically pure, double distilled 1.260 S.G., £13 3s. 6d. to £13 14s. 6d. per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

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

**Hydrofluoric Acid.**—59/60%, about 1s. 3d. to 1s. 6d. per lb.

**Hydrogen Peroxide.**—27.5% wt., £128 10s. per ton. 35% wt., £158 per ton d/d. Carboys extra and returnable.

**Iodine.**—Resublimed B.P., 17s. 7d. per lb., in 28-lb. lots.

**Iodoform.**—£1 6s. 7d. per lb., in 28-lb. lots.

**Lactic Acid.**—Pale tech., 44 per cent by weight, 14d. per lb. ; dark tech., 44 per cent by weight, 8¼d. per lb., ex-works ; chemical quality, 44 per cent by weight, 12¼d. per lb., ex-works ; 1-ton lots, usual container terms.

**Lead Acetate.**—White : About £143 10s. per ton.

**Lead Nitrate.**—About £129 10s. 1-ton lots.

**Lead, Red.**—Basis prices per ton. Genuine dry red, £135 10s. ; orange lead, £147 10s. Ground in oil : red, £153 ; orange, £165. £165

**Lead, White.**—Basis prices : Dry English in 5-cwt. casks, £141 10s. per ton. Ground in oil : English, 1-cwt. lots, 178s. per cwt.

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

**Litharge.**—£137 10s. per ton, in 5-ton lots.

**Magnesite.**—Calcined, in bags, ex-works, about £21 per ton.

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

**Magnesium Chloride.**—Solid (ex-wharf), £16 per ton.

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

**Magnesium Sulphate.**—Crystals, £16 per ton.

**Mercuric Chloride.**—Technical Powder, £1 5s. per lb., in 5-cwt. lots ; smaller quantities dearer.

**Mercury Sulphide, Red.**—£1 9s. 3d. per lb., for 5-cwt. lots.

**Nickel Sulphate.**—D/d, buyers UK £170 per ton. Nominal.

**Nitric Acid.**—80° Tw., £35 per ton.

**Oxalic Acid.**—Home manufacture, minimum 4-ton lots, in 5-cwt. casks, about £130 per ton, carriage paid.

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

**Potash, Caustic.**—Solid, £93 10s. per ton for 1-ton lots ; Liquid, £36 5s.

**Potassium Carbonate.** — Calcined, 96/98%, about £74 10s. per ton for 1-ton lots, ex-store.

**Potassium Chloride.**—Industrial, 96%, 1-ton lots, about £24 per ton.

**Potassium Dichromate.**—Crystals and granular, 1s. 1d. per lb., in 5-cwt. to 1-ton lots, d/d UK.

**Potassium Iodide.**—B.P., 14s. 1d. per lb. in 28-lb. lots ; 13s. 7d. in cwt. lots.

**Potassium Nitrate.**—In 4-ton lots, in non-returnable packaging, paid address, £63 10s. per ton.

**Potassium Permanganate.**—BP, 1-cwt. lots, 1s. 9d. per lb. ; 3-cwt. lots, 1s. 8½d. per lb. ; 5-cwt. lots, 1s. 8d. per lb. ; 1-ton lots, 1s. 7¾d. per lb. ; 5-ton lots, 1s. 7¼d. per lb. ; Tech., 5-cwt. packed in 1-cwt. drums, £8 14s. 6d. per cwt. ; packed in 1 drum, £8 9s. 6d. per cwt.

**Salammoniac.**—Per ton lot, in non-returnable packaging, £45 10s.

**Salicylic Acid.** — MANCHESTER : Technical 2s. 7½d. per lb. d/d.

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

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

**Sodium Acetate.**—Commercial crystals, £91 per ton d/d.

**Sodium Bicarbonate.**—Per ton lot, in non-returnable packaging, £15 10s.

**Sodium Bisulphite.** — Powder, 60/62%, £42 15s. d/d in 2-ton lots for home trade.

**Sodium Carbonate Monohydrate.**—Per ton lot, in non-returnable packaging, paid address, £59 5s.

**Sodium Chlorate.**—About £87 per ton nominal 1-cwt. drums, carriage paid station, in 4-ton lots.

**Sodium Cyanide.**—96/98%, £113 5s. per ton lot in 1-cwt. drums.

**Sodium Dichromate.**—Crystals, cake and powder, 10¾d. per lb. Net d/d UK, anhydrous, 1s. 0½d. per lb. Net del. d/d UK, 5-cwt. to 1-ton lots.

**Sodium Fluoride.**—Delivered, 1-ton lots and over, £4 15s. per cwt. ; 1-cwt. lots, £5 5s. per cwt.

**Sodium Hyposulphite.**—Pea crystals £35 15s. a ton; commercial, 1-ton lots, £32 10s. per ton, carriage paid.

**Sodium Iodide.**—BP, 17s. 1d. per lb. in 28-lb. lots.

**Sodium Metaphosphate (Calgon).**—Flaked, loose in metal drums, £127 per ton.

**Sodium Metasilicate.**—£25 per ton, d/d UK in ton lots, loaned bags.

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

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

**Sodium Percarbonate.**—12½% available oxygen, £8 6s. 9d. per cwt. in 1-cwt. kegs.

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

**Sodium Silicate.**—75-84° Tw. Lancashire and Cheshire, 4-ton lots, d/d station in loaned drums, £10 15s. per ton ; Dorset, Somerset and Devon, £3 17s. 6d. per ton extra ; Scotland and S. Wales, £3 per ton extra. Elsewhere in England, excluding Cornwall, and Wales, £1 12s. 6d. per ton extra.

**Sodium Sulphate (Glauber's Salt).**—About £9 5s. per ton d/d.

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

**Sodium Sulphide.**—Solid, 60/62%, spot, £34 2s. 6d. per ton, d/d, in drums ; broken, £35 2s. 6d. per ton, d/d, in drums.

**Sodium Sulphite.**—Anhydrous, £66 5s. per ton; commercial, £25 5s. to £27 per ton d/d station in bags.

**Sulphur.**—Per ton for 4 tons or more, ground, £20 to £22, according to fineness.

**Sulphuric Acid.**—Net, naked at works, 168° Tw. according to quality, per ton, £10 7s. 6d. to £12 ; 140° Tw., arsenic free, per ton, £8 12s. 6d. ; 140° Tw., arsenious, per ton, £8 4s. 6d.

**Tartaric Acid.**—Per cwt. : 10 cwt. or more £13 15s.

**Titanium Oxide.**—Standard grade comm., with rutile structure, £162 per ton ; standard grade comm., £142 per ton.

**Zinc Oxide.**—Maximum price per ton for 2-ton lots, d/d, white seal, £107 ; green seal, £105 ; red seal, 2-ton lots, £103 per ton.

### Solvents & Plasticisers

**Acetone.**—Small lots : In 5-gal. cans : 5-gal., £125 10-gal. and upward, £115, cans included. In 40/45 gal. returnable drums, spot : Less than 1 ton, £90 ; 1 to less than 5 tons, £87 ; 5 to less than 10 tons, £86 ; 10 tons and upward, £85. In tank wagons, spot : 1 to less than 5 tons (min. 400 gal.), £85 ; 5 to less than 10 tons (1,500 gal.), £84 ; 10 tons and upward (2,500 gal.), £83 ; contract rebate, £2. All per ton d/d.

**Butyl Acetate BSS.**—£159 per ton, in 10-ton lots.

***n*-Butyl alcohol, BSS.**—10 tons, in drums, £143 per ton d/d.

***sec*-Butyl Alcohol.**—5 gal. drums £159 ; 40 gal. drums : less than 1 ton £124 per ton ; 1 to 10 tons £123 per ton ; 10 tons and over £119 per ton ; 100 tons and over £120 per ton.

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

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

**Dibutyl Phthalate.**—In drums, 10 tons, 2s. per lb. d/d ; 45-gal. drums, 2s. 1½d. per lb. d/d.

**Diethyl Phthalate.**—In drums, 10 tons, 1s. 11½d. per lb. d/d ; 45 gal. drums, 2s. 1d. per lb. d/d.

**Dimethyl Phthalate.**—In drums, 10 tons, 1s. 9d. per lb. d/d ; 45 gal. drums, 1s. 10½d. per lb. d/d.

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

**Ether BSS.**—In 1 ton lots, 1s. 11d. per lb. ; drums extra.

**Ethyl Acetate.**—10 tons lots, d/d, £128 per ton.

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

**Methanol.**—Pure synthetic, d/d, £43 15s. per ton.

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

**Methyl Ethyl Ketone.**—10-ton lots, £133 per ton d/d. ; 100-ton lots, £131 per ton d/d.

**Methyl *iso*Butyl Ketone.**—10 tons and over £159 per ton.

***iso*Propyl Acetate.**—In drums, 10 tons, £123 per ton d/d ; 45 gal. drums, £129 per ton d/d.

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

### Rubber Chemicals

**Carbon Bisulphide.**—£61 to £67 per ton, according to quality.

**Carbon Black.**—8d. to 1s. per lb., according to packing.

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

**India-Rubber Substitutes.**—White, 1s. 5¾d. to 1s. 9½d. per lb. ; dark, 1s. 4d. to 1s. 6¾d. per lb. delivered free to customers' works.

**Lithopone.**—30%, about £52 per ton.

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

**Sulphur Chloride.**—British, about £50 per ton.

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

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

### Coal-Tar Products

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

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

**Creosote.**—Home trade, 1s. to 1s. 9d. per gal., according to quality, f.o.r. maker's works. MANCHESTER : 1s. to 1s. 8d. per gal.

**Cresylic Acid.**—Pale 99/99½ %, 5s. 10d. per gal. ; 99.5/100%, 6s. per gal. D/d UK in bulk : Pale A.D.F. from 6s. 5d. per imperial gallon f.o.b. UK., 85 cents per US gallon, c.i.f. NY.

**Naphtha.**—Solvent, 90/160°, 5s. per gal ; heavy, 90/190°, 4s. 10d. per gal. for bulk 1000-gal. lots, d/d. Drums extra ; higher prices for smaller lots.

**Naphthalene.**—Crude, 4-ton lots, in buyers' bags, £17 5s. to £28 7s. per ton nominal, according to m.p. ; hot pressed, £40 per ton in bulk ex-works ; refined crystals, £56 10s. per ton d/d, mis. 4-ton lots.

**Pitch.**—Medium, soft, home trade, £9 per ton f.o.r. suppliers' works ; export trade about £10 10s. per ton f.o.b. suppliers' port.

**Pyridine.**—90/160;, 20/- to £1 2s. 6d. per gal·

**Toluole.**—Pure, 5s. 7d. ; 90's, 4s. 10d. per gal. d/d. MANCHESTER : Pure, 5s. 7d. per gal. naked.

**Xylole.**—For 1000-gal. lots, 5s. 10d. to 6s. per gal., according to grade, d/d London area in bulk.

### Intermediates & Dyes (Prices Nominal)

***m*-Cresol** 98/100%.—4s. 9d. per lb. d/d.

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

***p*-Cresol** 34/35° C.—4s. 9d. per lb. d/d.

**Dichloraniline.**—4s. 3½d. per lb.

**Dinitrobenzene.**—88/89° C., 2s. per lb.

**Dinitrotoluene.**—S.P. 15° C., 2s. 0½d. per lb. ; S.P. 26° C., 1s. 4d. per lb. ; S.P. 33° C., 1s. 2d. per lb. ; S.P. 66/68° C., 1s. 10d. per lb. Drums extra.

***p*-Nitraniline.**—4s. 10d. per lb.

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

**Nitronaphthalene.**—2s. 1d. per lb.

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

***p*-Toluidine.**—5s. 9½d. per lb., in casks.

**Dimethylaniline.**—3s. 3d. per lb., drums extra, carriage paid.

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The consumption of lead in the United Kingdom during August totalled 2,954 long tons, bringing the total for the first eight months of the year to 237,536 long tons, compared with 215,735 long tons for the corresponding period last year. Consumption of cadmium totalled 72,300 long tons, making 17,950 long tons for the first eight months of the year, compared with 13,950 long tons last year.

# *Chemical & Allied Stocks & Shares*

WITH sentiment this month almost entirely dominated by the knowledge that the Government was planning further measures to check inflation, stock markets suffered a sharp decline, followed later by a partial rally. This gave way to a big fall last week when it was announced that the anti-inflation measures would include an Autumn Budget. Now, however, share values have recorded a rally because it is realised that the Government's plans should curb inflation and result in strengthening of the £ and an upward trend in our gold and dollar reserves in due course.

It is also realised that the hopeful estimates of increased dividends which were current in the City not so long ago, will have to be revised, partly because of the growing competition both in home and export markets. On the other hand, there are many shares which have fallen heavily in recent weeks, and now offer quite attractive yields with favourable prospects of dividends being maintained. In fact the prevailing assumption is that, with the removal of uncertainty regarding the Government's plans, it should be easier to assess the market outlook and buyers are likely to become much more in evidence than in recent weeks.

**Imperials Decline**

Reflecting the prevailing trend in markets, Imperial Chemical have declined on balance for the month from 50s. 7½d. to 47s. 1½d. The half-yearly profit figures created an excellent impression, though like those of many other industries, they showed that there has been a tendency for the rate of increase in profits to decline owing to rising costs and other factors. There was a good deal of business in Albright & Wilson 5s. shares, which after falling to 17s. 6d. rallied to 20s. 9d. compared with 21s. a month ago.

Anchor Chemical 5s. shares remained at 13s. 9d. and elsewhere, Fisons have declined on balance from 58s. to 56s. In line with the general trend, Laporte 5s. units were 16s. 6d. compared with 19s. 3d. a month ago. In other directions, Hardman & Holden 5s. shares were 13s. compared with 14s. 3d., while Hickson & Welch 10s. shares have been relatively firm, and at 27s. 6d. compared with 28s. a month ago.

Borax Consolidated, in common with some other shares in which there are American shareholders, fluctuated very sharply, and were 141s. 6d., compared with 149s. 3d. a month ago. Unilever was another share to show big movements, and the current level of 87s. 9d. compares with 92s. 6d. a month ago. In the same period Unilever NV have come back from 112s. to 104s. 3d. Both companies, it was announced this week, are to distribute free scrip issues of 25 per cent.

The 6s. 8d. units of the Distillers Co. came back from 24s. 7½d. to 23s. 7½d. Yorkshire Dyeware & Chemical 5s. shares remained at 11s. 3d., but Reichhold 5s. shares eased from 20s. 9d. a month ago to 17s. 9d., and Lawes Chemical 10s. shares from 16s. 6d. to 15s. 7½d. Coalite & Chemical 2s. units have receded from 4s. 3d. to 3s. 9d., while shares of plastics companies also moved with the surrounding trend in stock markets, British Xylonite, for instance, being 43s. 6d., compared with 46s. a month ago.

British Industrial Plastics 2s. units eased from 6s. to 5s. 9d. while British Glues & Chemicals 4s. units receded on balance from 15s. 3d. to 14s. 6d. Ashe Chemical 1s. shares were 1s. 7d., Brotherton 10s. shares 36s. 10½d. and Greeff-Chemicals Holdings 5s. shares have changed hands actively around 18s. In other directions, Staveley were 64s. 3d., Boots Drug 5s. units 17s. 3d. and Sangers 5s. shares 15s. 3d. Triplex Glass 10s. shares eased to 39s. 6d. Oil shares fell heavily, Shell being 123s. 1½d., compared with 135s. 7½d. a month ago, and BP 100s. 7½d. compared with 115s. 7½d.

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**University Students**

Dr. K. S. Dodgson, lecturer in the department of biochemistry at the University College of South Wales and Monmouthshire, told Pontypridd Rotary Club on 18 October: 'Some university students have got their grants too easily. They do not appreciate the trust placed in them. They do not realise that it is their duty to everyone to do their utmost'. In the last examinations in his department nearly half the students failed to reach the required standard. This lowering of standards was true not only in his own college but all over the country. Something would have to be done if we were to retain our standing in the world.

# Next Week's Events

MONDAY 31 OCTOBER

**Society of Chemical Industry**

Leeds: Chemistry Lecture Theatre, 6.30 p.m. 'The Hydrogen Isotope Effect in Reaction Kinetics' by R. P. Bell, M.A., F.R.S.

**Institute of Metal Finishing**

Glasgow: Institution of Engineers & Shipbuilders in Scotland, 39 Elmbank Crescent, 7.30 p.m. 'Tumbling into the Future', colour film on barrelling and tumbling presented by H. Marston.

**Society of Chemical Industry**

Eastbourne: Winter Gardens and Grand Hotel, start of the four-day National Crop Protection Conference.

TUESDAY 1 NOVEMBER

**The Chemical Society**

Manchester: Large Chemistry Theatre, The University, 6.30 p.m. Centenary Lecture, 'The Photosynthetic Carbon Cycle' by Professor M. Calvin, Ph.D.

WEDNESDAY 2 NOVEMBER

**Society of Chemical Industry**

Grangemouth: Lea Park Hotel, 7.30 p.m. Joint meeting with the Royal Institute of Chemistry and Society for Analytical Chemistry, 'Ion Exchange' by T. R. E. Kressman, Ph.D., D.I.C., F.R.I.C.

**Society for Analytical Chemistry**

London: Chemical Society Rooms, Burlington House, Piccadilly, W.1, 7 p.m. 'The Evaluation of Anti-fungals' organised by the Biological Methods Group.

**The Textile Institute**

Macclesfield: Canteen of Wm. Frost Ltd., Elizabeth Street Mills, 8 p.m. 'The Retailers' Requirements from the Dyer & Finisher' by I. Glasman.

**Institution of Chemical Engineers**

Fawley: Visit to the Fawley Refinery of Esso Petroleum Ltd. Meet Charing Cross Underground Station at 9 a.m.

THURSDAY 3 NOVEMBER

**The Chemical Society**

London: Chemical Society Rooms, Burlington House, Piccadilly, W.1, 7.30 p.m. Meeting for the Reading of Original Papers.

Bristol: Chemistry Department, The University, 7 p.m. Joint meeting with the Royal Institute of Chemistry and the Society of Chemical Industry. 'New Aspects of the Chemistry of the Nitrogen Oxides' by Dr. C. C. Addison, F.R.I.C.

**Institution of Chemical Engineers**

Manchester: Meeting in the Students' Common Room, College of Technology, 6.45 p.m.

**The Chemical Society**

Leicester: University College, 4.30 p.m. Joint meeting with University College, Leicester Chemical Society. Lecture by Professor C. W. Shoppee, Ph.D., D.Sc., F.R.I.C.

FRIDAY 4 NOVEMBER

**The Chemical Society**

Newcastle-on-Tyne: King's College, 4 p.m. Meeting for the Reading of Original Papers.

Cambridge: University Chemical Laboratory, Pembroke Street, 8.30 p.m. 'Synthetic Polypeptides' by Dr. C. H. Bamford.

## *May Build Scottish Refinery*

THE possibility that a major refinery might be located in Scotland by Esso was suggested during a visit by Scottish industrialists and representatives to the company's Fawley refinery. Mr. E. W. Hardiman, regional manager, told them that a time came when further expansion of an existing refinery became impracticable and uneconomic. When that situation arose the obvious policy was the location of a second refinery and Scotland could not be excluded from their calculations.

Having a refinery at one end of the country, he said, suggested that the logical place for a second was at the other end. The prospect was still very much in the air, although a site near Glasgow had been investigated. The second refinery would require to be on the same scale as Fawley and with the present rate of increasing demand, it could well materialise within 10 years.

Speaking on the future of oil, Mr. Hardiman said that Esso had completed a series of 10-year agreements with the Central Electricity Authority under which they would supply oil to seven power stations now being built or projected. Starting from small deliveries this year they would build up to 3,000,000 tons by 1961.

# Law & Company News

## Commercial Intelligence

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

### Mortgages & Charges

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

BRITA FINISH LTD., Coventry, metal anodisers, etc.—29 September, two charges, to Barclays Bank Ltd., each securing all moneys due or to become due to the bank; respectively charged on piece of land at Bodmin Road and 14 The Butts, both Coventry. *Nil. 7 April, 1955.

### Satisfactions

M. G. SOUTHALL LTD., London N., plastics manufacturers, etc.—Satisfaction, 29 September, of debentures registered 17 June, 1948.

### Changes of Name

BRITISH DISINFECTANT CO. LTD., South Grove, South Tottenham N.15, to Three Hands Products Ltd.

CHAMBERLAIN CHEMICAL CO. LTD., Power Road, London W.4, changed to LAMBERT CHEMICAL CO. LTD., on 5 August, 1955.

CLINICAL PRODUCTS (OVERSEAS) LTD., manufacturers of pharmaceutical preparations, etc., 2 The Green, Richmond, Surrey, changed to PERSOMNIA LTD., on 4 August, 1955.

SHELL CHEMICAL MANUFACTURING CO. LTD., St. Helens Court, London E.C., changed to SHELL CHEMICAL CO. LTD., on 27 July, 1955.

### Increases of Capital

T. SAVILLE WHITTLE LTD., manufacturing chemists, etc., 49 Princess Street, Manchester 2, increased by £9,000, in 4,000 ordinary and 6,000 non-redeemable preference shares of £1, beyond the registered capital of £6,000.

RELIANCE MANUFACTURING CO. (BLACKLEY) LTD., oil and chemical manufacturers, etc., 36 Radford Street, Blackley, Manchester, increased by £2,000, in £1 ordinary shares, beyond the registered capital of £50,000.

BOOTS PURE DRUG CO. LTD., 37 Station Street, Nottingham, increased by £7,000,000, in 5s. ordinary shares, beyond the registered capital of £8,000,000.

EPSYLON INDUSTRIES LTD., mechanical, electrical and chemical engineers, etc., North Feltham Trading Estate, Faggs Road, Bedfont, Middlesex, increased by £319,000, in 120,000 six per cent redeemable cumulative preference and 199,000 ordinary shares of £1, beyond the registered capital of £1,000.

JOSEPH WEIL & SON LTD., manufacturers & processors of chemicals, etc., Friars House, 39/41 New Broad Street, London E.C.2, increased by £10,000, in 9,500 ordinary shares of £1, and 5,000 'A' founders and 5,000 'B' founders, shares of 1s., beyond the registered capital of £10,000.

IMPERIAL CHEMICAL INDUSTRIES (TURKEY) LTD., Millbank, London S.W.1, increased by £70,000, in £1 ordinary shares, beyond the registered capital of £280,000.

MINSAL LTD., manufacturers of iodised minerals, salts and condiments for cattle, etc., Crewe Road, Wheelock, Sandbach, increased by £49,000, in £1 ordinary shares, beyond the registered capital of £1,000.

## New Registrations

### Sutton Silica Co. Ltd.

Private company registered on 5 October to carry on business as millers of quartz, silica and sands for the chemical industry at Sutton Street, Newcastle, Staffordshire. Share capital—£1,500 in £1 shares. Directors: W. Ralph Lawton and G. A. Barker.

### Peptinol (G.B.) Ltd.

Private company. (555,894). Capital £1,000 in £1 shares. To carry on the business of manufacturing, research, dispensing and analytical chemists and druggists, etc. Directors: Rt. Hon. Baron Westwood, and Walter Wilson. Reg. office: 80 Elswick Road, Newcastle-on-Tyne.

### Edward Hurt & Son Ltd.

Private company. (554,537). Capital £10,000 in £1 shares. To carry on the business of mechanical, electrical and chemical engineers, etc. Directors: Edward Hurt and Nellie M. Hurt. Registered office: 86 Tullibardine Road, Sheffield 11.

**Lake & Cruickshank Ltd.**

Private company. (554,832). Capital £20,000 in £1 shares. To carry on the business of extractors by crushing chemical or any other means of cocoa residues and any other substances, manufacturing chemists and druggists; makers of cattle foods and feeding preparations of all kinds, etc. Subscribers (each with one share): James S. P. Lake and Ernest G. L. Harrison. Directors: James S. P. Lake, George M. Cruickshank and Leonard Saunders. Solicitors: Potel, Tattersall & Lake, 58 Haymarket, London S.W.1.

**Powrie Bros. (Seaweed Products) Ltd.**

Private company (31,062.) Capital £1,000. To harvest seaweed and manufacture kelp, disinfectants, fertilisers, dyes, etc. Directors: C. F. Powrie, A. Y. Powrie, Mrs. H. Powrie and Ian H. Powrie, 5 Westholme Crescent, South Aberdeen.

**Edons Ltd.**

Private company. (555,642). Capital £500 in £1 shares. To carry on the business of manufacturers of and dealers in chemicals, gases, drugs, medicines, etc. Subscribers (each with one share): Mrs. Edith L. Lyons and Brenda Lyons. Mrs. Edith L. Lyons signs as director. Solicitors: M. J. Jeffrey & Co., 119/125 Finsbury Pavement, E.C.2.

**Cirolanum Successors Ltd.**

Private company (556,168.) Capital £5,000. To carry on the business of chemical engineers, chemical and other analysts, manufacturing chemists and druggists, manufacturers and distillers of and merchants in ammonia, tar, coal, coke, oxides, ammoniacal liquor and mineral and chemical substances of all kinds, makers and vendors of gas and electricity, metallurgists, mechanical and other engineers, etc. Subscribers (each with one share) are: Donald Best and Derek Chambers. The first directors are to be appointed by the subscribers. Solicitors: Simpson Curtis & Co., Leeds 1.

**Agricultural & Industrial Coatings Ltd.**

Private company (556,240.) Capital £100. To carry on the business of manufacturers of and dealers in chemicals in raw or manufactured state; to carry on the business of makers and manufacturers of paints, distempers, varnishes, lubricants, chemical compounds, nitrates, composts, weed and pest destroyers, disease preventatives, soil purifiers, insecticides, artificial manures and fertilisers, etc. The subscribers (each with one share) are: Hylton F. G. Sheppard and Frank L. Coventry. The first directors are to be appointed by the subscribers. Solicitors: Howe & Rake, 22 Chancery Lane, London W.C.2.

## *Company News*

**Midland Industries Ltd.**

During the year under review the sales reached a new high level, and further progress was made in the sale of Mil steam traps and fittings which in the last two years have increased by 40 per cent. Their success, said Mr. J. H. Bean, C.B.E., presiding at the annual general meeting, is evidenced by the new names on our order books which includes those from the petroleum and chemical industries. The company's profit for the year, after all charges except taxation, was £146,413, compared with £109,610 for the last year. Tax absorbs £76,600 against £68,550, leaving a net profit of £69,813; £28,000 more than in the previous year.

**Ketton Portland Cement Co. Ltd.**

Profits for the year ended including dividends received, and before allowing for tax, depreciation and other charges, is £442,988 as against £354,328 last year. Taxation—profits tax and income tax—will absorb £190,700, and £56,285 is provided for normal depreciation. A final dividend of 15 per cent (12½ per cent last year) is recommended, with a bonus of five per cent, both less tax, on the ordinary shares, making a total of 20 per cent, less tax.

**North British Rayon**

The company reports a loss for the year ended 30 June last of £34,486, compared with a deficit of £58,031 in the previous 12 months. This is before providing £46,893 (£33,523) for depreciation and charging interest and fees. After all charges the group loss is £97,619 and goes against a debit of £2,141 in 1953-54 after a tax credit of £52,569 and crediting £53,000 taken from tax equalisation account. There is neither a tax charge nor credit for 1954-55. The dividend on the six per cent preference in respect of the 2½ years ended 30 June last remains unpaid.

# 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.**

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VACANCIES for Draughtsmen with experience in the following fields :—
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Working conditions and scope good. Five-day week, 3 weeks' holiday, luncheon facilities, pension scheme. Initial salaries depending on age and experience up to £800 per annum for senior men. Write,

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HUNTINGTON, HEBERLEIN & CO., LTD.,
114, CROMWELL ROAD,
LONDON, S.W.7.**

**GRADUATE CHEMISTS,** aged 23 to 25 years, National Service completed, required for investigational work in rubber, resins, waxes and allied fields. Experience in these subjects is not required. The posts will call for practical ability and should appeal to those interested in Applied Chemistry. Superannuation and bonus schemes in operation. Apply to **MANAGING DIRECTOR, EVODE LIMITED, STAFFORD.**

**GRADUATES in MECHANICAL and CHEMICAL ENGINEERING required for progressive positions in the Research, Design and Production Divisions of THE POWER-GAS CORPORATION LIMITED. Training given to men without previous industrial experience. Apply to :—STAFF PERSONNEL MANAGER, PARKFIELD WORKS, STOCKTON-ON-TEES.**

**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.**

**MINISTRY OF SUPPLY** requires **CHEMIST** in London H.Q. to take charge of small section responsible for design and development of packaging for vehicle components. **Qualifications**—British of British parents ; Honours Degree Chemistry or Chemical Engineering or A.R.I.C. or A.I.M. or equivalent qualification. Experience in corrosion prevention and chemical processing of metallic stores desirable. **Salary**—Within £1,095-£1,415. Not established but opportunities to compete for establishment may arise. Application forms from M.L.N.S., Technical and Scientific Register (K), 26, King Street, S.W.1, quoting F.775/5A.

RETIRED Chemical Engineers' Contract Manager or Assistant required for part-time by Northern firm of Assessors to assist with plant and machinery work. Must have fair technical knowledge and be conversant with current prices. **BOX No. C.A. 3434, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

**NORTH WESTERN GAS BOARD
(NORTH CHESHIRE GROUP)
Chief Chemist—Stockport Works**

APPLICATIONS are invited for the above pensionable appointment at a salary within Grade A.P.T.II (£785-£910 per annum).

The successful applicant will be responsible to the Station Engineer for all chemical control connected with the operation of the works and to carry out any special investigations which may be required from time to time.

Applicants should possess suitable technical qualifications and gas works experience would be an advantage, although not essential.

Detailed applications, giving the names of two referees, should reach the

**GENERAL MANAGER,
N.W.G.B. (NORTH CHESHIRE GROUP),
GREAT PORTWOOD STREET,
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within 14 days.

THERE ARE VACANCIES in the Rand and O.F.S. Undertaking Power Stations of the Electricity Supply Commission in the Union of South Africa, for :

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723, THE ADELPHI,
JOHN ADAM STREET, LONDON, W.C.2.**

## 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.**

**ECONOMIC BOILERS.**—Two 11 ft. 6 in. diam., 175 lb, w.p., 15,000 lb. evap. ; 10 ft. 6 in. diam., 160 lb. w.p. ; 9 ft. 6 in. diam., 120 lb. w.p. New 1948. 400 other Boilers in stock.

**TWO** Broadbent **WATER-DRIVEN CENTRIFUGES,** 30 in. diam., 12 in. deep, 1,150 r.p.m.

**SIX** Aluminium **CONDENSERS,** 14 ft. long by 2 ft. 3 in. diam. 386 Tubes, ⅞ in. o.d.

**FORTY** Riveted **RECEIVERS,** 8 ft. 6 in. long, 5 ft. 6 in. diam., 75 lb. w.p. Numerous other sizes.

Solid Drawn **STEEL PIPES,** 6 in., 8 in., 10 in., 12 in., 14 in., thousands of feet in stock, plain and flanged.

**CAST-IRON PIPES,** 1,200 yds. 10 in. and 400 yds. 8 in., **NEW.** Also most other sizes, up to 24 in. bore.

**VALVES** in Stainless, Gunmetal, Enamel Lined.

**CAST-IRON TANK PLATES,** 2 ft. square. 500 in stock.

**FRED WATKINS (BOILERS), LTD.
COLEFORD, GLOS.**

**For Sale**—*continued*

**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).

**TWO**—30 ft. by 9 ft. Boiler Tanks, $\frac{3}{8}$in. plate. Capacity 12,000 gallons each. Cheap for quick sale. **G. E. SIMM (MACHINERY) LTD., 27, BROOMGROVE RD., SHEFFIELD, 10.**

**15** Sulphuric Acid Tanks for sale, as removed from rail wagons. $\frac{3}{8}$ in. plate, welded construction. 15 ft. 6 in. long by 5 ft. diam. Manhole, etc. Excellent condition. **BOX NO. C.A. 3436, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

## WANTED

**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.3.**

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**THE CRACK PULVERISING MILLS LTD**
**Plantation House,**
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**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.**

## PATENTS & TRADE MARKS

**KINGS PATENT AGENCY, LTD., (B. T. King A.M.I.Mech.E., Patent Agent), 146a, Queen Victoria Street, London, E.C.4. ADVICE Handbook, and Consultation free. Phone: City 6161.**

THE Proprietors of Patent No. 656556, for **"PROCESS OF PRODUCING VINYL ETHERS,"** desire to secure commercial exploitation by licence or otherwise in the United Kingdom. Replies to Haseltine Lake & Co., 28, Southampton Buildings, Chancery Lane, London, W.C.2.

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Interplanetary travel is quite feasible and (in the not too distant future) highly probable. The experts who are planning the next stage of man's greater achievements have carefully calculated all factors in men and machines.

Fuel is of course a major problem not yet solved, the answer to this may lie within the field of Fluorine Chemistry

At present Imperial Smelting Corporation make no claims for an interplanetary fuel, but remarkable advances have been made in other fields for industrial and domestic use.

Fluorine compounds are playing an ever increasing part in our daily lives and a brilliant future lies open for this highly specialised group of chemicals—in our Research Laboratories investigations are being conducted in an endeavour to make the greatest use of these chemicals.

ANHYDROUS HYDROFLUORIC ACID
HYDROFLUORIC ACID · BORON TRIFLUORIDE
BENZOTRIFLUORIDE · FLUOSULPHONIC ACID

The above compounds are of great value in the manufacture of fluorinated materials and are available in commercial quantities. Industrial applications include catalysts, lubricants, plastics and specialised welding.

*Should you have any problems or theories on these or any other applications, please consult us.*

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