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THE Chemical Age

VOL. LXXV

22 SEPTEMBER 1956

No. 1941

Ladies are to be admitted

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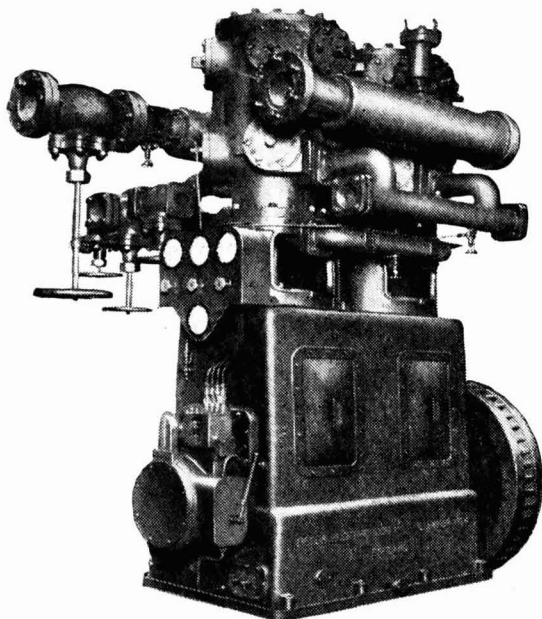
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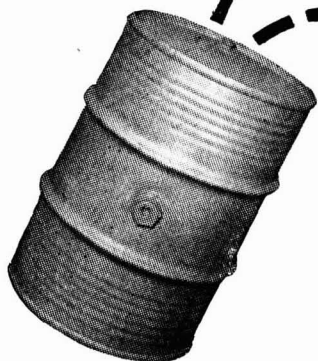


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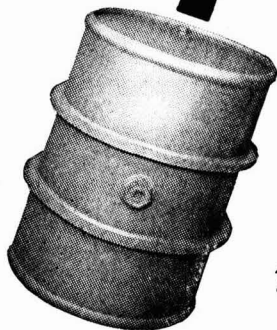
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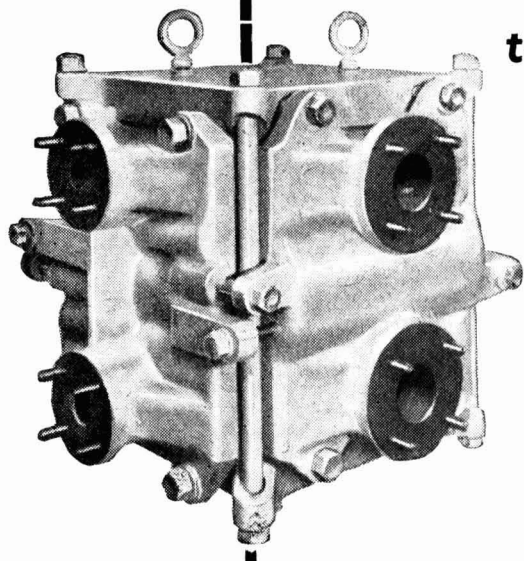
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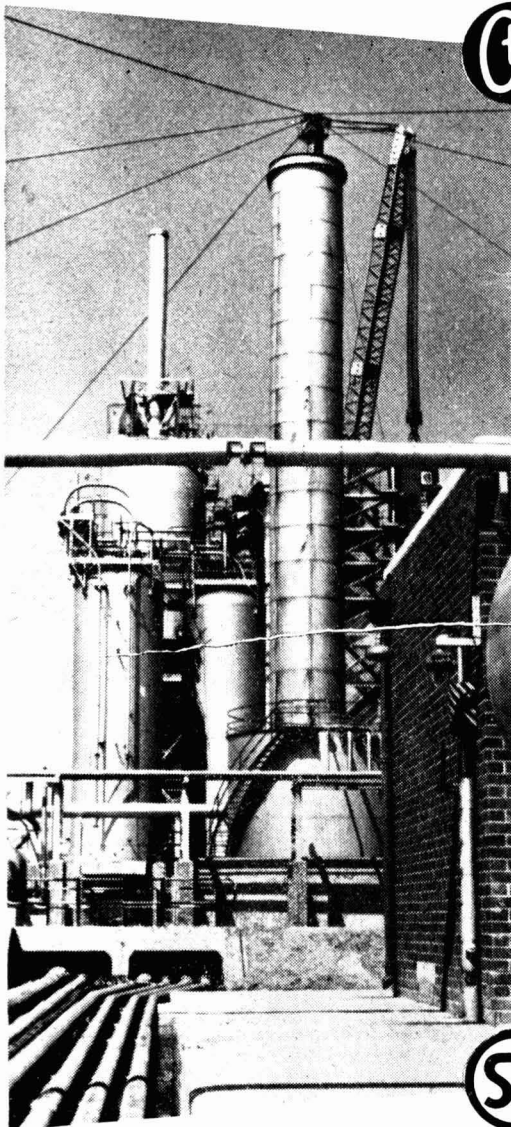
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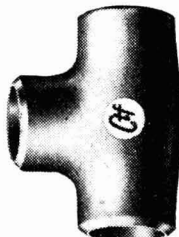
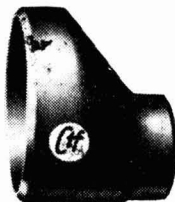
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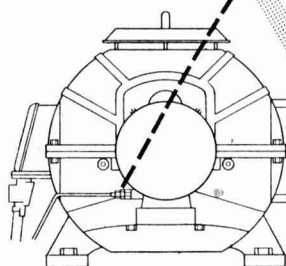
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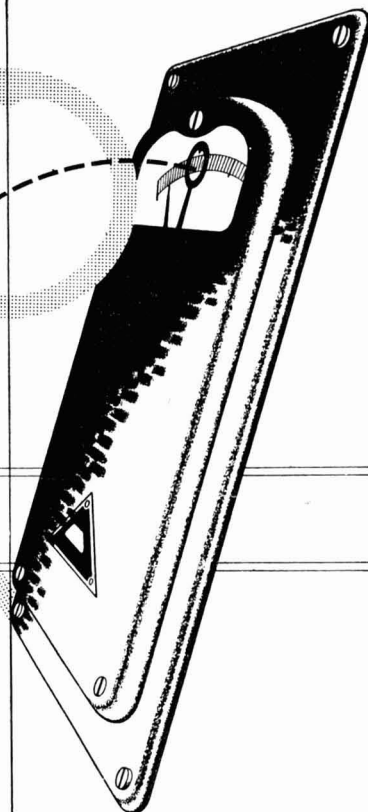


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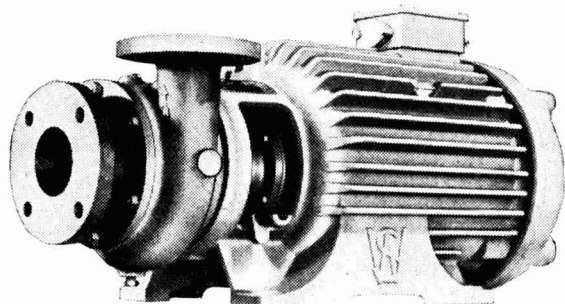
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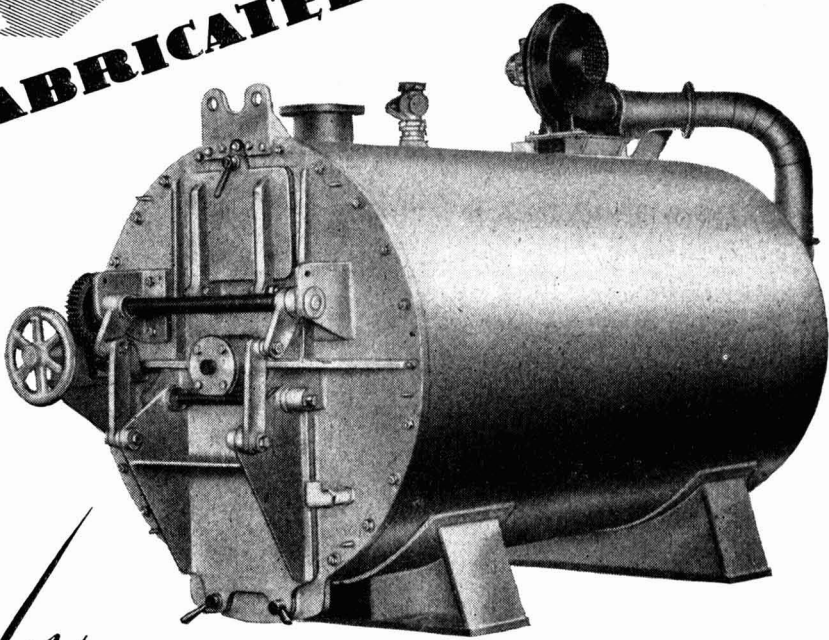
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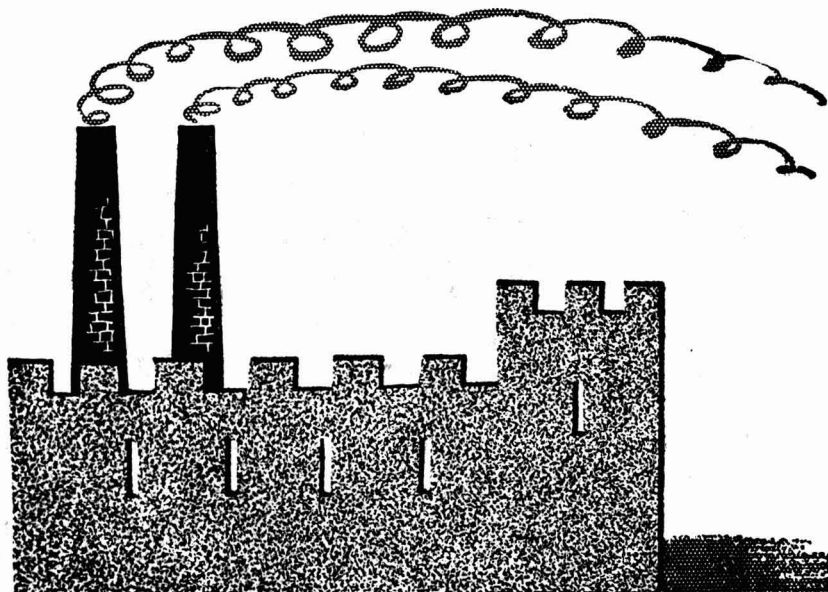
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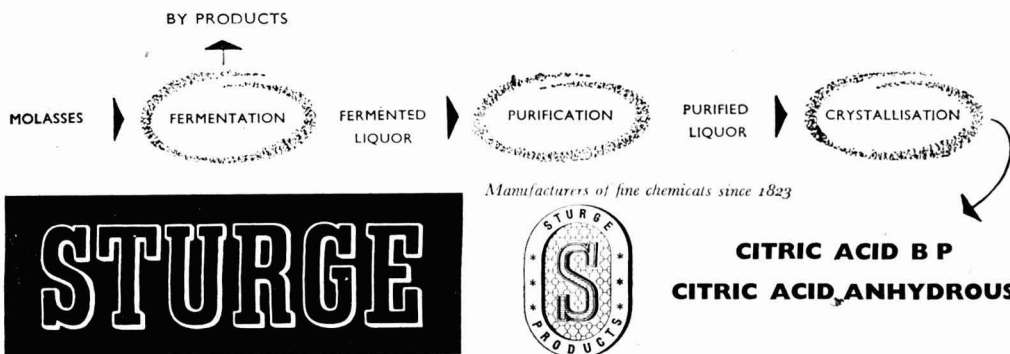
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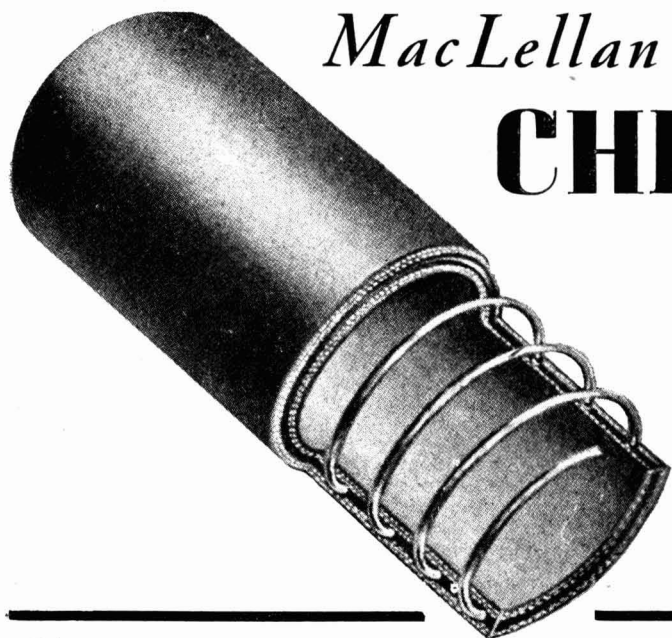
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Research & Development

ONE OF THE most important papers read at this year's British Association meeting at Sheffield was Mr. Ernest Rudd's report on the DSIR preliminary survey of British expenditure on scientific research and technical development (THE CHEMICAL AGE, 8 September). Yet the attention devoted to it by the press was relatively small. Much is being currently said about the need for the British Association to modernise its annual routine, but it is reasonable to wonder whether any changes will alter the fact that papers dealing, say, with sex or planetary exploration projects are bound to receive more public attention than those dealing with fundamental industrial facts.

'What determines a country's rate of economic progress? Any economist can produce a long list of items, but one of the most important is the rate at which new ideas—new things to make, and new ways of making things—are adopted. This in its turn is partly dependent on the rate at which new ideas are produced or, in effect, the amount of research and development work being done.' This, the opening paragraph of Mr. Rudd's paper, could hardly be bettered as a straight-from-the-shoulder statement.

The survey, the first of its kind, is subject to fairly sizeable errors. The paper has been written before all the results have been received and correlated. However, the data involved will be more out-of-date by mid-1957, the earliest time when greater accuracy can be reached. There were in fact two surveys. One, a large sample survey of industry as a whole to find out the number of people

employed on research and development, two, a smaller survey to find out the average expenditure per person. The probable error is of the order of 10 per cent for man-power data and 20 per cent for expenditure data. Most figures given in the paper have been rounded off, a reasonable enough procedure at 80-90 per cent standards of accuracy. The period covered is roughly that of 1955 though, with greater accuracy, it might have been given as the 1955-56 financial year. Research in Northern Ireland and research done abroad by British subsidiaries are not included.

Total figures for industrial research conducted by industry are expressed in outlay terms as follows:

Man-power: 106,000 whole-time workers.
Cost: £185,000,000 per annum.

In these totals, three industries had the following shares:

Aircraft:

Man-power: 30,000.
Cost: £90,000,000.

Electrical Engineering:

Man-power: 27,000.
Cost: £32,000,000.

Chemicals etc. (excluding oil refining):

Man-power: 15,000.
Cost: £20,000,000.

Thus, these three industries together account for some 70 per cent of the total man-power effort, and more than 70 per cent of the total expenditure. No one could dispute the fact that these three industries depend particularly upon research. The chemical industry always has done so, the other two are in a peak

phase of growth and change; but even making all due allowances for this the proportionately small effort made by the *whole* of the rest of industry must be deplored.

When non-private research effort is brought into the picture, the true total is as follows:

<i>Government research:</i>	£120,000,000
<i>Private industrial research:</i>	£185,000,000
<i>Nationalised industries' research:</i>	£4,000,000
<i>Research associations, universities etc.:</i>	£16,000,000
Total:	£325,000,000

This figure is subject to an error of plus or minus £80 million (about 20 per cent). In the figure for 'Government research' the expenditure upon atomic energy has had to be estimated owing to lack of information (for security reasons).

It might seem that industry's own share of this total is reasonable enough—£185 out of £325 million looks like 57 per cent. But largely through Ministry of Supply and Admiralty payments, some £120 million of the £185 million is paid for by the Government. Industry's true share is about 20 per cent or slightly less. However, if this comment is taken as a criticism of industry, it seems a fair reply for industry to say that much of the total expenditure by the Government is, in fact, funded by taxation of profits.

An obvious deduction is that the proportion of research and development effort classifiable as 'defence' must be very high. According to the DSIR survey it is above 60 per cent. Perhaps this can be too readily criticised. It certainly does not mean that research conducted for defence purposes has no other uses. For example, would polythene stand where it does today had it not been for wartime development? Research effort can be classified, but the results of research are not as easily confined to the same filing-system.

It may be open to question whether any country should decide how much research work it needs by making comparisons with other countries' decisions. The research enthusiast—and the whole of this century's industrial story proves

that the research enthusiast is right—would probably say that the decision should be non-relative, that the effort devoted to research should be 'large enough to hurt.' Mr. Rudd's paper includes an Anglo-US comparison. It may be questioned whether the problems of a small country with so many raw material difficulties can be brought into the same perspective as those of a large country without major difficulties in raw materials. An up-to-date Anglo-German comparison might have been more informative and rational.

As here, so also in America, the three largest industrial efforts are made by the same industries, aircraft, electrical engineering, and chemicals. In US, however, their total effort (as cost) is only one half of the total, not nearly three-quarters. US manufacturing industry employs six times as many graduates on research and development as British industry. In one respect, British research expenditure appears to be bolder than that of the US—we spend 2.0 per cent of our gross national product income compared with their 1.5 per cent. But this is quickly offset by the difference in defence and non-defence outlay. More than 60 per cent of our effort is for defence; in US, the proportion is 34 per cent. This means that the Americans are devoting to civil research and development one per cent of their gross national product income, compared with a figure of 0.7 per cent for our civil effort. Nor is this all. The US national product is $2\frac{1}{2}$ times per person more than ours—so, even with national differences of size and population allowed for, the US outlay on civil research etc., is in fact *more than three times the British outlay*. (Perhaps it is almost sadistic to point out also that in the past 10 years or so a profitable amount of US development effort has been devoted to projects whose origin by research was mainly British!)

Clearly enough, the size of the US effort is much bigger and it has a better balance. But absolute need and not keeping-up-with-the-Jones's comparison is the better guide. The fact is that the British research and development effort is not nearly enough, moreover it is not well balanced.

NEWS BRIEFS

Price Stabilisation Continued

It is announced by Johnson, Matthey & Co. Ltd., London EC1, that the company has decided to continue the present policy in regard to charges for refining and manufacturing wherever practicable. It stated on 27 March that charges for refining and manufacturing would be stabilised for six months.

Effluent Permitted

At a meeting held at Chester on Friday, 14 September, the Dee and Clwyd River Board agreed that Monsanto Chemicals Ltd. of Ruabon should be given permission to discharge effluent into the River Dee at Mostyn. The resolution of approval added that the company will be held responsible if any adverse effect on the fisheries is directly traceable to any effluent from these works.

Salt Bath on Show

Wild-Barfield Electric Furnaces Ltd., of Watford, included a small self-contained electrode salt bath—Model ESB 69—on their stand at the exhibition held in conjunction with the Electroheat in Industry and Commerce Conference at Cardiff between 18 and 21 September. There was in addition a small drip feed gas carburising furnace operating with Carbodrip drip feed liquid. This equipment enables gas carburising to proceed at nearly the maximum theoretical rate with complete control of case depth and type of case.

Change of Address

The Institute of Metals and its publications, *The Journal of the Institute of Metals*, *Metallurgical Abstracts* and *Metallurgical Reviews*, have moved to 17 Belgrave Square, London SW1 (telephone: BELgravia 3291). Correspondence for the Advertisement Department and the Joint Library & Information Department should be addressed to 4 Grosvenor Gardens, London SW1 (telephone: SLOane 0061).

Mauve Centenary Exhibition

From Wednesday 26 September to Friday 28 September, the Colour Chemistry and Dyeing Department of Leeds University is holding an exhibition in the department to commemorate the centenary of the discovery of the first aniline dye—Mauve—by Sir William H. Perkin. The exhibition, which will include historical documents relating to

Perkin's discovery, will illustrate the growth of the dyestuffs industry since his time, and also the recent developments in the industry. The exhibition opens from 2 to 5 p.m. on the first day and will be open from 9 a.m. to 5 p.m. on the remaining days. This department at Leeds University is the only one of its type in the country.

Scottish Representatives

Hess Products Ltd., and A. Hess & Bros. Ltd., have appointed as representatives for Scottish sales (apart from the paint and printing ink trades), Anglo Scottish Chemical Co. Ltd., Bank of Scotland Chambers, 20 Renfield Street, Glasgow C2. (Central 7421). MR. G. D. W. ORGAN will be handling the business.

British Tetracycline Patent

The Pfizer Corporation has been granted a patent in Great Britain to produce the antibiotic tetracycline. The patent covers tetracycline and its salts as well as pharmaceutical and veterinary preparations containing them. It also covers a process for the production of tetracycline by catalytic hydrogenation of chlortetracycline.

New Chemical/Metallurgical Plant

Foundry Services Ltd., Birmingham, has issued invitations to 1,000 foundry customers from all over Britain to mark the completion of the new works at Drayton Manor, near Tamworth. Visits will spread over the whole of 'Open Week' beginning Monday 24 September. The new factory is stated to be the largest and most up-to-date plant of its kind in the world for the manufacture of chemical and metallurgical products for the treatment of molten metals and of the moulds into which they are cast. The company maintains an advisory service on metallurgical problems and difficulties arising in the customers' own works.

Monkton Coke Works Output

As a result of extensions to Monkton Coke Works, the plant will begin carbonising 1,300 tons of coal daily in November, as against 600 tons daily with the original plant. It is stated that when the ovens (66 in number) are in full production, 10,000,000 cu. ft. of purified gas daily will be produced compared with 4,000,000 cu. ft. of unpurified gas at present. Annual output of tar will be 22,000 tons with 4,700 tons of sulphate of ammonia. Some 3,300 tons of crude benzole will be produced daily.

Butakon Copolymers

ICI Introduces New Range

A RANGE of copolymers of butadiene with a variety of other monomers such as styrene, methyl methacrylate and acrylonitrile, is being introduced for the first time in Great Britain by Imperial Chemical Industries Ltd., Plastics Division, under the trade name Butakon. Initial manufacture will be of the order of 10,000 tons per annum at ICI's Wilton Works, Yorkshire. The plant should be in operation by the end of this year.

The Butakon range of copolymers will provide a series of speciality copolymers, some of which are novel in character and application and others which have previously been available only in limited quantities by import. The range will include the so-called 'high styrene' reinforcing resins containing more than 50 per cent of styrene, which have proved excellent reinforcing agents for both natural and synthetic rubber, particularly in the manufacture of shoe soles and compositions. Careful studies in the merits of Butakon copolymers as shoe soles indicate that these will wear three to four times as long as the best leather procurable.

Synthetic Rubbers

Butadiene/acrylonitrile oil-resisting synthetic rubbers, known as Butakon A, have also been developed. These nitrile rubbers have varying applications, ranging from flexible fuel tanks to oil-resistant hose.

There are already established and growing applications for aqueous dispersions or latices of butadiene copolymers. Butakon copolymers of the A, M and S series will be available in this form. Such latices are being used increasingly in the paint and paper-coating fields, and there are growing uses in the leather, adhesives and rubber industries. Copolymers containing about 60 per cent of styrene have proved the most suitable for emulsion paints and products of this type are included in the Butakon S series. Novel materials in paint manufacture having the advantage of improved colour stability and gloss on ageing are provided by the Butakon M series based on butadiene/methyl methacrylate. This series and that of the butadiene/styrene (Butakon S) series can be used as pigment binders in paper-coating operations.

Versatile Materials

ARALDITE EPOXY RESINS can be considered among the most versatile of new materials. These resins, developed by Ciba Ltd., Basle, Switzerland and manufactured in the UK by Aero Research Ltd., Cambridge, have properties which have resulted in their being used in many and diverse industries. (*Aero Research Technical Notes, Bulletin No. 163, July 1956*). Excellent adhesion, strength, chemical resistance and electrical insulation, have led to their employment in castings, fillers and surface coatings, and as insulators and 'potting' agents for electrical components. As they are structural materials in their own right they have been most successfully applied as the 'continuous phase' in laminates.

Recently, use was made of Araldite epoxy resin in opening the Dead Sea Scrolls which were discovered in a cave in Jordan. The scrolls, originally riveted together to form a single plaque about 8 feet long by 11 inches wide, were of copper or copper alloy, 0.004 inches thick, on which letters had been impressed with a small punch. The Scrolls had deteriorated badly and no metallic copper remained. Because of extreme brittleness of the scrolls, it was doubtful whether they could be read. Dr. H. Wright Baker, Professor of Mechanical Engineering at Manchester College of Technology, was entrusted with the work of opening the scrolls. After delicate cleaning the scrolls were coated with Araldite epoxy resin (No. 102 with hardener 951) and a small quantity of Toluene and heated at a temperature of 40°C for a few hours in an electric oven. This treatment transformed the brittle sheet of salts into a tough material which could be handled with confidence.

Dunlop's New Factory

A factory, equipped at a cost of more than £250,000, has been built at Hirwaun, South Wales, for producing Lastex yarn and Lactron thread. Mr. John H. Lord, Dunlop director and chairman of Lastex Yarn and Lactron Thread Ltd., stated that when production began later in the year it was hoped to employ 250 people. Mr. Lord said it was logical to set up the factory at Hirwaun where the manufacture of Dunlopillo was already established because their main raw material, liquid rubber latex, was the same and arrived at Swansea docks.

NOTE & COMMENT

'GETTING RID of toxic or odorous fumes by exhausting them through stacks may be a thing of the past'. Thus runs the opening sentence of an article in *Chemical and Engineering News* (1956, **34**, 4096). Its truth would certainly open up a pleasant vista for chemical industry, whose air pollution problems have not been lessened by modern process developments. However, the article is practical rather than prophetically tantalising. It describes a new approach to the fundamental problem of gaseous effluent disposal, destruction of the objectionable gas by combustion coupled with the use of the resultant heat for steam generation. Natural gas is used as the added fuel and the combustion process is catalytically guided. The amount of fuel required can be calculated from the oxygen content of the waste gases, though it is said that a five or 10 per cent excess on calculated amount is needed. This suggests that the new method of elimination may be applicable only to waste gases with an oxygen content, or to wastes that are reducible. A unit based upon this principle has been installed at a nitric acid plant. It is less than 23 feet long and under six feet high; the fuel and waste gases—the latter pre-heated—mix in the catalyst chamber at about 900°F. This temperature may rise through reaction to about 1,600°F depending upon the waste gas oxygen content. The gases then pass on—purified in the sense that they can no longer give rise to fuming—to a heat exchange cooler, most of the heat thus being recovered. It is said that one such unit can deal with the tail gases from a 250-tons-per-day nitric absorption column.

Although this system was devised to deal specifically with nitric oxide fumes, the parent firm (Chemical & Industrial Corporation) are said to have developed

similar units for other kinds of atmospheric pollutants. The active type of catalyst, such as platinum, palladium, nickel, rhodium, is the most suitable, for the apparatus is simplified, the heat development increased, and the catalyst itself more easily controlled. Natural gas is, of course, a relatively cheap agent in the US. In many other countries the supply of a gaseous fuel would be more costly, or call for other equipment for its synthetic production. Nevertheless, catalytic combustion combined with heat recovery may prove cheaper than the cost of atmospheric pollution, especially in a world which is becoming increasingly sensitive about the discharge of effluents.

The Republic & Farm Chemicals

THE REPUBLIC OF IRELAND could enjoy much greater prosperity if her agricultural production was bigger and more economic. This has been said many times before of course. Not much that Denmark has done could not be done by the Republic, though a wetter climate would place even more emphasis upon meat and dairy products as these are so considerably conversion-products of grass. Against these prospects, Southern Ireland has one of the lowest fertiliser usage records in Europe, viz,

	<i>Pounds of plant-food per acre of agricultural land.</i>		
	<i>nitrogen</i>	<i>phos. acid</i>	<i>potash</i>
Republic of Ireland	2.9	12.2	8.3
Britain	17.5	24.3	18.4
Belgium	48.3	46.3	72.8
Average for all OEEC countries	12.9	18.9	17.2

As the last line of figures, the OEEC average, includes some very low-using countries whose agricultural methods are still primitive, the Republic's rate of fertiliser usage is particularly poor—a quarter of the average for nitrogen, a third of the average for phosphate, and about half the average for potash.

There are signs that something is being done to improve this situation. A beginning, properly enough, has been made with lime. If soil acidity is rife, fertiliser applications will not give their fullest benefits. A subsidy scheme for lime (which pays the transport cost from plant to farm) has been initiated and in a few years the consumption of ground limestone has been quadrupled. A 1954 tonnage of some 650,000 has jumped now to

over the million level. This sharply increased demand has led to considerable investment of capital in limestone grinding plants, and the number of these in the Republic has risen from 12 to 50 in under five years. The subsidy cost is rising with tonnage; it is estimated to cost £706,000 in 1955-56. However, a far more generous subsidy scheme for lime and liming materials in general has operated advantageously in the UK since 1937, and has amply repaid its cost through the national value of increased crop output.

But lime can be no more than a start. The Irish Department of Agriculture has recently claimed that twice as much nitrogen, three times as much phosphate, and five times as much potash are now being used by farmers than before the war. This statement would be more impressive if the OEEC comparison figures were not also available; obviously, the pre-war consumption standard is too low to be an effective base for comparison. If a subsidy for lime has proved so effective, the Irish Government should consider introducing some similar scheme to encourage more fertiliser usage.

Atomic Waste Disposal

ON OCTOBER 17 the Calder Hall nuclear power station will come into operation; other reactors are being constructed. The safe disposal of atomic waste from these reactors will present problems but some waste is being discharged into the sea. The annual report of the AEA (HMSO 2s 6d) indicates that radio-activity studies on fish, sea-weed and sand etc, have been in progress. The *British Medical Journal* (4 August) points out that since 'the rate of interchange between surface and deep water varies in different parts of the world, and radioactive materials vary in the rates at which they decay, the particular places chosen for the disposal of waste have to be studied with some care.'

One of the best depositories for fissile material appears to be the Black Sea, as the time taken for the deep water to move near the surface and be replaced by new water mixing downwards (the flushing time) is about 2,500 years. The flushing time in the Atlantic and Caribbean is

estimated at a few hundred years. Thus short-lived fission products can be disposed of in the ocean depths. There is, however, uncertainty about the safety to commercial fisheries, and hence to man, of dumping long-lived fission products such as radio-strontium (*Biological Effects of Atomic Radiation*, Summary Reports from a study by the National Academy of Sciences, Washington, US, 1956).

Titanium Reduction Process

COMPARABLE TESTS with the two inert gases, argon and helium, in the US Bureau of Mines' perfected Kroll magnesium-reduction process for making titanium, conducted over a period of months at the Electro Metallurgical Experiments Station Boulder City, Nevada, US, have shown conclusively that high-purity argon can be substituted for the scarcer helium in the reduction of titanium chloride with magnesium. Mr. C. T. Baroch, Bureau Metallurgist, and two former associates, Mr. T. B. Kaczmarck and Mr. John F. Lenc, report that the reduction could be accomplished with no noticeable impairment in the quality of the resulting titanium sponge metal and with only minor alteration in the reduction technique.

Relative costs of using the gases was not determined, but the Bureau Director, Mr. Marling J. Ankeny has said that the findings are extremely significant and will be increasingly important should greater quantities of helium be required for military or atomic energy uses.

From Natural Gases

Helium is extracted from some natural gases by the US Bureau of Mines and large amounts are used by the Atomic Energy Commission, the Department of Defence, and private industry. Argon, extracted from the atmosphere, is used extensively for shielded-arc welding of certain metals. However it cannot substitute for helium in all fields where the latter is used.

A copy of *Report of Investigations, 5253—Helium and Argon as Inert Atmospheres in Producing Titanium* can be obtained from US Bureau of Mines, Publications Distribution Section, 4800 Forbes St., Pittsburgh 13, Pa. It should be identified by number and title.

TITANIUM OXIDE PIGMENTS

Trends Reviewed at OCCA

Meeting

THE paint machinery manufacturers in this country, said Mr. Hibberd, were following the American lead by developing high speed dispersing equipment which, given suitable raw materials, was capable of high yields of paint with a fineness of grind satisfactory for most purposes. Many titanium oxide manufacturers had anticipated that development and had had on the market for some years 'refined' pigments which gave a really good performance in those high speed dispersing machines.

At first, United Kingdom manufacturers had concentrated on the refining of rutile grades, but only this month a new refined anatase grade (Anatase LF) had been introduced which, it was claimed, had all the ease of dispersion characteristics of the well known Rutiox HD.

Giving some typical results under optimum conditions on a laboratory model Kady mill, he said paints made in that way with refined TiO_2 pigments were perfectly satisfactory for the majority of brushing decorative paints, but were not yet good enough for very high quality industrial finishes where much thinner coats were applied. Commissions were made in the laboratory between ball milled and Kady milled paints by measuring the gloss of films of different thicknesses which had been applied to glass by a spinning table technique.

Gloss Measurements

He gave details of the method of paint preparation and film application together with the gloss measurements and some photomicrographs of some of the thinner films. It was seen from those results, and better still from visual examination of the examples he exhibited, that the critical film thickness above which the film was free from 'nibs' was lower for properly ball-milled paints than for the best that could be produced on the Kady mill.

While the thinness of the films required to show up the differences between the two types of milling reflected great credit on the

At the first meeting of the London Section of the Oil and Colour Chemists' Association in the 1956/57 session on Thursday 13 September, Mr. A. D. Hibberd, B.Sc., of British Titan Products Co. Ltd., presented a paper entitled 'Trends in Titanium Oxide Pigments and Titanium Oxide Pigmented Paints.' Mr. H. A. Newnham, B.Sc. (chairman of the Section), presided.

titanium pigment manufacturers, further improvements were desirable to enable paint to be made eventually with a bucket and stick.

On the subject of yellowing, the author discussed some work in his company's laboratories which confirmed the conclusion in a report of the Federation of Paint and Varnish Production Clubs that the yellowing of air drying oil esters and alkyds in light or dark depended upon the nature of their acid constituent, and that yellowing in the dark was significantly greater than in the light.

Choice of Materials

It had also been found (a) that the type of titanium oxide used had a negligible effect on yellowing and (b) that titanium oxide pigments did not increase the yellowing of air dried paint films. Paint manufacturers were now in a position, he said, to use either anatase or rutile titanium oxide for stoved application appliance finishes for indoor use, where non-yellowing properties were required. He gave details of some work to illustrate the beneficial effects of the modification of anatase titanium oxide.

With regard to chalking resistance, he gave a selection of chalking curves from the results of his company's work on mixed pigmentations which were described in detail to the Newcastle Section of OCCA 18 months ago. In general it was shown that substitutions in a paint of original Rutiox CR by other pigments did improve chalking resistance, although the amounts required were large. For example, for zinc oxide about 40 per cent substitution was required and for white lead about 50 to 75 per cent was necessary.

In the case of antimony oxide, however, as little as 15 per cent of antimony oxide substituted for Rutiox CR was found to be

Titanium Pigments

beneficial. It was also shown that reasonable substitutions of Rutiox CR by the other white pigments did not delay the incidence of chalking but only reduced its severity once it started.

He also discussed at some length some work on the current modified Rutiox CR itself and in admixture with other white pigments and commented on the results obtained by Campbell and Hughes in their recent contribution to *JOCCA* (July, p. 481).

That led him to discuss the problems arising in the use of a clear medium layer over a film in relation to chalking, checking etc. He concluded that there were possibly many practical difficulties and would be many objections to the use of a clear varnish coat, but one was tempted to wonder whether the bogey of clear varnish films lifting from anatase paints had left too lasting an impression. Certainly this did not happen with Rutiox CR, and with more durable and non-yellowing varnishes now available it was interesting to speculate whether the wheel had turned full circle back to the use of a final coat of varnish.

Discussion

Regarding the onset of chalking where there was a protective layer of varnish over a film, Mr. Hibberd was asked if exposures had been made with the film thickness associated with printing inks. He replied that he had not done any work on the chalking of printing inks. The proportion of clear layer over a thin layer would be very similar to that on an ordinary paint, but, of course, in amount it would be very much thinner. Therefore, one would expect chalking to start much more quickly than with an ordinary paint.

Next he was asked if it was right to conclude that increasing covering power meant increase of chalking. He said he believed—although he and his colleagues were not sure about it—that the original Rutiox CR was on the borderline between the photo-active and photo-protective, and hence a more photo-protective pigment, when substituted for a proportion of Rutiox CR, would give a real improvement in chalking resistance, but only because one had made a substitution; in other words, there was a dilution effect.

But in the case of pigments of equal hiding power one was building up a more highly pigmented film, and irrespective of the relative hiding powers of the other pigments one was getting protection of the underlying surface of medium by the film on the top. He was not sure of the whole mechanism, but it would appear that the original Rutiox CR at any rate was not completely photo-inactive, and by the substitution of something which was photo-inactive one would improve the results.

With regard to the author's comparison of films containing pigments prepared in the ball mill and the Kady mill respectively, he was asked for an indication of what happened with those pigments if they were mixed in a heavy duty mixer with high shear. By and large, he said, he and his colleagues did not believe that we could develop sufficient shear in a high duty mixer to break down the particles which the Kady mill would break down.

In reply to a further question he said the reason for applying a clear coat over a pigmented film was to obtain some practical benefits from the work of Campbell and Hughes. If we increased the value of a paint by pigmenting it, it lost gloss quickly, and that was impracticable for most decorative finishes. In the work described there was in fact a protective layer and a decorative layer; but the time over which the decorative feature remained depended on the durability of the medium itself.

More Difficult Conditions

It was suggested that, when Mr. Hibberd did further work on overcoatings, he would choose some rather more difficult exposure conditions. The speaker had in mind conditions where differential swelling between the various coatings was possible.

A comment on a photo-micrograph of a film 2.5 microns thick, pigmented with the new anatase, the material being prepared in a ball mill, was that it seemed extraordinary that so thin a film was so smooth. That newly found grade of material must have been practically completely free from aggregated pigment particles.

Finally it was pointed out that the chalking curves that had been exhibited showed practically no variations, and a speaker said he suspected that the site on which the author's chalking experiments were carried out was not particularly severe from the point of view of chalking.

PEOPLE in the NEWS

- **MR. L. A. WISEMAN** has been appointed deputy director of The British Rayon Research Association and will join the organisation on 1 December. He is 40. At present he is working at the Atomic Weapons Research Establishment at Aldermaston, Berks.
- **MR. S. L. WAIDE**, local director and general manager of the chemical division, Newton, Chambers & Co., has been appointed an assistant managing director.
- **MR. W. L. NICOL**, works manager of the Scottish Agricultural Industries Ltd. plant at Newton on Ayr, has been promoted to the Edinburgh works where he will assume duty in October as deputy production and technical manager. For the past 12 years he has been in charge of the Ayr fertiliser works.
- Courtauld's Scientific and Educational Trust Fund has awarded four post-graduate research scholarships in textile technology to the following students:—**MR. BRIAN CHALKLEY** of Wakefield, **MR. PAUL ENDLEY WILLIAMS** of Leeds, **MISS JENIFER ANN SOPER**, also of Leeds, and **MR. WILLIAM GREENWOOD KAYE**, of Elland.
- To aid the recruitment of young scientists, **DR. F. DIN**, a research scientist at British Oxygen's Research and Development Centre, Morden, Surrey, visits schools, scientific societies and technical institutes to demonstrate the properties of liquid oxygen. On 7 September, Dr. Din performed on BBC children's TV, and he has also appeared on a women's TV programme. His repertoire included a demonstration of 'tricks' with liquid oxygen.
- Staff changes are announced by Evans Medical Supplies Ltd., Speke, Liverpool, as follows:—**MR. G. A. WILSON**, formerly general manager, has been appointed managing director of Evans Medical (Wales) Ltd.; **MR. G. T. RANDAL DAVIES**, overseas marketing manager, has been appointed a director of E.S.L. & W. (South Africa) (Pty.) Ltd.; **MR. T. J. GARNER**, export sales manager, has been appointed a director of Evans Medical Supplies (India) Private Ltd.;

MR. A. E. SMEETON, manager, overseas administration department, has been appointed a director of Evans Medical (Nigeria) Ltd.

● **MR. HENRY SCHIESSL** has been appointed technical assistant to the manager of research and development of the industrial chemicals division, Olin Mathieson Chemical Corporation. He will be located at the company's divisional headquarters offices in Baltimore, Md. Mr. Schiessl has been with Olin Mathieson since 1950 and most recently was liaison engineer at the Niagara Falls, NY, research laboratories. He is a chemical engineering graduate of Cornell University and a member of the American Chemical Society and American Institute of Chemical Engineers.

● **MR. J. V. GALLAGHER** has resigned as a director of the Anglo-Lautoro Nitrate Corporation.

● After 65 years' continuous service at the Cleckheaton chemical works, **MR. D. P. B. DAVIES** retires at the end of September. He will, however, continue to act in an advisory capacity. It was in 1891 that Mr. Davies began work with the Cleckheaton Chemical Co. Ltd. (now part of the Laporte Group). He became secretary of the company and chairman and managing director in 1936. He continued as managing director when Cleckheaton Chemicals joined the Laporte Group in 1954. Recording appreciation of Mr. Davies' 'untiring services over an exceptionally long period,' Laporte Acids Ltd. state: 'In our view this constitutes a record that under present day conditions is unlikely to be repeated, let alone surpassed.'



Mr. D. P. B. Davies

US Primary Aluminium Plant

OLIN MATHIESON Chemical Corporation and Revere Copper & Brass Incorporated have formed a joint company to produce 180,000 tons a year of primary aluminium. Capital is \$231 million. The company will be called the Olin Revere Metals Corporation.

President will be Mr. Walter F. O'Connell, who will also continue as executive vice-president in charge of Olin Mathieson's aluminium programme.

Olin Mathieson has contracted with Olin Revere on a long term basis for 120,000 tons of primary aluminium a year. Revere has made a similar contract for 60,000 tons a year.

Facilities of Olin Revere Metals Corporation will include an alumina plant (capacity 350,000 tons per year). This will be built on a site near the Gulf coast on deep water transportation. There will also be a reduction plant (180,000 tons per year capacity). This is under construction near Clarington, Ohio. Capacity production is expected to begin late in 1958. Supplying power to the reduction plant will be three 225,000 kW generating units in a new power plant at Cresap, West Virginia.

Bauxite, furnished from the Surinam, Dutch Guinea, mines of NV Billiton, will be processed into alumina at Olin Revere's plant on the Gulf coast. This will be transported by barge up the Mississippi and Ohio rivers to the Clarington plant, where it will be reduced to aluminium.

Half of the output of aluminium contracted for by Olin Mathieson will be fabricated at a new rolling mill now being built near Clarington and the remainder in mid-West and West coast plants.

Revere will use part of its 60,000 tons of aluminium in the aluminium sheet, tube and extruded shapes departments. Balance at the Baltimore, Ind., plant will be used at the Dallas Division plant in Chicago.

Will

DR. MARTHA ANNIE WHITELEY, of 4 Roland Gardens, London SW7, who died on 24 May last, aged 89, left £8,840 14s gross, £8,625 8s 7d net value. Probate has been granted to the Westminster Bank Ltd. and Gerald G. Caney, of 182-3 Upper Thames Street, London EC4. Dr. Whiteley was one of the inventors of the tear gas used in World War I.

Irradiated Plastics

PLASTIC PARTS from irradiated carbon-black filled polythene are being produced experimentally in General Electric's chemical development department in Pittsfield, Mass. The new material, known as Vulkene 107-E, is stated to have better heat and chemical resistance than the conventional high pressure polythene from which it is derived.

Vulkene 107-E and low density polythene have been immersed for three months at 18.9°C in a number of reagents. It is reported that Vulkene showed less evidence of attack by concentrated inorganic acids (except concentrated nitric acid) than conventional polythene. Samples of Vulkene suspended in boiling water for six months showed negligible change in tensile strength and elongation. Polythene samples, after the same treatment showed severe degradation of physical properties. Yield strength of Vulkene at low temperature is said to be double that of polythene and creep deformation is reduced to approximately 10 per cent of the value obtained for polythene. At 149°C tensile strength is 50 p.s.i. The large quantity of carbon black present in Vulkene makes the product electrically conductive. It is considered that pipes and tank linings of Vulkene would be of particular interest to the chemical industry.

General Electric are also making significant progress in the vulcanisation of silicone rubber by high energy electrons. Patent application for the process, developed by Mr. F. M. Lewis and Mr. Elliott J. Lawton, two General Electric research workers, has just been allowed. The process eliminates use of heat and chemicals in curing.

IFC Policy Booklet

THE International Finance Corporation, the new affiliate of the World Bank, has published a booklet outlining its operating policies and procedures. The purpose of the booklet is to inform the world financial and industrial community about the types of investment which the Corporation is interested in making and about the information required from enterprises wishing to attract the investment of IFC funds.

The booklet is being published in English, French, German and Spanish. Copies may be obtained from the International Finance Corporation, 1818 H Street, Washington, DC.

Antioxidants in Foods

Functions Discussed by DSIR Chemist

CHEMISTS have to concern themselves with the action of antioxidants in foods because storage behaviour is often influenced in marked degree by the pro- and antioxidants which foods already contain naturally, or which they acquire fortuitously during handling and processing, said Dr. C. H. Lea, of the DSIR Low Temperature Research Station, Cambridge, in a paper delivered to the chemistry section of the British Association in Sheffield on 31 August.

Addition of chemical antioxidants to food, in the way that they are added to rubber and petroleum products, was not at present permitted in this country, said Dr. Lea. A limited use of antioxidants was, however, already permissible in a number of other countries and recent recommendations by the Preservatives Sub-Committee of the Food Standards Committee of the Ministry of Agriculture, Fisheries & Food indicated that we may perhaps follow suit in the not too distant future, he added.

Loss of Natural Aroma

Defects arising from the action of atmospheric oxygen, which could sometimes be combatted by the use of antioxidants, included loss of natural 'fresh' aroma and flavour, the development of 'rancid' or other 'off' odours and flavours, discolorations and loss of nutritive value due to the destruction of vitamins A, E and C.

Antioxidants which had been found useful in fats and other foods were usually *ortho*- or *para*-substituted phenolic compounds, continued Dr. Lea. Many of these occurred naturally, e.g., the tocopherols (vitamin E), gallic and caffeic acids, flavonols such as quercetin and rhamnetin, and tannins. Others were synthetic compounds such as BHA and BHT which had been 'taken over' from the petroleum industry. Certain aromatic amino compounds had found a very limited use, as for the preservation of carotene in dried lucerne and for the stabilisation of synthetic vitamin A.

A second large class of substance included synergists and metal deactivators, which reinforced the antioxidant activity of the primary inhibitors, often by complexing traces of pro-oxidant metals. Substances of

this type, such as citric acid and its oil-soluble monoesters, could, said Dr. Lea, help to protect edible fats and oils against traces of copper and iron picked up from the plant during processing. Ascorbic acid was also a useful inhibitor of enzymic browning in fruits and vegetables, a form of deterioration due to the oxidation of polyphenolic constituents under the influence of a copper-containing enzyme.

Rendered animal fats contained relatively little natural antioxidant and could often be stabilised in some degree by the addition of vegetable materials richer in natural inhibitors, continued Dr. Lea. The smoking process as applied to bacon or fish, provided another means of incorporating phenolic antioxidants which helped the fat to resist the development of rancidity.

When chemical antioxidants were to be added directly to foods elaborate precautions had to be taken, by extensive feeding tests with animals over long periods, to ensure that no appreciable hazard to health resulted. Just how to ensure a satisfactory standard without unnecessarily restricting progress by over-caution was a question causing much concern at present, not only in connection with antioxidants but for all non-nutrient chemicals which found their way into food by whatever route or for whatever purpose.

Filter Paper Prices Stabilised

Instead of making a general percentage increase on all its products, British Filters Ltd. has carefully studied each of its products to discover the minimum increase necessary to arrive at realistic prices in relation to actual current costs. The company has in fact kept the prices of its industrial filters stable for the last four years, against the pressure of steadily mounting costs by increases in productivity and total sales. The prices of about half the company's products have been increased. Further economies and productivity improvements now planned will be directed towards maintaining, and wherever possible, reducing these prices.

Preparation of Fluoroacetic Acid

FLUOROACETIC ACID was described by Saunders and Stacey (*J. chem. Soc.*, 1948, 1773). In a recent communication to THE CHEMICAL AGE, Dr. M. A. Phillips, D.Sc., F.R.I.C., A.M.I.Chem.E., reported the following method of preparation of small quantities of fluoroacetic acid from the now freely available fluoroacetamide



Fluoroacetamide (77 g.) is dissolved in water (77 ml.) and concentrated hydrochloric acid (sp.gr. 1.18; 77 ml.) is added. The mixture is refluxed for three hours and is then evaporated to dryness under reduced pressure, care being taken that the temperature of the contents of the still does not exceed 40°C at any time. This process retains the fluoroacetic acid and ammonium chloride formed by the hydrolysis while removing the excess water and hydrogen chloride. The solid mass in the still is then removed and dried thoroughly in a vacuum desiccator over calcium chloride and is dissolved in 250 ml. of water.

Continuous counter-current extraction of this solution with ether or, preferably, diisopropyl ether, takes the bulk of the fluoroacid into the organic solvent which is then dried, using anhydrous sodium sulphate and, after filtration, distilled to remove solvent. The residual material weighs about 70 g. and is crude fluoroacetic acid (titre equivalent to 95-93 per cent F.CH₂COOH); fractionation at 20 mm. gives 65 g., bp. 94-5°C. The yield of distilled acid, bp. 167-8°C at atmospheric pressure is hence 84 per cent of theory.

Fluoroacetic acid is a toxic product and should be handled with caution; the above preparation should be done in a fume cupboard.

US Cement Production in 1954

Production of Portland cement in the US during 1954 amounted to 272,352,557 barrels, an increase of 3.1 per cent over the 1953 figure, according to the Bureau of Mines, US Department of the Interior. Other hydraulic cements also showed an increase in production. Shipments from Portland cement plants in 1954 totalled 274,871,992 barrels valued at \$759,861,502. Shipments of the other hydraulic cements were 3,513,358 barrels valued at \$13,214,960.

Russian Chemical Abstracts

RECEIPT of a further six issues (1 to 6, 1956) of these chemical referati at the British Museum, shows expansion in size and scope since their commencement in 1953.

At that time (actual date of commencement, 1 October) the first issue contained 1,297 abstracts, and the last, issued 15 December, went up to 10,042. These were paged by column, as in the US *Chemical Abstracts*, but from 1954 pagination has been by page and not by column. Each issue for 1956 so far numbers 480 pages on average, as compared with 448 columns in 1953, or more than double the size in three years. There is a separate series for biological chemistry, of which the first six 1956 issues total 6,241 abstracts. In all cases the issues are twice monthly. The number of chemical abstracts in the first six issues for this year totals 18,355.

Classification appears to be much the same as the US, but there are separate sections for corrosion and its problems and for safety first and sanitation. In most cases the abstracting is full and thorough. The author index in both Russian and English characters, is a useful guide in transliterating many proper names which sometimes assume weird forms in their literal Russian characters, thus Dzheims for James.

Atomic Energy for Egypt

AN AGREEMENT has been signed between the Egyptian Government and the USSR for co-operation in the field of use of atomic energy for peaceful purposes. The agreement stipulates that the two Governments will co-operate in nuclear research work and the practical application of scientific progress in atomic energy for the construction of institutes, laboratories, the supply of apparatus and instruments, exchange of experts and technicians and the delegation of Egyptians to the USSR for training in research work. The agreement confirms a previous one for the establishment of an atomic laboratory in Cairo containing a cyclotron of 3 million electron volts capacity, and of a reactor of 2,000 kW for experimental and research work. This laboratory will be backed by other necessary scientific laboratories. The Egyptian Institute for Atomic Research will be responsible for the installations and it is expected that they will begin to function in mid-1958.

Italian Chemical Industry

Vital Role in Economic Development

ACCORDING to a recent report from the Milan Correspondent, of *The Times* the chemical industry in Italy is vitally concerned in the country's economic development. Reference is made to the annual report of the managing committee of the Italian Association of Chemical Industries which shows that in 1955, exports of chemicals totalling 77,700 million lire (an increase of 17.7 per cent over the previous year) represented 6.69 per cent of the total Italian exports.

Imports of chemicals were also large, being 5.76 per cent of the total imports, valued at 97,200 million lire (including freight charges). Imports from Britain totalled 11.2 per cent.

Trade and Navigation figures of the UK show that exports of UK chemical elements and compounds to Italy in 1955 were valued at £1,415,552 and chemicals for dyes, pigments and tanning, paints and related products etc., at £505,782. Germany exported 28.52 per cent and the US 22.7 per cent.

Local factors behind this growth of the Italian chemical industry are the discovery and exploitation of considerable quantities of oil and natural gas, which have resulted in the development of fresh branches of the chemical industry. Italy, according to the correspondent, although comparatively rich in some basic materials used in the chemical industry, such as hydrocarbons, sulphur, pyrites bauxite and sodium chloride, suffers from a scarcity of familiar raw materials, in particular, coal.

Sulphuric Acid Output

In the heavy chemicals industry, sulphuric acid output held first place in 1955, 1,953,720 metric tons being produced, an increase of seven per cent over the previous year. This increased output was the result of greater demand for fertiliser manufacture and for meeting the needs of the oil and metallurgical industries. Nitric acid ammonia production also increased. Calcium carbide manufacture is stated to be eight per cent up, mainly for manufacturing calcium cyanamide and synthetic resins.

Heading the list of Italian chemical exports are fertilisers. Home demands for fertilisers have also risen. Production of nitrogenous fertilisers, particularly of

ammonium nitrate, rose by 12 per cent in 1955. However, phosphate fertiliser production is stated to be almost stationary and exports of super-phosphates have fallen by a third. Insecticides and pesticides are in good demand. Production of organic dyestuffs has not been affected by the crisis in the textile industry and is increasing.

Plastics and petroleum products have developed in recent years. Petroleum chemistry is said to be supplying the Italian and export markets with a great number of products, ranging from isopropyl alcohol to plastics materials and plasticisers, solvents, detergents, oil additives, greases etc. Production of plastics and of synthetic resins rose from 74,000 metric tons in 1954 to 90,000 last year.

Hydrogen from Natural Gas

Hydrogen is being obtained from natural gas the annual output of which is now 4,000 million cubic metres. The hydrogen is extracted from the gas, using a process whereby methane is submitted to partial combustion with oxygen in the presence of a nickel-based catalyst. Acetylene from methane is beginning to compete with the calcium carbide process.

Synthetic rubber will also be produced shortly from methane by the state-controlled EWI at Ravenna under licence from Union Carbide & Carbon Corp. The plant is expected to be capable of producing 30,000 tons a year in addition to 350,000 tons of nitrate fertilisers, obtained by an oxidation process.

Output of synthetic fibre is being expanded. Nylon is the main one and there are said to be good prospects for Terital, the Italian equivalent of Terylene, now being produced on an industrial scale.

Israeli Developments

It has been announced by the chairman of the Israeli Atomic Energy Commission that an agreement will be signed for the construction of a nuclear research reactor in Israel. Electrochemical Industries (Frutarum) Ltd., of Haifa are now reported to be producing hydrochloric acid in two concentrations at the rate of 1,000 tons a year.

Olefine Polymerisation

New Techniques Considered in US

A NEW approach to low pressure polymerisation of ethylene was reported recently by Professor Nenitzesen and his co-workers of the organic chemistry department of the RVR Academy in Bucharest (THE CHEMICAL AGE, 21 July). Now from US (CHEMICAL WEEK, 25 August) comes a report of a new olefine polymerisation technique developed by Metal Hydrides Inc., Beverly, Mass.

The method developed by Professor Nenitzesen involves the use of sodium alkyls to reduce the titanium halide employed as an activator or co-catalyst. The technique employed by Metal Hydrides Inc. employs sodium hydride in place of sodium alkyls. If the ethylene is to be polymerised at low or moderate pressures, sodium hydride is dispersed in oil, aluminium chloride and titanium tetrachloride plus an inert diluent, e.g., mineral oil, in a polymerisation vessel at 100°C. In the presence of a small amount of ethylene, the catalyst is formed and polymerisation initiated. More ethylene is added and 'highly crystalline' Ziegler-type polythenes are formed. These are stated to be in the 40,000 to more than 200,000 molecular-weight range.

No Aluminium Chloride Necessary

At higher temperatures and pressures (500 psig.), according to Metal Hydrides Inc. no aluminium chloride is necessary. Sodium-hydride-reduced titanium halides are sufficient to catalyse the polymerisation, which results in an end-product identical with the low-pressure polythene.

It is of interest to note that the Ziegler patent (British Patent No. 713,081) on 'Polymerisation of Ethylene' states that 'polymerisation activators have the general formula $Me(R)_n$ in which Me is one of the metals aluminium, gallium, indium and beryllium, n is the valency of the metal, i.e. 2 or 3, and R is at least one of hydrogen, alkyl radicals, and monovalent aromatic hydrocarbon radicals or their mixtures.'

Another point of interest is the statement made by Metal Hydrides that its technique 'eliminates the need for making and handling the highly flammable and costly (\$25/lb) aluminium trialkyls which are necessary with

the present so-called Ziegler catalysts. Ziegler stated, in a paper which he read on 8 October 1954 at the annual convention of the Deutsche Gesellschaft für Mineralöl wissenschaft und Kohlenchemie (in translation): 'The process is so simple and the standing materials are so cheap that on a large scale the manufacturing costs for aluminium triethyl could hardly exceed 2-3 DM per kg.'

Ziegler himself used ball-milled sodium hydride in his early experiments but Metal Hydrides Inc. states that this does not have the same catalytic properties as its new, highly dispersed form.

The point regarding cost is of some importance for Ziegler catalysts, unlike classically defined catalysts, are consumed to an appreciable extent in the polymerisation process.

A.I.Ch.E. Meeting

APPROXIMATELY 1,500 chemical engineers from the US and other countries met in Pittsburgh, Pa. from 9-12 September 1956 for a national meeting of the American Institute of Chemical Engineers. The technical programme included eight symposia on major topics of current interest and 44 papers by leading chemical engineers from the chemical process industries. Eleven plant trips to process plants in the Pittsburgh area were highlighted by a visit to the Shipping-port Pa., nuclear power plant being built by the Duquesne Light Co., the first major plant of its kind in the US.

Operations research as a scientific aid to process plant operating management was the subject of a day-long symposium, in which experts from various chemical companies, petroleum refineries, and consulting organisations spoke. The morning session described how to put operations research to work, and the afternoon session heard case histories of how Monsanto, Dow, Standard of Ohio, Esso, and other organisations are making use of operations research.

Explosions were analysed in another symposium, with emphasis on factors for detecting the approach of explosive conditions. A dramatic demonstration followed the symposium.



From all Quarters



Austrian Trade with Hong Kong

Following a visit of some Austrian merchants and industrialists to Hong Kong, business to the value of US \$10-15 million is stated by the Hong Kong Press to have been concluded. Items mentioned in the deal include 150,000 tons of nitrogen fertiliser (value £2.6 million) and scientific instruments.

Benger's US Agreement

A marketing and research agreement on a reciprocal basis between Benger Laboratories Ltd. and Lakeside Laboratories Inc., of Milwaukee, US, is announced. Under this both firms will make available to each other new products and research data.

Dutch Chemical Industry

Some interesting figures have been issued concerning investment in fixed assets in Netherlands industry in the last five years. The figures show that there has been a remarkable increase in investment in the past year in the chemical industry compared with the four preceding years. (1952: 187 million guilders; 1953: 128; 1954: 215; 1955: 216; 1956: 354).

Hong Kong Commodity Report

Exports of chemicals from Hong Kong recently were on a small scale. Items exported to the Republic of Korea included tanning extract (US \$220-251 per metric ton), ammonium bicarbonate (US \$138 per 1,000 kg.) and nickel sulphate (US \$43.75 per cwt. cask) all prices c.i.f. Other chemicals were lithopone 50 kg. pack 36.38 cents per lb. (Dutch) and 32 (German); soda ash, China Mainland, 80 kg. bags \$24 per bag; and sulphuric acid Hong Kong manufactured in 700 lb. drums at 17 cents per lb.

Gypsum Production Up

Production of gypsum in Pakistan during the first half of 1956 was 15,643 tons, compared with 13,083 tons for the corresponding period last year. It is anticipated that production of this mineral will increase as the result of a recent trade agreement with the Government of India for the export of 100,000 tons of gypsum, and the establishment of a fertiliser factory at Daudkhel.

Heat Exchangers for Italy

The M. W. Kellogg Co., a subsidiary of Pullman Inc., announces that under a licensing agreement recently concluded Nuovo Pignone of Florence will manufacture in Italy heat exchangers according to Kellogg designs, standards and techniques.

New Aluminium Salt

A new aluminium salt, aluminium tri-formate, has been introduced by Rhodia Inc. of Canada, under the trade name Trinoral. The compound is stated to advantageously replace aluminium diformate and aluminium acetate, in the preparation of water repellent compounds. By virtue of its high purity Trinoral is very stable in compounding and as it does not require the addition of acetic acid, it is economical and efficient.

Synthetic Rubber Output

A new process for producing synthetic rubber latex has been developed by the BF Goodrich Company, Shelton, Connecticut. It is stated that an output of 15,000 lb. of dry polymer per reactor per day can be obtained, compared with 6,000 lb. at present.

Mexican Formaldehyde Plant

A plant for the production of formaldehyde on a scale sufficient to meet Mexican needs and to obviate imports of this chemical is shortly to be installed by Celanese Mexicana SA, the principal Mexican rayon company. The company hopes to produce 3 million kilos a year of formaldehyde as well as other chemical products such as alkalis, resins and detergents which up to now have been imported. Financial backing of the company is by Nacional Financiera.

Japanese Chemical Statistics

Indices of industrial activity and production issued by the Japanese Economic Planning Board show that individual activity in chemicals stands at 390.4 for April 1956 and 402.7 for May 1956 (preliminary figures). The volume of sulphuric acid production reached 473,941 metric tons in April 1956 and 509,812 metric tons in May 1956 (preliminary figures). Sulphur production was 18,943 metric tons in April this year and the preliminary figure for May was 19,600 metric tons.

NZ Carbide Industry

SPEAKING at a mining and quarrying conference in Dunedin recently, Dr. T. Hagyard, senior lecturer in chemical engineering at Canterbury University College, said that New Zealand could profitably establish an expanding calcium carbide industry to supply the home market and export to Australia.

Research had led Dr. Hagyard to believe that the South Island had all the requirements for the setting up of such an industry. The West Coast would be particularly suitable for the industry, according to other scientists at the conference.

Canada, the US, Germany, France and other countries had all established profitable industries based on carbide production, Dr. Hagyard said. All but Germany based their calcium carbide industries on cheap and abundant electric power. In this respect, the potential of the South Island was considerable.

An annual production of 10,000 tons would be a desirable target, he added. Australia was manufacturing only two-thirds of her annual carbide requirements of 30,000 tons while New Zealand imported 1,700 tons a year.

Shawinigan Chemicals

BUSINESS of Shawinigan Chemicals Ltd. was 'well maintained' during the first half of this year, it is reported to shareholders by J. A. Fuller, president of Shawinigan Water & Power Co. and vice-president of the chemicals subsidiary.

The bulletin also says that the chemicals firm has practically completed the new carbide furnace at Shawinigan Falls and that development is proceeding of the new plant site in Shawinigan East.

Reporting on associated companies, Mr. Fuller says in the bulletin that the market for certain plastics products of Canadian Resins & Chemicals Ltd. was adversely affected during the second quarter of the year by reductions in the prices of competitive products. Additions to the resins plant at Shawinigan Falls are completed and in operation.

Business of B-A.-Shawinigan Ltd. for the half-year showed improvement over the first half of 1955, especially in the phenol market. St. Maurice Chemicals Ltd. also had a satisfactory half-year's business, the report says.

Corrosion Control System

LATEST ACHIEVEMENT of the British Petroleum Company's extensive research in the field of steam raising equipment is the elimination of low temperature corrosion resulting from sulphuric acid in air heaters or economisers. A limiting factor in the utilisation of heat from flue gases has therefore been overcome and boiler plant can now be operated with low exit gas temperatures and greater thermal efficiencies without the prospect of expensive and frequent replacements.

Laboratory tests were carried out over a period of years at the company's research station at Sunbury, followed by full scale trials. The corrosion inhibition process (for which patents have been applied for) uses ammonia to neutralise sulphuric-acid forming elements in the flue gases. The resultant non-corrosive compounds can be removed easily from metal surfaces by water-washing.

Liquid Oxygen Hose

FLEXIBLE hose for conveying liquid oxygen has been produced experimentally by Compoflex Co. Ltd, 23-25 Northumberland Avenue, London WC2. The hose will not be a standard stock addition to the company's flex range.

The hose consists of an inner wire spiral of 12 gauge stainless steel; lappings of square-woven 10-12 oz. Terylene fabric; layers of Terylene film (Melinex); further layers of Terylene fabric and an outer wire helix of 12 gauge stainless steel. The number of layers of film and fabric used in the hose make-up depends on the working pressure required. It has been produced experimentally in lengths of up to 20 ft. and in bore sizes up to 4 in. internal diameter. Development work is being carried out on bore sizes of up to 8 in. internal diameter. It is understood that the hose can be used for conveying liquid nitrogen.

Colombian Oil

Oil production in Colombia in June at 124,406 barrels a day is stated to be a new record and the total for the first six months of this year at 21,125,954 barrels, represented a rate 7 per cent above that of 1955. The increase for June came from a new strike by Shell. The Colombian Petroleum Co. (owned jointly by Texas and Socony) is to invest in extensive explorations.

Instruments for Level Control

Application of the Tektor & Telstor

ON certain machines used for automatic weighing and filling, it is essential to maintain a constant head of material above the outlet in order to keep within the accuracies claimed. Fielden Electronics Ltd., Wythenshawe, Manchester, have therefore designed various level alarms or controllers. Controllers can be applied to practically any liquid or free-flowing solid, regardless of conductivity, insulating value, viscosity, density, corrosive properties, and in conditions of high temperature, pressure or vacuum. These instruments are not depth-gauges but maintain level at any desired point in any kind of container, irrespective of shape, size or construction.

Electrical Capacity

The instrument consists of a small electronic unit and probe, the latter being inserted into the container. The principle of electrical capacity is employed to detect the approach of any substance to or recession from the probe. The consequent change in capacitance is made to actuate a relay which can switch in an audible or visible alarm, or stop or start feeding mechanism, to maintain the predetermined level in the container. The substance does not need to touch the probe, which can therefore be covered with anticorrosive and heat-resistant insulation.

Technically the electronic unit employs a single valve in an oscillating circuit, the anode current of which varies with change of oscillating amplitude. This amplitude is controlled by the effective capacity of the probe. The change of anode current is arranged to energise the relay. Hence the relay is in one or two positions according to whether the material, level of which is to be maintained, is adjacent or remote from the probe.

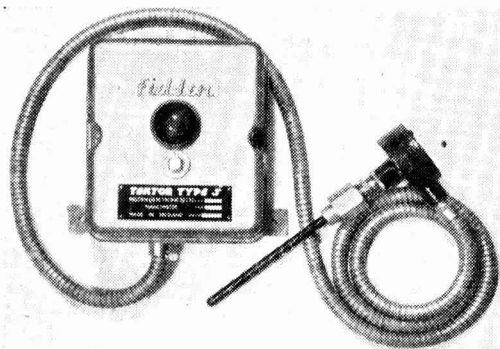
Some of the materials with which the Tektor J level control can deal with are:—*Liquids*: water, condensate, brine, glucose, molasses, paraffin, petrol and other spirits, gelatines, gypsum, solvents, mineral and vegetable oils, chemical solutions and immiscible liquids interface. *Powders*: chalk lime, salt, sodium bicarbonate, abrasives, fertilisers, cosmetic powders etc. *Granular solids*: salt, slag, resin, plastic granules, lime,

ash etc. *Bulky solids*, mineral oils, chemicals, rubbers etc.

Installation of these instruments is simple, only a small hole in the container through which the probe is inserted being required. Since there are no moving parts or other mechanisms, no adjustments are required. A fail-safe device protects against mains failure. The instrument will operate indefinitely and all parts are made for industrial conditions. Weather and flame-proof versions are obtainable. Marked changes in specific gravity or chemical constitution of liquids have no effect on operation. The instrument will operate on level changes as small as 1/16 inch if desired but it can be set to have a larger differential if used as a controller to prevent rapid intermittent action of a pump or valve.

The principle of capacitance has been extended to provide equipment for the continuous indication of level. The Telstor LF3 incorporates the results of experience gained over a number of years. The capacity change is initiated by an electrode suspended from the top of the container and extending to its full depth. The contents of the container may then be displayed in indicators situated at a remote point from the actual plant, even up to ½ mile away. Level variation can be measured over the whole container or a very small part of it as desired. The interface between two immiscible liquids can also be followed, even in a sealed container.

Technically, the Telstor electronic continuous level indicator consists of an oscilla-



The Tektor J Level Control

tor feeding an AC bridge with two capacitive arms. One arm is formed by the capacitance to earth of the level-measuring electrode. Out of balance voltage, caused by the electrodes' change of capacity due to rise or fall of material around it, is rectified and measured on a moving-coil meter. Two pre-set controls are provided for adjustment at installation. One adjusts the equipment to zero when the container is empty and the other is for 'full' adjustment.

Application of the Fielden Telstor in chemical plant presents no difficulties, since the electrodes have been designed to suit most known materials and conditions. Thus the instrument can be used in brick-lined vessels containing sulphuric acid at a temperature of 70°C.

High Temperatures

Discussion of Chemical Behaviour

PRODUCTION of higher and higher temperatures and the study of chemical changes occurring at these temperatures was one of the most active fields of endeavour in present day science, declared Professor George Porter, professor of physical chemistry, University of Sheffield, in a paper delivered before the chemistry section of the British Association in Sheffield on 30 August.

There were many practical reasons for this, one of the most important being that higher temperatures meant greater efficiency when an engine was used to convert the heat into useful work. Jet and rocket engines converted chemical energy into very high temperature heat and the chemistry which went on in those engines presented many interesting new problems, said Professor Porter.

Because the reaction went so rapidly special techniques of research had to be used to study chemical changes which were all over in a few millionths of a second. One new technique of that kind used a 'shock tube'. It was simple in principle and involved the bursting of a diaphragm by pumping up the pressure on one side of the diaphragm much higher than on the other. When the diaphragm burst a temperature much higher than the surface of the sun could be produced. A second method consisted of irradiating the gas with an intense flash of light—'as bright as a million electric light bulbs', said Professor Porter. Both methods

heated the gas without having to heat the vessel holding them.

One of the interesting things about chemistry at high temperatures was that when the substances present were examined numerous molecules which were chemically unstable at lower temperatures were discovered. The blue light of an ordinary gas burner for example, was nearly all emitted by the diatomic carbon molecules C_2 which were quite unknown at ordinary temperatures. Another important feature of high temperatures was that things went so fast that the molecules could not keep up and the point was reached where 'temperature' no longer had any clear meaning.

The great energy liberated in nuclear reactions had opened up new vistas in the production of high temperatures and attached new importance to their study, said Professor Porter. Like ordinary chemical reactions, nuclear reactions could be initiated by heating a substance, but the temperature required to start nuclear transmutation was, of course, very much higher than for chemical transformation.

The earliest chemists, said Professor Porter, sought the philosopher's stone for transmuting the elements and in one sense it might be said that in attaining very high temperatures we should have the philosopher's stone itself.

Salt Output Going Up

ANNUAL output of the Royal Netherlands Salt Industry is to be raised from 580 thousand tons to 700 thousand tons to meet the increased needs of the salt factory and the chemical plant. Production of the chemical plant at The Hague is to be increased by about 50 per cent. In Delfzijl, where a new soda plant industry is being established, an electric plant will have to be built.

Increased demand for salt in Canada has brought about expansion of two of the six salt plants in Ontario. The companies involved in this are Dominion Tar & Chemical Co. Montreal, and the Canadian Salt Co. which is associated with the Morton Salt Co. of Chicago, US.

More than half the salt produced in Canada is used by the chemical industry, principally in the form of brine.

Publications & Announcements

REASONS why glass is an excellent packaging material are summarised under ten headings in a leaflet entitled *The Advantages of Glass Containers*, published by the Glass Container Publicity Committee of the Glass Manufacturers' Federation. The leaflet has been prepared for wide distribution, both to packers and public. It can be obtained, free of charge, from the Public Relations Officer, Glass Manufacturers' Federation, 19 Portland Place, London W1.

* * *

CONTAINED in Volume 27 of the 'Dechema-Monograph' series is the full text of the 31 discussion lectures that were delivered in connection with the First Congress of the European Federation of Chemical Engineering and the ACHEMA XI-Chemical Apparatus and Equipment Congress and Exhibition, held in Frankfurt am Main in May 1955. Among subjects dealt with in detail are analytical balances, extraction methods, chromatography, mass spectrometers, pulverising and triturating methods, flow measurement and indication, pressure and measuring transformers, gas-analysis with infra-red rays, new pH apparatus and di-electric measurement apparatus. The full title of this volume is *Recent Developments in Laboratory Technique and Measuring and Control Practice*, Nos. 332-362, Volume 27. It is published by DECHEMA Deutsche Gesellschaft für chemisches Apparatewesen, Frankfurt am Main and contains 359 pages with 215 illustrations. Price to members of the DECHEMA is DM 33.70; non-members, DM 42.15.

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CONCLUDING the publication of the texts of the various lectures delivered during the DECHEMA and ACHEMA XI Congresses is *Recent Developments in Operating and Material Technique*, Nos. 363-391, Volume 28, in the 'Dechema-Monograph' series. Treated at length under 'Operating Technique' are, supply of currents in electrolysis, problems in heat exchange with plate apparatus with boiling two-component mixtures, and in distillation plant, extraction practice, filtration questions and answers,

high vacuum technique, chemistry of wood, and planning and licensing methods. Subjects under 'Material Technique' include synthetic materials, behaviour of synthetic materials and metals under stress, corrosion testing methods and anti-corrosive methods and practice. The development of apparatus and equipment in connection with nuclear operations is the subject of a special article by Professor Dr. Fleischmann. It is a survey of experiences with atomic energy in chemical engineering. This volume contains 400 pages with 194 illustrations. Price to members of the DECHEMA is DM 36.75; non-members, DM 45.95.

* * *

ADDITIONS to the British Drug Houses Catalogue, July/August 1956, include behenic acid, 2-bromo-ethyl cyanide, butane-1:3-diol, *tert.*-butylamine, fluorosulphonic acid, L(-)-Fucose, microcrystalline wax which is used for blending with paraffin wax to improve its properties, and sodium hydroxide N/9. This is supplied in cartons of six polythene ampoules, each ampoule providing 500 ml. of N/9 sodium hydroxide on dilution.

* * *

CHAS. PFIZER & CO. INC. are the publishers of *Our Smallest Servants*, a publication tracing the story of fermentation from the days of the cave-man to the present day.

The booklet is well presented, easy to follow, and contains illustrations of old processes, as well as photographs of modern plant and laboratories.

Ancient man discovered that his meat and alcohol tasted better if left for a few days, he used mouldy soybean to heal skin infections, and these unconscious discoveries of fermentation led to Louis Pasteur's experiments in the 19th century when he proved that yeasts are living cells. The story of fermentation unfolds; Pfizers experiments in the early 1900s, the discoveries of Weizmann, Emmerich and Low, Alexander Fleming's penicillin, Waksman's streptomycin, and on through the ages the 'ability to harness microscopic living creatures in the service of mankind'.

Publications

A BOOK entitled *Restrictive Trade Practices Act, 1956—A Guide for the Industrialist* was published on 6 September by the Federation of British Industries. The preface points out that the Act 'represents a new and radical departure for this country in that for the first time Parliament has expressed through this measure a general disapproval of restrictive practices on the management side of industry and commerce.' It touches industry at many points and its implications and scope are more far-reaching than may at first sight appear. The purpose of the booklet is therefore to enable industrialists and trade association officials to see whether they are likely to be affected, and if so to take legal advice. The preface emphasises that the last word in each case will rest with the new Restrictive Practices Court—a procedure which the FBI itself has always favoured—and that much will depend on the court's interpretation of the complex provisions of the Act. These provisions are summarised in eight chapters, one of which includes a discussion of the criteria to be used by the court in reaching its decision. Other chapters deal with the enforcement of resale price maintenance and with the functions of the reconstituted Monopolies Commission. A timetable for the registration of agreements is given as an appendix. The booklet, copies of which are being sent to all FBI members, is published at 4s, post free.

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THE SUMMER ISSUE of the Tin Research Institute's quarterly journal, *Tin and Its Uses*, No. 36 contains articles on tinplate and canning, soldering, bearing alloys and organo-tin compounds, together with the regular review of the Institute's recent publications.

'Speculations on the Future of the Tinplate Container' reviews the continuing expansion of the tinplate industry in relation to the experiments now being made to find a 'tinless can'. The conclusion reached is that uses for such cans could not exceed 5 per cent of present consumption and that expanding uses for tinplate would more than counterbalance this figure.

A method of tinning ceramics, glass, wood, titanium, aluminium and stainless steel, as a preliminary to soldering is des-

cribed, also a new bonding method for aluminium-tin bearing alloys which avoids aluminising the steel strip prior to bonding. Experiments in the use of triethyl tin hydroxide and tributyl tin acetate against teredo and gribble attack on wood are reported.

Tin and Its Uses, No. 36 is available, free of charge, from the Tin Research Institute, Fraser Road, Perivale, Greenford, Middlesex.

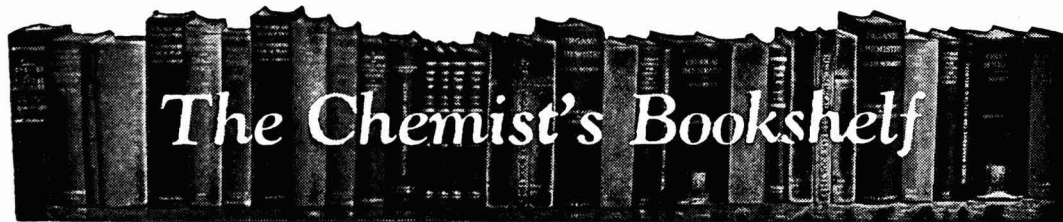
* * *

A BOOKLET describing the company's high melting point waxes has been issued by Abril Corporation (Gt. Britain) Ltd., of Bridgend, Glamorgan. The company claims that its high melting point waxes can be used to advantage in any process employing materials whose ability to withstand frequent or wide temperature variations is important. The only limitation to their use, says the booklet, is their compatibility with other materials, in the solid state, which must be determined in each individual case. These speciality waxes are said to have proved their value in the bitumen industry, in the manufacture of heat and moisture insulating materials, as components of sealing compositons (adhesives), as release agents (lubricants) and in many other fields.

US Raw Materials

WILLINGNESS to enter into premium price contracts to encourage expansion of nickel production both in and out of the US has been announced by the Office of Defence Mobilisation. It is considered that this method of stimulating supplies of nickel for the US up to a goal of 440 million lb. a year (current supplies are stated to be about 300 million lb.) will be of major interest to Canadian producers for whom fast US tax amortisation is no inducement. At the same time this method of providing financial assistance may well mean that extra supplies will go into the US Government Stockpile.

The Alabama Metallurgy Corp. plans to build a \$7 million primary magnesium plant at Selma, Alabama, with an annual capacity of 10,000 tons. Present US capacity is said to be 75,000 tons per annum (30,000 tons at the Freeport plant owned by Dow Chemical Corp. and 45,000 tons at the Government-owned plant at Velasco, Texas, operated by Dow Chemical Corp.



SPEKTROCHEMISCHE BETRIEBSANALYSE. By Heinrich Moritz, Ferdinand Enke Verlag, Stuttgart, 2nd edition (revised), 1956. Pp. xv+240. DM 52 (paper); DM 55 (full cloth).

Feature of post-war books on analytical chemistry has been the number written for the specialist. This, a direct result of the great advance in analytical methods in general and instrumental methods of analysis in particular, is no less obvious in books of German origin. Indeed, this source shows a trend in books on a variety of specialised topics by authors who have spent many years of their working-life in an industrial laboratory using the instrument or the technique described. These carry weight because, generally, they represent an extensive record of the authors' experiences which, in many cases, may be unique.

Author Competent

Into this class of publication comes *Spectrochemical Industrial Analysis*. The author, Dr. Moritz, is employed at the Central Institute of Foundry Techniques, Leipzig, and produced the first edition in 1944. He has spent many years in the field of spectrochemical industrial analysis and is, therefore, competent to write a book of this type. In the second edition considerable expansion has taken place, principally in the sections dealing with types of apparatus and methods of procedure. The author has also given consideration to progress and recent developments in the West and in the East, especially the Soviet Union.

The first 84 pages deal in great detail with the fundamental principles of spectrography and include such topics as: Arrangement of the light source; production and evaluation of spectra; types of apparatus for evaluation; and the photographic plate and its treatment. The main part of the book, running to 110 pages, covers all the analytical techniques. Here are found detailed procedures for the qualitative, quantitative and general analysis

of metals, alloys, minerals, ores, and stones in the solid or dissolved form, and some special analyses. Two valuable chapters follow as sections three and four. In the former the time factor, expenditure of material and precision of industrial analyses using the spectrograph are discussed; in the latter some selected examples are chosen and details of procedure are set out in tabular form.

An appendix of terms and units of value to the spectrographer, and a widely-selected literature-reference of 322 references, some as recent as 1954, are also included.

Use of the spectrograph in practice has, without question, grown at a great rate in recent years, and without attempting to quote figures, the percentage of analyses carried out in industrial laboratories by this instrument must be very high. In fact, the book gives the impression that few, if any, analytical operations are outside its scope; such is its versatility.

The book is full of facts and information. All those deeply interested in spectrography will find it of much value though it is a handbook for the working spectrographer rather than a text-book for the student. It is well-written and clearly set out with practical examples.—R. J. MAGEE.

VACUUM DEPOSITION OF THIN FILMS. By L. Holland. Chapman & Hall Ltd., London. 1956. Pp. 541. 70s.

The author of this book is head of the vacuum coating research laboratory of Edwards High Vacuum Ltd. In his foreword Professor S. Tolansky points out that the successful worker in the vacuum deposition of thin films must be almost as much an alchemist as a physicist, since the subject is still as much an art as a science. The extensive know-how which Mr. Holland has derived from his industrial experience is now made available in the form of the present volume, which might be described as a summary of technical procedures rather

The Chemist's Bookshelf

than a theoretical treatise on thin films. The preparation of solid thin films by the technique of vacuum evaporation, and in some cases by cathodic sputtering has been growing steadily in industry and in research. The progress made in this field has largely been the result of the transformation over the last 15 years of high vacuum technique from a laboratory practice into an engineering science.

The opening chapter deals with the main features of the design and operation of vacuum technique. One important application of vacuum deposition is in the coating of plastic materials, either for electron microscopy work or for the large scale aluminising of plastic components. Here, the problem of the degassing of the plastic material is an important consideration, and chapter 2 is devoted to this topic. The most durable and adherent coatings on glass and metal substrates are only obtained when the supporting surface is free from contaminating films, such as grease. The problems involved in obtaining a satisfactory base surface are discussed, including the method for removing surface contaminants by electron bombardment.

Chapter 4 deals with the techniques involved in the production of the source of vapour to be subsequently condensed as a film, particular consideration being given to the heating source. This is followed by a somewhat theoretical treatment of the emission characteristics of vapour sources and the distribution of film thickness. The evaporation techniques suitable for a number of different metals and alloys are described in chapter 6, and the growth, structure and physical properties of vacuum deposited films are discussed. Methods are described for controlling and measuring the thickness of the deposited film. In the chapter on the preparation of thin films for electrical purposes, the author considered it worthwhile to confine himself largely to the major applications, such as the preparation of metallised resistors and the deposition of surface electrodes on to quartz crystal vibrators.

Vacuum deposition of uniform films of both dielectrics and metals whose thickness can be accurately controlled has been of great value in optical interferometry. Descriptions are given of methods by which the reflectivity of glass and metal surfaces can

be enhanced, or suppressed, and interference filters constructed capable of transmitting light within a narrow wavelength band. Evaporated aluminium films are extensively used as front surface mirrors in optical apparatus because of their freedom from tarnishing and high reflectivity, and the account of these films describes their method of production and properties. Chapter 12 deals with the deposition of metal films on a plastic base. These have both optical and electrical application. The technique of vacuum deposition involving shadow casting and surface replication is used in the preparation of specimens for electron microscopy.

Subject of chapter 14 is cathodic sputtering. The two final chapters are concerned with the preparation and properties of a number of metal oxide films. There is an appendix giving the deposition characteristics and refractive indices of a range of inorganic compounds, and a list of over 550 references.

This is a useful and interesting account of a relatively new and important technique, which has a wide field of possible applications.—G. S. E.

THE MATHEMATICS OF DIFFUSION. By J. Crank. Clarendon Press, Oxford; Cambridge, London. Pp. 347. 50s.

This book is a strictly mathematical account of some methods of obtaining solutions to the diffusion equation. Cases of constant and variable diffusion coefficients in plane, cylindrical and spherical regions; diffusion with a moving boundary; simultaneous diffusion and chemical reaction; and simultaneous diffusion of heat and moisture are all discussed. Emphasis is placed upon the description of methods of deriving results in a useful numerical form. The powerful 'random walk' or 'Monte Carlo' method receives scant attention, however.

Within its self-imposed limitations, the book is very well written; the account of any particular solution is simple and comprehensive, and an elementary knowledge of calculus is all that is required of the reader. Since the analysis is similar to that employed in theories of heat conduction, the book may bore a mathematician since no mention is made of the actual mechanisms of diffusion. It should prove useful to chemists, engineers and physicists concerned with practical diffusion systems.—A. DALGARNO.

COMPANY MEETING

The Distillers Company Limited

Supplementary statement to shareholders made by the chairman at the annual general meeting held in Edinburgh on Friday 14 September 1956.

THE chairman said:— In view of the criticism expressed in certain sections of the press, I feel that in the interests of our shareholders I should make a short statement with regard to the request for a detailed breakdown of the profits by the various divisions of this organisation.

You will be aware that over a number of years the company has broadened and diversified its interests, particularly in the chemical and plastics fields. This has been carried out as a carefully planned programme, and all these operations are entirely within the powers contained in the company's Memorandum of Association.

It is your board's considered opinion that diversification of the group's activities is a sound policy which has been fully justified by results. The steady consolidation of our assets in the industrial field gives the group a spread of earning power which should be a safeguard in adverse economic conditions. In normal circumstances it should make an increasingly valuable contribution to our earnings.

The constantly expanding and changing character of the chemical and plastics industries has of course necessitated substantial investments, which to a large degree have been met by ploughing back profits earned on these enterprises. These industrial developments have followed a logical and progressive pattern, and, as I have reported in my annual statements to shareholders, they have in the main proved successful and profitable, with the over-all yield on the capital employed comparing favourably with that of other similar organisations.

Having again reviewed all the circumstances, the opinion of the board is that the operations of the group should be taken as a whole. The conservative policy of this company, and its marked progress over the years, are the best assurances for the future that we can offer to our investing shareholders, the great majority of whom I am sure will readily approve the attitude of your directors on this matter.

In order to give our shareholders a clearer

picture of the background and progress of industrial enterprises than is possible in my annual statements, an illustrated brochure is now in course of preparation. This will be circulated in due course and I feel sure you will find it of considerable interest.

After the chairman had called for any comments or questions, to which there was no response, the report of the directors and the accounts for the year ended 31 March 1956 were unanimously adopted.

Atoms by Automation

AUTOMATION has a large and important part to play in the development of atomic energy, said Dr. D. Taylor, of the Atomic Energy Research Establishment, Harwell, in a paper delivered to the engineering section of the British Association in Sheffield on 4 September.

It was, he said, being applied to processes which could be carried out manually, but which by the introduction of automatic methods could be carried out more satisfactorily, particularly when large-scale operations were involved.

Reviewing the general application of automation to continuous flow processes, Dr. Taylor went on to consider in detail an automatic uranium analyser, which had been developed for uranium analysis of process streams from an ion-exchange plant.

This instrument employed an absorptometric technique for the determination of uranium-ion concentrations in aqueous solutions. Contemporary batch samples were taken automatically in cyclic order from process streams, separately treated with aqueous ammonium thiocyanate, and the resulting colour complexes were analysed by an ultraviolet absorptiometer. Volumes of samples and chemical reagents were measured and controlled by capacitance level indicators and electrically operated valves, and a record of the uranium-ion concentration was continuously available with alarm indication if the concentrations varied unexpectedly.

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.)

EDMUND R. GOODRICH LTD., London EC, oil and colourmen.—13 August, £16,000 charge, to London Grocers Ltd.; charged on 11 Dod Street, Stepney. *Nil. 17 November 1955.

MATTHEW TURNBULL LTD., Sunderland, glass manufacturers etc.—20 August, £600 mortgage, to M. N. Clay, Putney Hill; charged on 1 The Grove, Sunderland. *—, 9 February 1956.

Satisfactions

EVANS MEDICAL SUPPLIES LTD. (formerly Evans Sons Lescher & Webb Ltd.), Liverpool.—Satisfaction, 22 August, of Trust Deed registered 12 March 1943 and supplemental deed registered 1 November 1951, to the extent of £21,370.

LANCASHIRE TAR DISTILLERS LTD., Manchester.—Satisfaction 24 August, of Trust Deed registered 24 January 1951, to the extent of £12,043.

New Company

Berk Exothermics Ltd.

Private company (571,247). Registered 7 September. Capital £25,000 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in exothermic products and compounds and chemicals, minerals, metals and all other substances, materials for use in the foundry, metal metallurgical and chemical industries etc. The subscribers (each with one share) are: B. E. Mileham, 1/19 New Oxford Street, London WC1, solicitor; and W. S. Jolley, 62

Beulah Hill, London SE19, director. The first directors are to be appointed by the subscribers. Solicitor: B. E. Mileham, 1/19 New Oxford Street, London WC1.

Company News

F. W. Berk & Co.

It is stated by the directors of F. W. Berk & Co., chemical manufacturers and merchants, who are repeating the interim dividend of 2 11-12ths per cent on account of 1956, on a larger capital, that in spite of expanding sales, declining margins and increased development costs indicate lower profits for 1956.

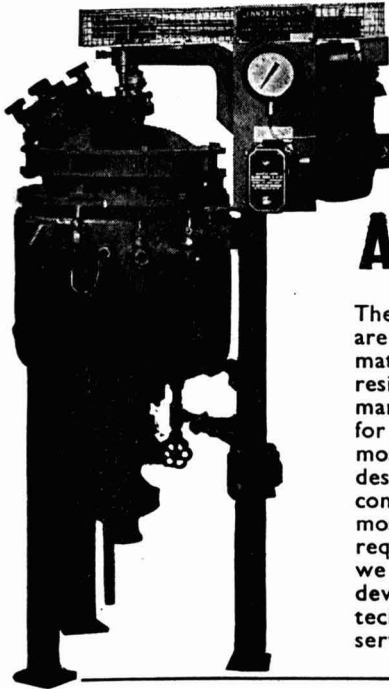
United Indigo & Chemical Co.

Reduction in its payment from 7½ per cent to 6¼ per cent for the year to 30 June 1956 is announced by the United Indigo and Chemical Co. The recommendations are 5 per cent, as previously, plus an additional 1¼ per cent (2½ per cent) on both the £52,500 ordinary and £90,000, 5 per cent cumulative participating preference capital. Group net profits have fallen from £6,287 to £3,456, struck after charging tax of £6,427 against £7,937.

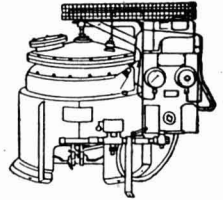
Quickfit & Quartz

A threefold development at Quickfit & Quartz Ltd., manufacturers of scientific laboratory glassware—in the product, in mechanisation and in sales—is reported by Sir Graham Cunningham, chairman and managing director of the Triplex group of companies. The balance sheet shows a group trading profit increase from £809,910 to £953,928. Net surplus for the year ended 30 June 1956, is £324,844 as against £312,764, the figures being subject to completion of the audit. During the year Quickfit & Quartz has designed many new pieces of apparatus which have been widely adopted by laboratories all over the world. Designs for more types of apparatus have been drawn up and will soon be on the market.

Another member of the Triplex group is QVF Ltd., which has already become one of the major world distributors of industrial



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AUTOClaves

The Lennox Foundry Company are specialists in the supply of materials of construction for resisting corrosion and in the manufacture of process plant for specialised applications. In most cases we can supply plant designed for particular working conditions, constructed of the most suitable materials for these requirements, and, if necessary, we can build pilot plant for developing new processes. Our technical staff are always at your service to give advice.

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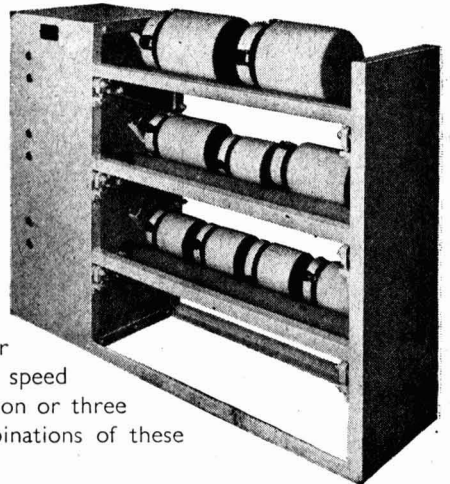
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This new ball mill is a useful unit for carrying out a number of separate jobs or for dealing with different materials at the same time. Arranged with three separate motors and with three pairs of 2½" diameter white rubber bonded rolls in three tiers. Each pair consists of one driven and one idler roll and the latter can be placed in any of three positions to accommodate containers up to 9" diameter.

All three tiers can be operated simultaneously or one or two separately and provision is made for varying the speed of the driven rolls. Each tier will carry either two 1-gallon or three ½-gallon or four 2-pint or five 1-pint and various combinations of these nominal capacities can be operated at the same time.



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Company News

from page 550]

plant in glass and glass pipeline: the sales curve has continued to rise steadily and progressively. The balance sheet shows a group trading profit increase from £809,910 to £953,928. During the year a German subsidiary, QVF Glastechnik GmbH at Wiesbaden has been set up.

Net surplus for the Triplex group of companies after taxation for the year ended 30 June 1956, is £324,844 as against £312,764, the figures being subject to completion of the audit.

The annual general meeting will be held at the Connaught Rooms, Great Queen Street, London WC2, at 2.30 p.m. on Wednesday, 26 September 1956.

Next Week's Events

MONDAY 24 SEPTEMBER

Institution of the Rubber Industry

Manchester: Grand Hotel, 6.45 p.m. Film, 'Rubber from Rocks' by Midland Silicones Ltd.

THURSDAY 27 SEPTEMBER

Society for Analytical Chemistry

Derby: Lecture Theatre, Derby & District College of Art, Green Lane, 7.15 p.m. 'High Precision Absorptiometry' by W. T. L. Neal, B.A., A.R.I.C.

FRIDAY 28 SEPTEMBER

Institute of Metal Finishing

Sheffield: Fitzwilliam Room, Grand Hotel, 7 p.m. 'Zinc Plating' by D. N. Layton, Ph.D., M.Sc., A.R.S.C., D.I.C., A.Inst.P.

Society for Analytical Chemistry

Glasgow: Central Station Hotel, 7.15 p.m. Joint meeting with the Methods of Analysis Panel (Glasgow). 'The Photometric Determination of Molybdenum as the Thiocyanate' by R. Kerr, B.Sc., A.R.I.C.; 'The Determination of Copper in Steel' by L. J. A. Haywood and P. Sutcliffe; 'The Analysis of Titanium and its Alloys' by W. T. Elwell, F.R.I.C.

Society for Analytical Chemistry

Birmingham: Main Chemistry Theatre, The University, Edgbaston, Birmingham 15. 7 p.m. 'Precipitation from Homogeneous Solution' by Professor L. Gordon.

MARKET REPORTS

LONDON Conditions show little change on the week and prices for the most part remain at recent levels. Contract deliveries to the home consuming industries have been moving steadily while new business has been reasonably satisfactory with buyers disinclined to cover more than spot or nearby requirements. Export enquiry continues to be active. The movement in the coal-tar products market is steady with supplies adequate to meet current needs. The creosote oils and cresylic acid remain in good call.

MANCHESTER With holiday stoppages at the consuming end now pretty well out of the way the Manchester chemical market during the past week has been more or less free from seasonal influences. The demand for contract deliveries of the bread-and-butter lines has been on a reasonably good scale, though there is room for improvement in the consumption of a number of textile chemicals. Prices generally are on a firm basis. There is a fair movement of supplies in several sections of the fertiliser trade, with a continued steady demand reported for most of the light and heavy tar products.

GLASGOW The Scottish heavy chemical market has shown an improvement during the past week, and a satisfactory week's trading has to be reported. The demand both for spot and contract deliveries has been well maintained, and covered a varied range of chemicals. In regard to prices, these have remained fairly steady with little or no alteration. On the agriculture side the demand has been reasonable. The export market continues steady with a fair amount of business being placed.

FMC Division Moves

Commercial development activities of Food Machinery & Chemical Corporation's Westvaco Chlor-Alkali Division have been moved from New York to South Charleston, West Virginia. The group is now operating under the direction of MR. WILLIAM B. ROSE, now manager of research development.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

CHEMISTS, CHEMICAL ENGINEERS, METALLURGISTS

VACANCIES exist with the Technical Policy Branch of the Industrial Group of the UNITED KINGDOM ATOMIC ENERGY AUTHORITY at its HEAD-QUARTERS at Risley, Warrington, Lancs. DUTIES:—To work in a small team concerned with the technical aspects of the procurement of raw materials, in particular uranium and thorium, for the atomic energy programme. The scope of the work will include some of the newer metals which are now being considered in connection with the constructions and operation of reactors.

The duties will provide an excellent opportunity for acquiring a comprehensive knowledge of the processes for the production and fabrication of the materials concerned; they will also involve the preparation of technical assessments, and liaison with research and production establishments.

QUALIFICATIONS AND EXPERIENCE:—Candidates should have a good Honours Degree in Chemistry, Chemical Engineering or Metallurgy, or equivalent qualifications, and preferably some appropriate industrial experience.

SALARY:—will be assessed within the scales £1,235-£1,655 or £775-£1,210 as appropriate.

A contributory Pension Scheme is in operation.

Authority houses for renting by successful married candidates may be available in due course, or alternatively, substantial assistance may be given towards legal expenses incurred in private purchase.

Suitably qualified persons are invited to send a postcard quoting reference 1598 for application form to the Recruitment Officer U.K.A.E.A. (I.G.) Headquarters, Risley, Warrington, Lancs.

Closing Date—5th October, 1956.

APPLICATIONS are invited for two senior metallurgical appointments in Northern Rhodesia.

The appointments will be those of **REFINERY SUPERINTENDENT** and **ASSISTANT REFINERY SUPERINTENDENT** of a 110,000 long ton per year Electrolytic Copper Refinery now in course of construction at Ndola, Northern Rhodesia.

Applicants should be in possession of a University degree in Metallurgy or equivalent qualifications and have had a number of years in an administrative capacity in an Electrolytic Refinery and preferably also experience of fire refining. The commencing basic salary will be according to experience and qualifications, in addition to which there is a variable Copper Bonus based on the prosperity of the industry which is paying at present in excess of 50% of basic salary.

A Cost of Living Allowance also applies.

Paid leave will accrue at the rate of 60 days per annum in the case of the Refinery Superintendent and 55 days per annum for the Assistant Refinery Superintendent. Leave can be accumulated for three years.

There is a Group Pension and Life Assurance Scheme, membership of which is compulsory, and a medical Benefit Scheme for the successful applicants and their families. Married accommodation will be provided at a subsidised rental.

The successful applicants will be required to take up their appointments towards the end of 1956 or early 1957.

Free passages to Northern Rhodesia will be provided. Applications giving details of qualifications and experience, also stating age and marital status, together with a copy of a recent photograph, should be sent before the 15th October, 1956, to **THE MANAGER, NDOLA COPPER REFINERIES LIMITED, P.O. BOX 642, NDOLA, NORTHERN RHODESIA.**

MIDLAND Company manufacturing Fume and Dust Collecting equipment, require the services of an **INDUSTRIAL CHEMIST** as a Consultant.

Problems arise from time to time involving the flocculation, etc., of various dust and fume particles, and the applicant would be expected to advise on these and other problems, remuneration being on a fee basis. **APPLY BOX NO. C.A. 3497, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

OFFICIAL APPOINTMENTS

APPLICATIONS are invited from well-qualified graduates in Chemistry for the post of **RESEARCH ASSISTANT** in Radiation Chemistry in the Department of Physical Chemistry of the University of Leeds. The person appointed would be required to investigate some aspect of the radiation chemistry of organic compounds and could be a candidate for a higher degree. The starting date would be arranged to suit the convenience of the successful candidate. Salary would be in the range £350-£500 per annum, the actual value depending on age, experience and qualifications. Previous research experience, especially in Physical Chemistry, is desirable but not essential. Applications should be sent to **PROFESSOR F. S. DANTON, SCHOOL OF CHEMISTRY, THE UNIVERSITY OF LEEDS, 2.**

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S.S. and CHROME STIRRERS/EMULSIFIERS $\frac{1}{4}$, $\frac{1}{2}$, 1
and 2 h.p. A.C.
GLASS LINED CYL. ENC. TANKS, 2,000 and 5,000
gallons.
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120 R.S. Joists 8 in. by 4 in. by 12 ft. 8 in./26 ft. 10 in.
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long by 6 ft. diam. ext. mild steel casing with
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long by 4 ft. diam. arranged geared Motor drive,
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steam traps, motor driven Exhaust Fan, cyclone,
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STEAM JACKETED TROUGH MIXER by Dobson &
Barlow, mixing trough 53 in. long by 43 in. wide
by 46 in. deep, fitted twin glanded 'Z' blades,
double enclosed gearing. Driven by 30 h.p.
Motor. Electrical tilting.

DOUBLE-TROUGH STEAM JACKETED MIXER by
Werner Pfeleiderer, stainless steel lined trough
33 in. by 31 in. by 26 in. deep, fully jacketed,
twin 'Z' blades, double geared glanded shafts.
Hand tilting, F & L pulley drive. Jacket suitable
for 30 lb. sq. in. w.p. Driven by 20 h.p. 415/3/50
Motor.

STEAM JACKETED VACUUM MIXER, 20 in. by 18 in.
by 16 in. cast iron construction single spur gearing,
double 'Z' blade, glanded shafts, hand tilting.
Vacuum cover secured by swing bolts and lifting
eyes at each corner. Usual connections and two
sight glasses. Jacket suitable 30 lb. sq. in. w.p.

DOUBLE-TROUGH MIXER by Morton, size 2, 18 in. by
18 in. by 16 in. deep, mild steel construction
twin 'Z' blades. Hand tilting through lead screw
with interlocking cover. Glanded shafts, two
speeds, Motorized 400/3/50.

PATENT 'RAPID' SIFTER/MIXER by Gardner, 66 in.
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type self-emptying agitator. Bottom discharge,
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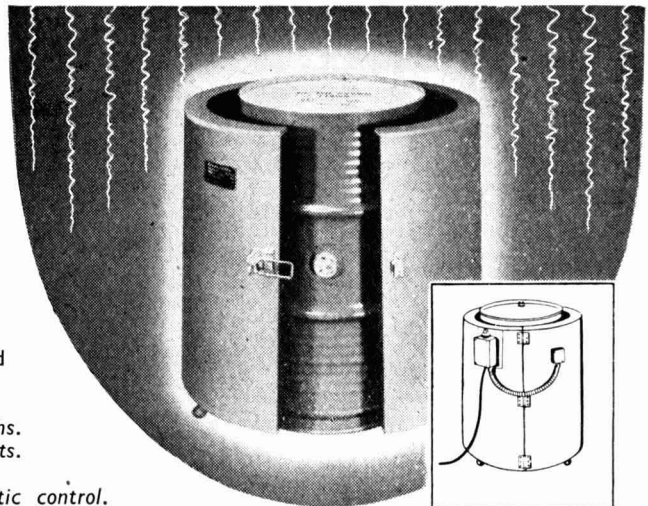
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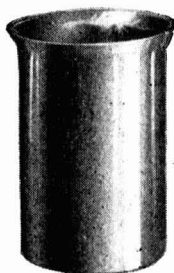
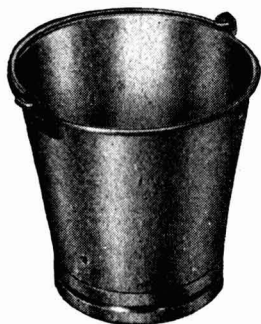
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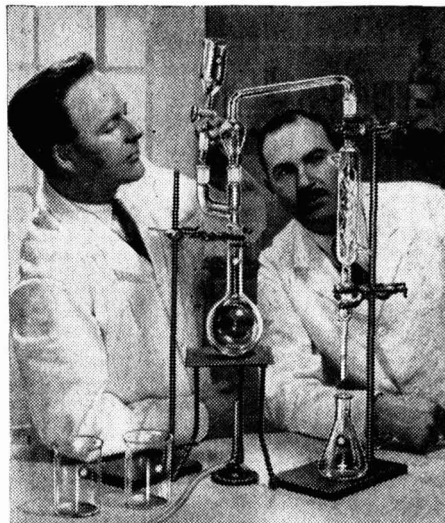
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