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Editor : E. A. Running *Publisher & Manager : John Vestey*

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

SCOTTISH OFFICE
116, Hope Street, Glasgow, C.2.
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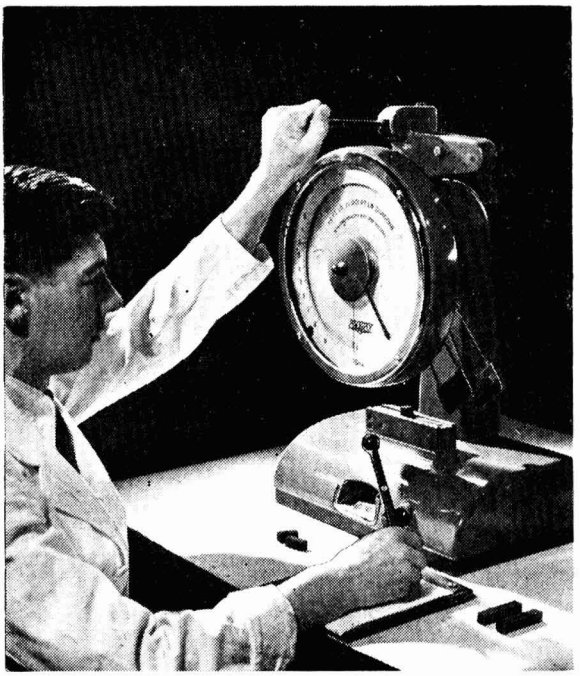

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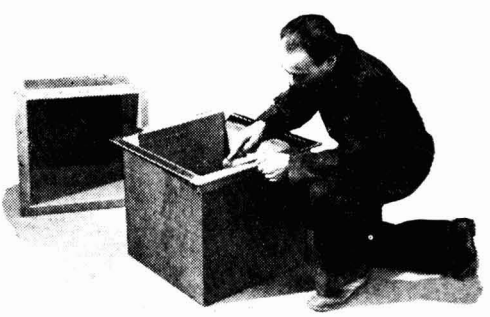


A Survey of Organic Chemistry

FOR chemists the outstanding address at the British Association's Liverpool meeting was surely Professor G. R. Clemo's review of the rise and progress of organic chemistry from the time of the Association's first Liverpool meeting in 1837. Then, too, a young Queen had just come to the Throne, the country was suffering from post-war economic problems, and the need for low-cost foods from our farms was a major problem. British interest in organic chemistry, however vaguely defined over a century ago, was virtually non-existent and Liebig at the 1837 meeting made a striking plea for 'English men of science . . . to further the advance of a science which, when taken in connection with the researches in physiology, both animal and vegetable, which have been so successfully prosecuted in this country, may be expected to afford us the most important and novel conclusions respecting the functions of organisation.'

It seems unlikely now that the incredible energy and vision of Liebig will ever receive their full recognition. He was not fully honoured in his own time, and history since seems to have been as much occupied with his failures as with his successes. Yet, as Professor Clemo has shown, it was Liebig at Liverpool who stimulated the birth of English organic chemistry, and when eight years later a new college was founded he recommended Hofmann as the head, and the great W. H. Perkin at the age of 15 became a student there another eight years later. Perkin's work on dyes possessed the flash of timeless originality that must always be attributed to genius but it was nevertheless inspired by Hofmann's predictions of 'producing from coal-tar the beautiful colour of madder . . .' It is not the smallest service of a scientist to put up the sign-posts for the discoveries of the next generation. The fact that we so soon lost leadership to Germany in the dye industry has often been lamented, but would we have had it to lose if Perkin had not stood on the shoulders of Liebig and Hofmann?

We were scarcely worthy of our opportunity. The new college cost only £1,200 a year—we might inflate inflation and call that sum the equivalent of £10,000 today—but failure to produce rapid results eroded the interest of the Governing Body. Finally it was merged with the Chemistry Department of the Royal School of Mines and Hofmann returned to Germany twelve years later. Oddly enough the merging occurred in the same year that Perkin became a student! None of our universities seems to have sensed the future for organic chemistry, for it was not until 1874 that the first Chair in the subject was created. Yet such men as Frankland, Williamson, and Crum Brown were already engaged in it, and by the 'seventies H. E. Armstrong and Tilden had arrived with their first contributions. Even by the 'nineties there was no great central school of organic research in England. Much is said today about the function of universities as centres for fundamental or pure research. Here was a new subject in which 99 per cent of the work could undoubtedly have been classified as pure, yet, to quote Clemo, 'there was little sign of life at Cambridge and none yet at Oxford.' What was achieved until about 1890 we owe to London and the provinces, hospital laboratories, and public schools. Perhaps few of us today realise that important papers on organic chemical subjects came from Clifton College and Dulwich College—and now almost a century later we come to the occasional suggestion that teachers of

chemistry might more easily be recruited if facilities and time for research were given!

Then at last came the first school of British organic chemistry, begun when W. H. Perkin junr. took the chair at Manchester in 1892, the school that was to produce Weizmann, Thorpe, Haworth, Simonsen, and Robinson. 'What Manchester thinks today . . .'—perhaps the old saying was never more appropriate. Was it the influence of cotton that made Manchester more conscious of the importance of organic substances? Perhaps it was just the chance that the young Perkin went there, taking with him the inherited succession, Liebig—Hofmann—Perkin senr. The pioneering days had ended, though for industrial organic chemistry they had scarcely begun. It required the 1914-18 War to expose the pathetic inadequacy of our organic chemical industry. We had been long content to allow other countries to produce naturally extracted or synthetic organic substances and to develop by-products. Scarcely any of the research work done had actually been applied. Anglo-German co-operation had fanned the first sparks of English organic chemistry; nearly 80 years later Anglo-German enmity had to be the stimulus for the foundation of an organic chemical industry.

Yet all this looks small enough in retrospect when the expansion, both in pure and applied research, from about 1930 onwards is set beside it. Organic chemistry has made its most momentous advances in our own times. Some of the theoretical work is even now incompletely absorbed and therefore still remains to be adequately assessed, e.g., the electronic theory of organic reactions. In applied research one sector alone—the vitamins—has justified Liebig's 1837 assertion that organic chemistry must exercise 'an immense influence over medicine, manufactures, and common life.' Not even Liebig could have foreseen an organic chemical industry producing such materials as Perspex, polythene, Ardil, and Terylene. Nor need we confine the story to one element of Group IV alone. The organic compounds of silicon are now widely known and diversely used as 'silicones.' To account for their modern existence we must go back to 1907 when Kipping published his first paper about them. It is one of the striking features of Professor Clemo's survey that the beginnings of British organic chemistry can be clearly set out, but then—almost abruptly—the subject becomes a giant whose full shape cannot be sketched. There could perhaps be no better answer to the question whether pure and fundamental research pays, for where are the modern developments in industrial organic chemistry that do not find their beginnings in the work (then often enough little recognised) of the pioneers? It might be said in contrast that numerous inorganic industrial developments have had wholly empirical origins; with organic chemicals, particularly with entirely new synthetic substances, the conception and the cradle have both sprung from pure research and theory. Molecule-building is inevitably more dependent upon fundamental knowledge than molecule-handling.

At least it is gratifying to find that the story has changed out of recognition during the period surveyed by Professor Clemo, that far from being backward and casually organised, the British contribution to organic chemistry is now as potent and respected as any other in the world. We no longer lag behind most other industrial countries, and in a number of fields we hold the lead securely. Our main weakness perhaps is that weakness common to all potential developments in Britain, our inability to put the knowledge we possess and create into rapid and sizeable application. It is a weakness of our economic climate and the time is surely close at hand when we must exercise control over that kind of weather. New developments whose beginnings have been made possible mainly by British work, must not in future find their fullest and quickest practical expression abroad. We must export goods, not opportunities. We must at all costs overcome every obstacle that stands in the way of investing British capital and labour in new organic chemical enterprises. Our future as an exporting industrial nation depends just as much upon new kinds of materials and articles as upon the old and familiar. Industrial organic chemistry has many more prizes to offer than those that have so far been won.

Notes & Comments

Tariffs in North America

THE border between the United States and Canada has long been instanced as a world model for pacific semi-detachment among nations, but for many chemicals crossing it there are tariffs to pay and the calm atmosphere seems to vanish when either American or Canadian manufacturers start discussing them. A majority of US manufacturers think that the tariffs their exports have to face are too high or that the tariffs on chemical imports into the United States are too low; this, at any rate, is the conclusion reached by a survey organised this summer. Canadian chemical manufacturers feel that the shoe that pinches hardest is on the other foot. US tariffs are high, Canadian tariffs are low. There is certainly plenty of evidence for this view. The US tariff on polystyrene is 33 per cent. The Canadian tariff is 7 per cent. On phenol there is a US tariff of 37 per cent, but most imports into Canada are free of duty. However, specific comparisons are apt to be misleading. Tariff rates commonly bear considerable relation to a country's need and both these differences are logically explained if it is assumed that Canada needs polystyrene and phenol more than America needs them.

Britain May Benefit

AS Canada's own chemical industry expands, the intensity of her needs for numerous chemicals formerly imported will tend to reduce. Negotiations for progressive reductions in tariffs by both countries will certainly not be made any easier by this. However, negotiations about tariff rates are not unlike disarmament conferences. Proposals for equal reductions are counterfeit exercises in equality, for what is already big remains sizeable still, and what has been initially much smaller becomes so small as to be ineffective. Tariff rates in the United States run between 25 and 50 per cent; in Canada they run from 5 to 20 per cent. Taking the last full year, Canada exported about $75,000,000 worth of chemicals to the US while she received $166,000,000 worth of US chemicals. These figures hardly suggest that America is at a disadvantage in two-way trade across the border. The situation may be helpful to Britain. Our chemical sales to Canada are sadly small compared with America's. If the two chemical industries of North America remain so opposed in their views on tariffs, we might well take more of the Canadian market. Canada has plenty of goods to sell us if we earn more dollars.

Antibiotics for Animal Feeding

ANTIBIOTIC additions to animal foods for pigs and poultry became permissible this month, but it is clear from the regulations issued that adequate safeguards will operate. Antibiotic substances may be used for these agricultural purposes either in manufactured ready-mixed foods or as supplements to be added to food on the farm. In either case, however, maximum concentrations are specified. The Ministry of Health must approve the composition of the diluent in supplements, and this requirement suggests that no preparation from which the antibiotic content could be easily extracted for illegal use will be able to reach the market through the 'agricultural use loophole.' The Ministry of Agriculture is given the power to call for such information as is required to be stated on the labels of containers for both supplements and ready-made feeding stuffs that include antibiotic substances. At present penicillin or residues from aureomycin production will be the only antibiotic materials used. A wider range of antibiotics is being developed for animal feeding in the United States, however, and it is likely and perhaps inevitable that other antibiotics will eventually be used in Britain. The present regulations permit the use of only penicillin and restricted forms of aureomycin, however.

Aluminium Anywhere ?

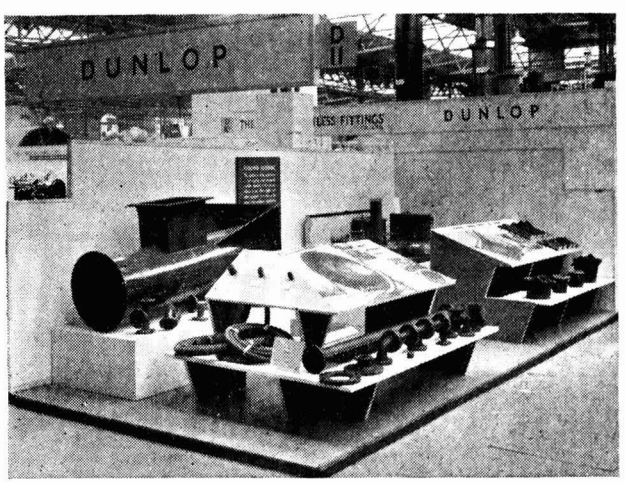
THE earth's crust is plentifully endowed with aluminium, but so far production of the metal has centred itself where there is bauxite or where there is cheap power to handle imported bauxite at low processing costs. A practical process to extract the element from clay would undoubtedly revolutionise the industry and world trade in both the metal and bauxite. Such a process is said to be making the most promising development progress in the United States, where the Bureau of Mines has recently run an experimental alumina-from-clay plant for several weeks. The long-encountered difficulty in using clay as a source of aluminium has been separating the aluminous content from the silica. In the experimental plant a method of heating clay with lime and soda which dissolves the aluminium without also taking up much silica has been developed. The remaining problem of separating silica is relatively small. Further treatments with lime and carbon dioxide remove sufficient silica to provide an eventual aluminium solution comparable in content to ores that are now economic to use. It is believed that this material can then be processed in the same plants now based upon bauxite. In emergency processes during the war when US imports of bauxite were precarious, acids were found to be the most effective silica-removing agents, but the corrosion hazards introduced were too severe. The new Bureau of Mines process seems to obviate this trouble. Another problem—filtration difficulties caused by the gelatinous nature of solutions containing silica—has been solved by adding molasses. Molasses retard the formation of silica gels. However, it is believed that in the further development of the new clay process the use of molasses will be superseded by a cheaper and simpler gel-inhibiting operation.

A Danger to $ Earnings

THE successful development of this process could deliver a severe economic blow to the world's dollar-earning trade. The United States imports some $16,000,000 worth of bauxite per year; Canada's annual imports are the next largest in world trade. There is a sharp difference in source, however. Most of the US requirements are drawn from Surinam and Indonesia, only about 5 per cent being bought from British Guiana. Canada's imports are almost entirely drawn from British Guiana.

Change of Address

Proabd (England), Ltd. have moved to 76 Victoria Street, London, S.W.1. The company's new telephone number is Tate Gallery 3311.



A range of hoses, couplings and moulded and machined articles of Ebonite on the stand of the Dunlop Rubber Co. at the Chemical Plant Exhibition which ended last week at Olympia

Manufacture of Phosphoric Acid

New Plant at Barton-on-Humber

DURING, and especially after the war, there was an increasing demand for a more concentrated form of phosphate fertilisers, including triple superphosphate containing 45-50 per cent P_2O_5. This made it essential for the superphosphate manufacturers to study the question of the manufacture of triple superphosphate.

Early in 1950 The Farmers' Company, Limited, Barton-on-Humber, under the direction of Mr. R. B. Risk, decided to go ahead on a £100,000 modernisation and development plan which included a new phosphoric acid plant as well as alterations to their existing superphosphate plant, and an extension of their sulphuric acid plant.

The design and supply of a phosphoric acid plant was eventually entrusted to the Sturtevant Engineering Company Limited, London, who had recently concluded an agreement with Mr. Sven Nordengren, of Sweden, one of the leading international authorities on phosphoric acid manufacture.

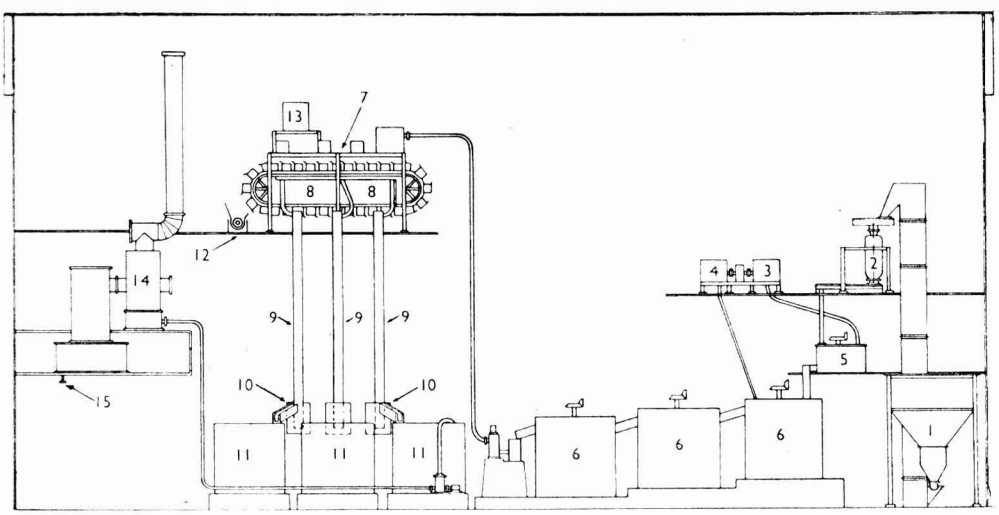
This plant, which contains several novel features, has recently been completed and tested, and is expected to become a model for future installations by other fertiliser manufacturers.

The process is based on the Nordengren dihydrate process, and is briefly as follows.

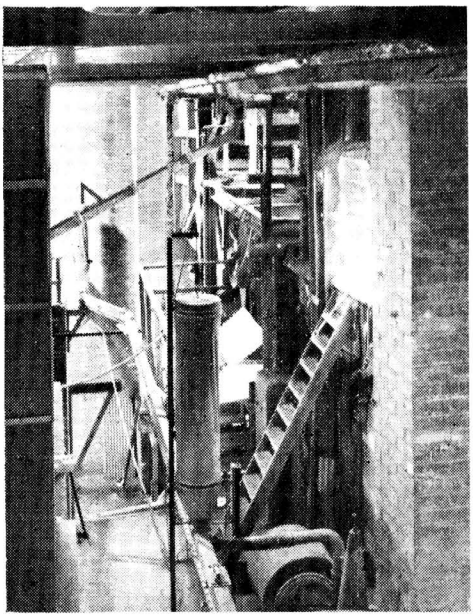
The phosphate is ground to a fineness of between 85 per cent to 95 per cent through 100 mesh and is first mixed with a large amount of weak phosphoric acid in a premixing stage. This slurry is thereafter mixed with sulphuric acid of a strength between 65-75 per cent. During the reaction, the temperature is controlled by re-circulating the sludge. Stable dihydrate crystals are formed under a temperature of 80°, and for the lower grade of phosphates the temperature margin is very small. Thus close temperature control is of the utmost importance.

After a reaction period of from 8 to 10 hours, the sludge is pumped to an acid filter where the phosphoric acid is removed from the gypsum crystals, part of the acid going as product, part being returned to the system as circulating phosphoric acid. The dried gypsum is diluted and pumped or carried to a disposal dump.

The phosphoric acid plant is housed partly



1. Phosphate bin
2. Weighing apparatus
3. Phosphoric acid tank
4. Sulphuric acid tank
5. Mixer
6. Digesters
7. Tray belt filter
8. Suction box
9. Barometric tubes
10. Drain traps
11. Filtrate tanks
12. Gypsum conveyor
13. Wash liquid tank
14. Acid concentration plant
15. Product outlet



The Sturtevant air flow conveyor

in an existing building which has been extensively modified, and partly in a new specially designed building, which also houses the extension to the sulphuric acid plant. The nominal capacity is 10 tons of P_2O_5 per 24 hours and the nominal output of phosphoric acid concentrated to 50 per cent P_2O_5 will, therefore, be 20 tons per day. It is, however, anticipated that the actual output will prove to be in the region of 25-30 tons of concentrated acid per day.

The phosphate is ground in an existing Sturtevant ring roll mill and is transported some 140 ft. to a storage hopper in the new acid plant by means of a Sturtevant air flow conveyor. This conveyor is arranged so that it can, if required, discharge ground phosphate to two hoppers in the superphosphate plant, and has been fitted with an alternative inlet from a second grinding mill to allow for experimentation with varying degrees of phosphate fineness. It is interesting to note that the power consumption of this long conveyor is under 1 bhp.

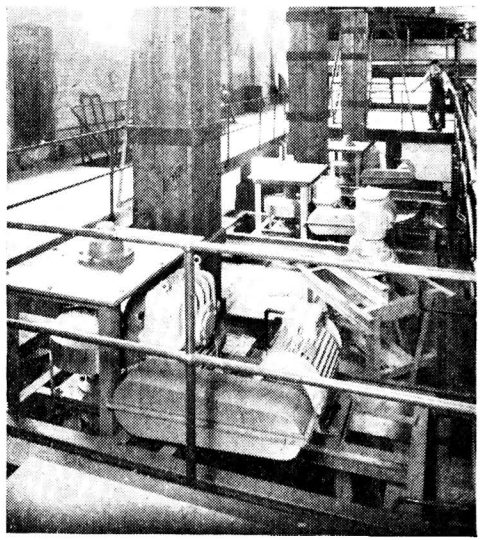
The ground phosphate is fed from the storage hopper to an automatic weigher discharging on to a screw feeder which regulates the flow of phosphate to the mixer. This is driven by a variable speed motor fitted with a tachometer generator so that any slight variations in the load to the weigher, or of the electric supply, are immediately corrected by means of an electronic device. Adjacent to the weigher on the top floor of the digester section are also situated the two acid measuring tanks which are specially designed rotary feeders, each having a variable speed drive. The pre-mixer has a lead-lined mild steel vessel with stainless steel agitators.

The main reaction takes place in three digesters comprising lead-lined timber tanks with heavy lead-covered agitators, and driving gear. The lead lining of this and other items of the plant has been carried out by The Farmers' Company with their own men and equipment.

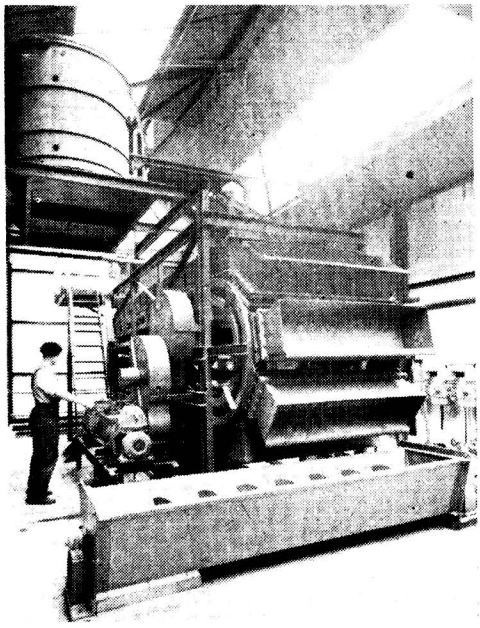
The first digester has been fitted with thermostatically controlled immersion heaters for the purpose of maintaining a temperature of 60° to 70° when the plant is shut down when necessary for cleaning and maintenance.

Although it is intended to use high grade Morocco phosphate it may be necessary to use lower grade phosphate, when the formation of froth in the early reaction stage can be quite troublesome. To combat this, a mechanical anti-frothing device has been included which effectively beats the froth to a liquid sludge before returning it to the first digester.

The main sludge pump is fitted with an overflow to a stand-by pump, and these as



Section of the phosphoric acid plant showing the digester plant



The Nordengren phosphoric acid filter with the gypsum diluter in the foreground

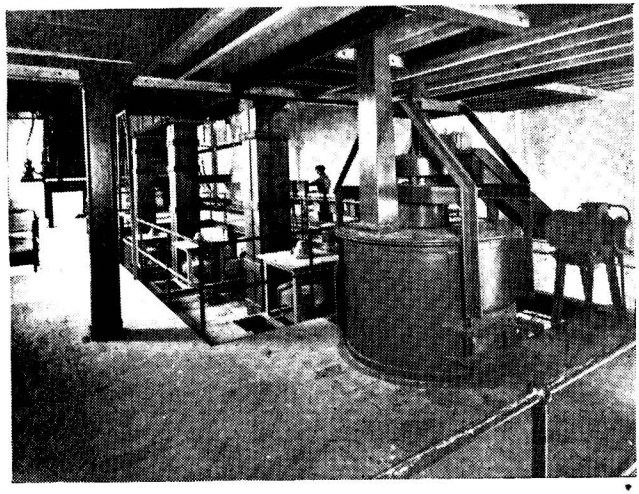
well as all other primary pumps are of LaBour make in nickel alloy.

The acid filter, which was manufactured in Sweden during a home shortage of stainless steel, is a Nordengren tray belt filter of an entirely new design, and is the first of its kind to be installed in this country. This type of filter is a great improvement over its predecessor, the Landskrona filter. The filter consists of a series of filter boxes connected up to form a conveyor belt and fitted with stainless steel perforated plates on which are fixed synthetic filter cloths of a new and improved type.

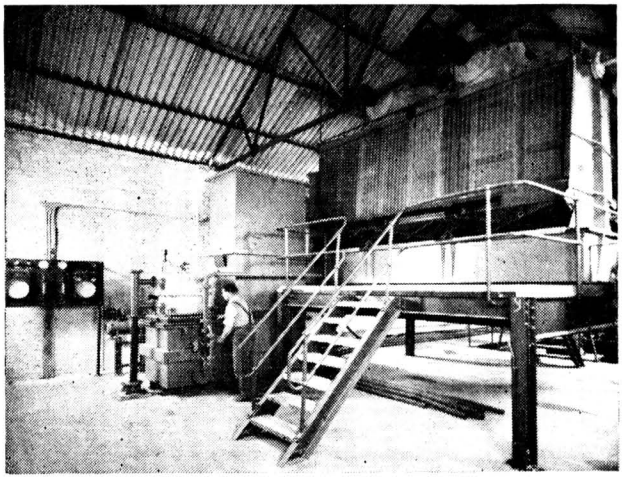
The bottom plates of the filter boxes are connected by a set of rubber pipes to a rubber rope which slides over a suction box. This is partitioned off according to the filtrate fractions required, and each compartment is connected to a barometric tube which is under 80 per cent vacuum. The bottom ends of the barometric tubes are sealed off in hydraulic closures.

The sludge is fed on to the filter boxes by means of a rotary bucket feeder, the speed of which is synchronised with the speed of the belt. As the filled filter boxes come under suction from the first suction compartment, the acid is drained off through the tube and overflows from the hydraulic closure into a filtrate tank. As the belt enters the next compartment, wash liquid from a following filtrate fraction is fed on to the trays from an adjustable wash box overhead, the last wash liquid being pure water, and spillage water, from the filter drain.

Three or four filtrate fractions are taken from the acid filter; the first filtrate will contain approximately 30 per cent P_2O_5, dependent upon the grade of phosphate used and is pumped up to a feed tank connected to the evaporator. The second filtrate containing 18 per cent P_2O_5 is returned to the process as circulating phosphoric acid in the pre-mixing stage. The third and fourth fil-



General view of the Digester section of the plant



The Swindin submerged combustion evaporator

trates containing from 5-7 per cent P_2O_5 are returned to the filter as wash liquid.

Vacuum is provided by a Sturtevant rotary exhauster, and a series of lead-lined sealed vessels in the vacuum line ensures that any acid fumes are trapped and neutralised.

The dry gypsum cake falls from the end of the filter into a paddle mixer, where it is diluted with water and gravitates into a gypsum storage tank fitted with a mechanical agitator. Once every hour the gypsum is pumped to a disposal dump approximately half a mile away, and the pipeline flushed with water.

The evaporator, which was supplied by Nordac Limited, includes a pre-evaporator where the liquid is pre-heated by means of the waste gases from the main evaporator. The liquid passes from the pre-evaporator through a control valve to the main evaporator. This is a heavy rubber-lined steel tank with an internal lining of acid-proof refractory bricks. The main evaporator is fitted with a Swindin submerged combustion chamber using an oil burner which was specially developed for this plant. The combustion flame is released beneath the surface of the liquid, giving an almost complete heat transfer. The pulsations in the liquid are utilised to create a circulation within the evaporator chamber.

The concentrated acid overflows through an overflow box, and is gravitated into a storage tank from which the acid is pumped to the phosphate acidulating plant. Fumes from the mixer, digesters and the evaporator are removed through a partly lead-lined timber ducting and are drawn through two wash towers arranged in series.

It is worth noting that this plant has been designed for conversion to the Nordengren anhydrite process which is the latest, and most up to date, of the wet processes, and promises to be the most efficient one for phosphoric acid manufacture. This process is, however, still only in the experimental stage, although full-scale plants are now being built on the Continent. The main feature of this type of plant is the production of phosphoric acid containing 45 per cent P_2O_5, without the need for concentration.

The new plant at Barton-on-Humber promises to be a most economical venture, not only because of the relatively low capital expenditure but also by virtue of the simplicity of the process and the low operating costs.

[*Editor's note: Both Mr. R. B. Risk, of The Farmers' Company, and Mr. Sven Nordengren, of Sweden, have been involved in the development of this unique plant which formed the subject of a paper read at the International Superphosphate Manufacturers' Association session which was held at Cambridge during the period 14-18 September, 1953, and the above article is by permission of Mr. Risk. We are also grateful to the Sturtevant Engineering Company, Limited, for their co-operation in preparing the article.*]

Society of Leather Trades' Chemists

Abstracts of Conference Papers

THE annual conference of the Society of Leather Trades' Chemists recently occupied a day and a half at The University, Leeds. Abstracts from some of the papers presented follow.

In the course of a paper entitled 'A Surface Colorimeter as an Aid to the Standardisation of Leather Finishes', Mr. J. S. Mudd and Mr. F. E. Downs, of Nene Finishes Limited, Northampton, pointed out that difficulties in the control of colour finishes and the accurate reproduction of colours at irregular periods of time have prompted the development of a control procedure using a simple type of surface colorimeter with a controlled light source (standard illuminant B), enabling reproducible colour measurements in C.I.E. terms to be made with an accuracy corresponding to that with which colours may be visually discriminated in normal conditions.

Additional interest is given by plotting the colours on a chromaticity chart. Moreover, by drawing on the work of Perry and others, it is possible to suggest a graphical method for colour tolerance. In this, an area can be plotted within which there will be no perceptible difference in shade from a predetermined standard, when viewed by the average observer.

Careful Preparation Necessary

Attention was drawn to the necessity for careful preparation of patterns where precise colour recording is involved, and where direct comparisons are to be made. A method of preparing and filing patterns was outlined as being suitable for routine work. The method was not suggested for direct colour matching, but the authors claimed that the information obtained was of practical value and that a colour submitted for matching, by means of the filed patterns, could be related readily to another pattern of known composition.

'The Application of Polymeric Phosphates in the Leather Industry' was the title of a paper presented by Mr. R. S. Meldrum, of the British Leather Manufacturers' Research Association. He said the sodium polymetaphosphates are a homologous inorganic series of the formula $(NaPO_3)_n.Na_2O$ and that their properties are a function of the long straight chain poly-anions which they contain. These anions have a high affinity for both globular and fibrous proteins, including collagen. In the case of collagen, it is shown that fixation of polymetaphosphates, in which 'n' has a suitable value, leads to a tanning action as judged by raising of shrinkage temperature and leather-like drying. Fixation is highest at *p*H 2.4 in the absence of added salts. Acid swelling is completely inhibited at this *p*H by the polyphosphates.

Polymer Used Successfully

As a result of assessing the tanning properties of a series of polymetaphosphates, a polymer of molecular wt. 2100 has been selected for practical tannery tests. This polymer has been used successfully in combination with chrome and vegetable tanning processes. Improvement of cutting value has been obtained in chrome side leather. A 48 hr. tannage for vegetable tanned split hides has been developed, using a polymetaphosphate to 'mask' the protein before tannage in strong vegetable tan liquors. In this latter application the strong iron-sequestering action of the phosphate polymer is beneficial.

It has been discovered at the British Leather Manufacturers' Research Association that high molecular weight phosphate polymers can be used as emulsifiers for raw oils commonly used in fat liquoring. Suggested applications were discussed.

In 'The Tannage of E.I. Kips and Other Leather', Mr. R. L. W. Inkster, of Forestal Central Laboratories, Harpenden, dealt with the methods employed in the tanning of East India half-tanned kips and skins. The various processes were described in detail, from the soaking through the liming, deliming, tanning and finishing, with a description of the various tanning materials used.

The United Kingdom is the principal market for this type of leather and the paper was of particular interest to those engaged in dressing and finishing this type of leather. The author drew attention to the fact that there has been practically no change in the processes involved since the industry first

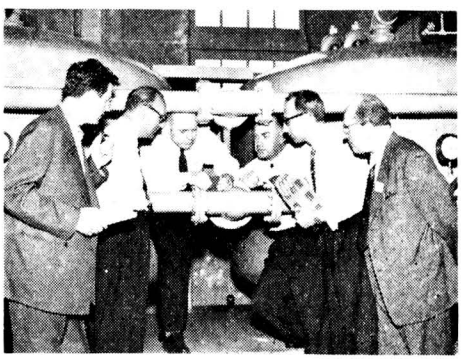
started. After drawing attention to the possibilities of modernising the industry, he gave various suggestions which could bring this important trade more into line with modern conditions.

Mr. N. L. Holmes, of Richard Hodgson & Sons, Ltd., Beverley, Yorkshire, presented a paper entitled 'The Story of Wattle'. He described the growth of the wattle industry from its earliest days, and gave a brief account of the methods of cultivation. This was followed by a film of about 30 minutes' duration, illustrating the cultivation and marketing of the bark.

Visitors to Pennsalt

Study Maintenance Coating Techniques

A NEW system of anti-corrosion maintenance painting for a variety of conditions in chemical plants, developed over several years by the Pennsylvania Salt Manufacturing Co., was studied recently by 22 European engineers who visited the company under the auspices of the Mutual Security Agency.



Mr. R. R. Pierce illustrates determination of the thickness of a new type Pennsalt coating being tested in the company's plant at Cornwells Heights, Pa. In the background are two large vessels protected by the same coating. Among the MSA visitors who inspected Pennsalt maintenance coating programme with Mr. Pierce were, l. to r., Dr. Veli Aytekin, Karabuk, Turkey; Dr. Jacques Jean Trachet, Brussels, Belgium; Dr. Emile-Maurice Elchardus, Asst. Manager for Research and Development, Societe d'Electrochimie d'Ugine, Lyon Rhone, France; Dr. Roger De Smet, Brussels, Belgium; and Dr. Erich Rabald of Mannheim, Germany

Representing nine countries, the visitors discussed the system with Pennsalt corrosion engineers, toured the company's Whitemarsh Research Laboratories, and then examined techniques and results of the programme at the company's Cornwells Heights plant, near Philadelphia, Pa.

Four basic fundamentals, established in the company-wide study of maintenance painting, were explained by Mr. R. R. Pierce, manager of Pennsalt's Corrosion Engineering Department. These are:

1. Corrosion must be stopped on surfaces before these surfaces are coated or recoated.

2. A minimum of .001 in. of primer coat must be applied to the surface.

3. A minimum of three coats of primer and coating must be applied to prevent incidence of pin holes or holidays in the coating.

4. A minimum of .005 in. total of primer and top coating must be applied to obtain good results in chemical plants or around chemical use points.

Pointing out that coating repairs at the first sign of failure are always the most economical, Mr. Pierce described how Pennsalt codes all plant areas and maintains graphs keeping accurate records of coating performance. The group then discussed various coatings and their suitability under a variety of corrosive conditions.

At the Cornwells Heights plant the MSA visitors studied Pennsalt's maintenance programme, its coding and testing procedures, and saw examples of the results obtained with the company's neoprene coatings and several new coatings now undergoing tests.

New Pakistan Plant

DESIGNED and built by the staff, a new aluminium sulphate plant owned by Pak Chemicals Limited and planned initially to produce two tons of alum a day, was recently opened in the Sind Industrial Area by the Hon. Khan Abdul Qaiyum Khan, the Pakistan Minister of Industries, Food and Agriculture.

He said he felt confident that every effort would be made to run the business on proper lines, but he warned that there was danger of setbacks if 'quick' steps were taken for its expansion. Pakistan had to industrialise as quickly as possible, but every care must be taken against too rapid expansion.

An Electrolytic Remote-Indicating Manometer

by JOHN T. STOCK, M.Sc., Ph.D., F.R.I.C., and M. A. FILL, F.R.I.C.

ALTHOUGH pressure-differences of the order of a few millimetres of mercury may, of course, be measured by direct manometry, indirect methods are useful when access to the manometer is inconvenient, when the pressure-difference is small and, particularly, when extended observations are required. Use of electrical methods permits ready amplification of the signal, if required, and allows the indicating instrument to be situated at any convenient point. The continuous attention of the operator may also be dispensed with, since electrical signals are usually amenable to automatic recording.

In the U-tube manometer described by Leach[1], a filling of paraffin is used. A platinum filament, electrically maintained at a slightly elevated temperature, passes down one limb. A change in pressure causes the paraffin level to alter, thereby affecting the extent of immersion of the filament. The rate of cooling of the filament, and hence its effective resistance, thereby changes and unbalances the Wheatstone network of which the filament forms part. High sensitivity is obtainable, but fluctuations in the heating current must be carefully avoided.

Simple but Effective

A few years ago, the authors developed a transmitting manometer having platinum filaments sealed axially in both limbs, each of which is about half-filled with mercury[2]. In conjunction with two small fixed resistors, the unsubmerged portions of these filaments form a balanced network, which is energised by a small battery. Displacement of the mercury alters the relative lengths of the filaments in the circuit and hence the state of balance of the bridge. The device is simple and effective but, owing to the high density of mercury, is not particularly sensitive.

A simple and sensitive mains-operated device, improvised from readily-available materials, has been in use for some time in connection with gas-flow experiments where the pressure-drop across the flowmeter had to be reduced to the minimum. The manometer fluid is a dilute aqueous electrolyte solution; London tap water fulfils the requirements admirably.

The H-form manometer vessel is shown in Fig. 1; no dimensions are critical. Electrodes A, B and C are of 32 SWG bright copper wire. The actual gauge is not important; the wire must be thin enough to straighten out under light tension, but thick enough to have reasonable strength. Wire A runs down the inner sides of the limbs and along the upper side of the cross-piece, as shown; wires B and C are arranged to run parallel and diametrically opposite to the vertical portions of A. Unlike the latter, B and C do not enter the cross-piece, but continue downwards to the lower ends of the respective limbs. Enlarged view (a) and limb cross-section (b) indicate the location of the wires, which are secured under light tension by the wedging action of rubber stoppers D, E, F, and G.

Provided that wires about twice the finished length are used, assembly is very

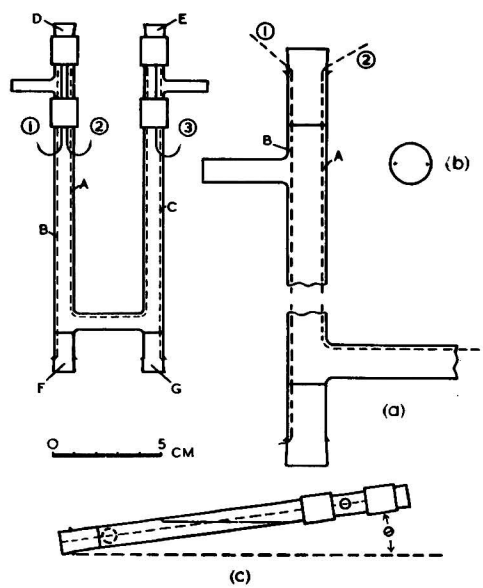


Fig. 1

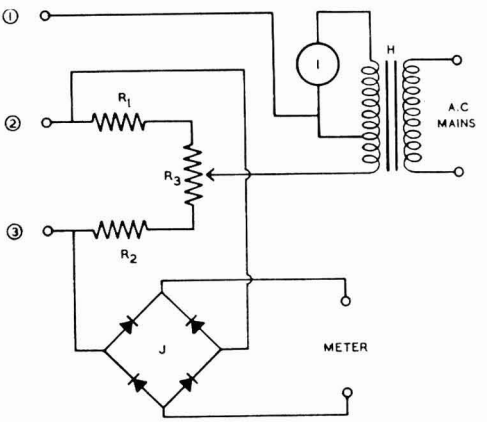


Fig. 2

simple. A brass nut or other small weight is tied to the end of a length of sewing thread and lowered down one limb of the H-tube. By tilting the latter, the nut may be made to pull the thread through the cross-tube and out through the top of the second limb. Having attached the nut to the end of wire A, the latter may be drawn into position by pulling on the thread. To straighten kinks and to maintain tension until the stoppers are inserted, the ends of the wire are twisted together. Wires B and C are now pushed down their respective limbs and tightened in a similar manner. Having coated the stoppers with rubber cement, they are now carefully pushed home and the cement allowed to harden.

Wires B and C are cut off close to the lower stoppers; their emergent upper ends are left about 1 cm. long for the attachment of light, flexible connecting leads. A similar lead is soldered to one end of A, the other end of the latter being cut off close to the stopper. If the three leads are plaited together or otherwise bunched, the lead attached to electrode A should be of a distinguishing colour. To prevent breakage at the joints by accidental drag on the leads, the latter are anchored to the tops of the limbs by, for example, a few turns of insulating tape. After rinsing out the manometer with tap water, sufficient of the latter is introduced to bring the level midway between the cross-tube and the top of the limbs.

Alternating current, used to minimise polarisation effects, is supplied from the 3 volt output of bell transformer H mounted in a small control unit, the circuit of which is shown in Fig. 2. The second, or 5 volt, output may be used conveniently to operate pilot lamp I. Constituting the fixed arms of the network, R_1 and R_2 are half-watt resistors of 1,000 ohms each. Zero adjuster R_3, a Forces-surplus radio type 300-ohm potentiometer, allows inequalities in the resistors, or in the 'no pressure' resistances of the limbs of the manometer, to be balanced out. Balancing may also be accomplished by slightly tilting the manometer sideways, so that the water-level in one limb is increased at the expense of the level in the other. The potentiometer may then be omitted, the three wires running to it being soldered together.

Leads from the manometer are attached as indicated by the numbering; the only other components are an 'instrument rectifier', J, costing a few shillings, and a suitable meter. Most of the work has been done with a Forces-surplus 0-1 milliampere moving-coil DC meter having a resistance of about 30 ohms. Complete with a very convenient desk-type mounting, this meter cost less than 30s.

With no pressure applied to the manometer, the meter reading should be zero. If otherwise, balancing should be carried out as indicated above. Application of a pressure-differential causes the water to rise in one limb, thereby decreasing the electrical resistance and upsetting the balance. Since a corresponding fall occurs in the other limb, an increase in resistance results, thus augmenting the electrical unbalance. The extent of the latter is indicated on the

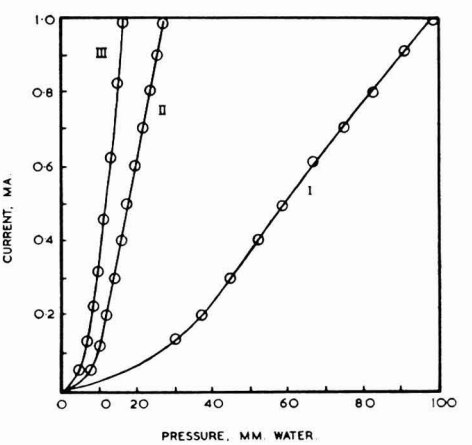


Fig. 3

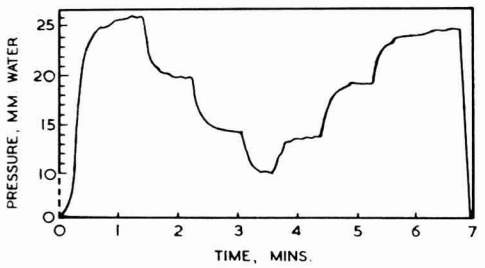


Fig. 4

meter. Since the rectifier can pass current in one direction only, the meter gives a positive reading for both positive and negative pressure-differentials.

When a newly assembled manometer is put into use, the immersed portions of the electrodes begin to lose their brightness; after about an hour they acquire a uniform matt black appearance.

Calibration curves were obtained by leaving one limb of the manometer open to the atmosphere and applying suction to the other. A 10-litre aspirator bottle equipped with a large fine-control stopcock[3] provided the suction. Also connected to the aspirator were a water manometer of conventional form, the scale of which could be read to 0.2 mm., and an air leak. The latter enabled the suction to be maintained constant for several minutes and to be easily varied by altering the rate of flow of water from the bottle.

Typical curves are shown in Fig. 3. Curve I, obtained as described above, shows that the response over the greater part of the meter scale is approximately linear, although the slight curvature is quite definite. At the lower end of the scale, however, the curvature is very great, since the sensitivity falls off rapidly. This behaviour, experienced in all observations, is probably due to rectifier characteristics.

The sensitivity may be greatly increased by tilting the manometer forward, as indicated by side view (c), Fig. 1, taking care that, with no applied pressure, the liquid levels in the limbs remain the same. As the angle of elevation θ is reduced, so the displacement of water by a given pressure is increased. Curve II, Fig. 3, shows the

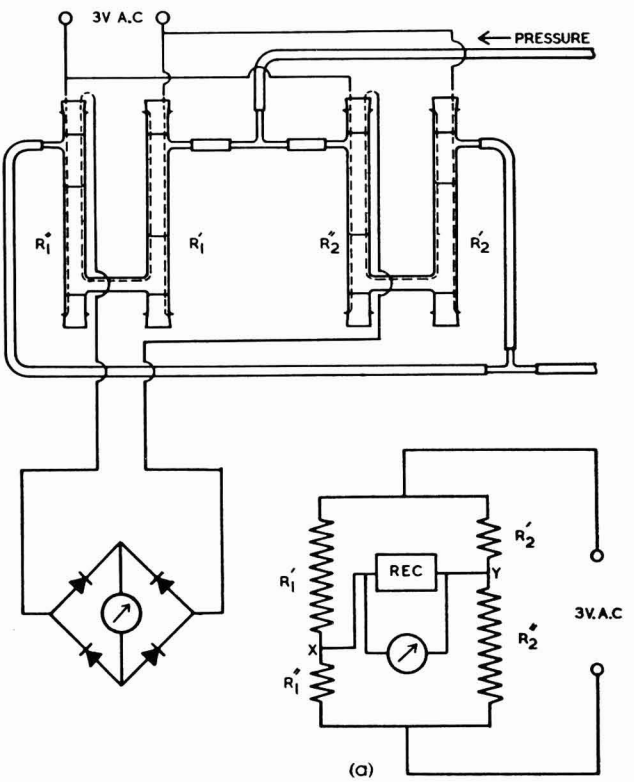


Fig. 5

response obtained with an angle of elevation of 12½°. The apparently linear portion is in reality slightly curved.

For obtaining continuous records the amplifier-recorder section of a Tinsley polarograph was connected in parallel with the milliammeter forming part of the permanent set-up. Since the minimum sensitivity of the recorder is 200 microamperes for full-chart deflection, a 1,200-ohm resistor was placed in one of the leads joining milliammeter and recorder. The latter thus drew only about 1/40th of the current passing through the milliammeter and was conveniently operated at a full-chart sensitivity of 20 microamperes. Fig. 4 was prepared from a tracing of a portion of the record of a test run; the grid lines and other matter printed on the strip-chart have been omitted for clarity. Irregularities on the plateaux are due to mains fluctuations, which are, of course, impressed on the low-voltage AC supply to the manometer.

Arrangement for Pairs

Manometers may be used in pairs to increase the sensitivity still further. The arrangement, shown in Fig. 5, has the additional advantage that the fixed resistors are dispensed with. Application of pressure produces electrical unbalance in each manometer; connections are such that the unbalance is additive. The principle is illustrated at (a); when no pressure is applied, the heights of liquid, and hence the electrical resistances R_1' and R_1'', in the first manometer are equal. In the second manometer, the corresponding resistances R_2' and R_2'' are likewise equal, so that points X and Y are at the same net potential and no current flows through the meter. Suppose that application of pressure causes R_1' to increase at the expense of R_1''; since the pressure is also applied to the second manometer, R_2' will decrease as R_2'' rises. A considerable degree of electrical unbalance is therefore produced by a small displacement of the liquid columns.

The two manometers may, of course, be arranged vertically or inclined as described above. Curve III, Fig. 3, is a calibration curve obtained with a pair of manometers operated at an angle of elevation of 12½°. The manometers, which were not identical in dimensions, differed in sensitivity by about 10 per cent. Pressures less than about 5 mm. of water may be measured, either by replacing the milliammeter by a microammeter, or by operating the recorder at increased sensitivity.

REFERENCES

[1] Leach, W., *Ann. Bot.*, **46**, 583, (1932).
[2] Stock, J. T., and Fill, M. A., *Analyst*, **74**, 120, (1949).
[3] Stock, J. T., and Fill, M. A., *ibid.*, **71**, 142, (1946).

Cathodic Protection

A SYMPOSIUM on cathodic protection will be held at the Institution of Electrical Engineers, London, W.C.2, on 13 November, beginning at 9.45 a.m. and finishing at 5.30 p.m. Seven papers will be presented, embodying experience gained in various parts of the world with the protection of ships, underground pipe, storage tanks and other structures used in contact with water or soil.

Although cathodic protection has been energetically developed during the last few years, it has not hitherto had full public discussion in this country. In organising this symposium the Society of Chemical Industry, Corrosion Group, is giving opportunity for such discussion. It is understood that preprints of the papers will be available.

Radioactive Waste

A NEW method of dealing with the drainage and effluent of radioactive materials has been adopted in the new laboratory at Hammersmith Hospital. Keeping these materials separate from other wastes involves special containers, pipe lines and pits for collecting them. To resist the effect of radioactive material upon this equipment a coating of synthetic rubber dough, which on drying becomes vulcanised, has been trowelled on to the storage pits and sumps. These Semtex Fleximer coatings waterproof without the need for heat as the compound merely dries by loss of solvent. Research work is now being done to find out whether this dough, originally developed and used for radioactive material, can be applied in other directions.

(Comments made by Sir John Cockcroft, director of the atomic energy station at Harwell, on the problem of the safe disposal of radioactive waste material, were published in THE CHEMICAL AGE, 12 September, p. 548.—*Editor.*)

Warning Labels

ABCM Outlines Marking System for Hazardous Chemicals

THE Association of British Chemical Manufacturers has published a booklet entitled 'Marking Containers' which outlines a system for warning labels for containers of hazardous chemicals. In recent years there has been a great deal of discussion here and internationally on the problems relating to warning labels, and this publication has been prepared after consultations over several years.

Many chemicals present no special hazards in normal use, but the increasing use of chemicals for new and varied purposes has emphasised the need to warn handlers and users that some products need special care; information regarding the properties of products and the action desirable in the event of a leakage of the contents of a package may be helpful also to carriers. The most effective means of supplying such information and advice to the user is through the technical service departments of the manufacturers, but a simple and uniform system of warning labels on containers provides valuable and continuous support at all stages in the passage from the maker to the ultimate user. Such marking cannot, of course, take the place of proper education of employees regarding possible chemical hazards, and the use of appropriate precautions is, and must remain, the responsibility of the user.

Safeguarding All Concerned

The primary object of the ABCM's scheme for warning labels is to safeguard all concerned, including merchants, ultimate users or carriers, in the home trade from the personal hazards involved in the handling of hazardous chemical products, up to and including the time the container is opened for use in the premises of the recipient. It is limited to trade in the UK.

The ABCM labels can be described as 'handler and user' labels, to differentiate them from 'transporter' labels, such as those in operation by the British Railways. Internationally there are several conventions considering the classification and labelling of dangerous goods for international transport purposes. Here the chief problem is to overcome language differences and the difficulties of the printed word, and consequently transport experts have decided that symbolic (pictorial) labels are most suitable for their purpose. These same symbolic transport labels will also indicate to a handler and user that the container should be handled with due caution, but in this country chemical manufacturers consider that the handler and user requires more specific information.

American System

A close study was made of the practices for warning labelling in other countries, and it was decided that the needs of the British chemical industry could best be met by compiling a scheme similar to one which has been most successfully operated for several years in the USA by the Manufacturing Chemists' Association.

The ABCM's booklet sets forth certain general principles for the preparation of warning labels and recommends specimen wording for a number of chemicals. The principles include a description of the legal position, a series of recommended standard phrases, and a detailed specification for the layout of the label. Specimen wording is given for over 200 chemicals, together with an index to the most common synonyms.

Types of container for which this scheme is intended are single bulk containers, or outer containers wherein small containers of one chemical only are packed, passing in trade in this country in quantities exceeding six pints for liquids or eight pounds for solids, but excluding compressed and liquefied gas containers and road and rail tank wagons. For the time being the labels will be additional to those required by law or by carriers, but the possibility of integration is being examined.

Warning labels recommended consist of:

(a) Name of product (or other description).

(b) Signal word (e.g. 'Danger,' 'Warning' or 'Caution').

(c) Statement of hazard (e.g. 'Corrosive'—'Causes Burns').

(d) Statement of precautions (e.g. 'Avoid Contact with Skin and Eyes').

(e) Accident action and/or first aid (e.g. 'In Case of Contact, Drench with Water).

The scheme has been approved by the Council of the Association and recommended for adoption by all members. It is hoped, indeed, that it will be adopted generally by all manufacturers, as the more widely the scheme is adopted, the more complete will be the protection obtained by both makers and users. The Chief Inspector of Factories has congratulated the Association on the scheme and also recommends it for adoption as a code of practice by all manufacturers concerned.

Copies of the booklet can be obtained from the Association at 166 Piccadilly, London, W.1, price 7s. 6d. net post free, cash with order.

IN THE EDITOR'S POST

Art & Salesmanship

SIR,—Boldness was required of British engineering firms if oversea competition was to be met, said Mr. D. D. Walker, the honorary president, opening the Engineering Exhibition at Olympia last week. Boldness in our goods was not lacking, but boldness in selling was required now. It is a fact, in some cases to be deplored, but in no way to be ignored, that the wrapping very often sells the goods within—as the chocolate makers, for one, know very well indeed. But who, suspended (if possible) over the Grand Hall at Olympia, looking down into the formless gallimaufry which made up the Chemical Plant Exhibition, would have been able to perceive more than the most unattractive of wrappings? An allocation of space, flat and featureless, on which are disposed a number of ungainly, lifeless objects; a cardboard office, painted in such a colour that the exhibits appear to sink into its walls; the banked flowers which certainly hide a multitude of sins—these are the abiding impressions of almost every stand. Exhibitors seem to ignore the fact that the visitor has come, not to inspect their products alone (which he could do more easily by a visit to the works), but to compare them, in a conveniently short space of time, with their competitors—and he will be attracted first by what catches his eye. If nothing at all does, he may even go away.

In the engineering section at BIF, Castle Bromwich, this year, the stands of only four exhibitors—I.C.I. Metals Division, British Plastics Federation, Bakelite Ltd., and Doulton & Co., Ltd.—were conceived as attractive, integrated displays, and these, I suspect, were the only four designed by qualified artists. Doultons are the only exhibitors of these four to have a stand in the Chemical Plant Exhibition, and theirs is the only one, out of 61, worth a second glance.

British exhibition design, said *The Times Review of Industry* in July, 1950, 'is now probably without rival anywhere in the world.' The Festival of Britain successfully confirmed this claim, and proved that the methods which Misha Black and his team of designers developed for the Ministry of Information during the war were equally applicable to commercial subjects. Is it not time that Britain's engineering firms took the task of stand design from the hands of the sales manager and the works drawing office, and gave it to those more qualified to wrap the goods in their most alluring tinsel?

Yours, etc.,

AJAX.

(Name and address supplied).

New Insulin for Diabetics

Sir,—The publication of your short report on 5 September of Dr. Boyes' intimation at the British Pharmaceutical Conference that a new form (indeed 3 types) of insulin produced by Danish work will shortly be available has led quickly to enormous trouble for this Diabetic Association and for many doctors treating diabetes.

Many of thousands of insulin cases have been asking in a spate 'When can I have the new insulin; what is the dose; how do I use it?' I hope you can publish this letter to clarify the position to diabetics.

The new forms of insulin are not yet available on the market. The best method of their use is not clearly known. In July 1953, at Leeds, British experts on diabetic treatment discussed the new preparations and asked the Ministry of Health and the manufacturers not to introduce the three new forms of this insulin before knowledge of their use in treatment was ripe.

I am, sir,

R. D. LAWRENCE,

Chairman, Medical Advisory Committee,
Diabetic Association, London.

South African Newsletter

From Our Own Correspondent

THE South African Minister of Economic Affairs has disclosed that the productive capacity of Sasol, the oil from coal project at Sasolburg, Orange Free State, has been enlarged from the 30,000,000 gal. of oil products a year originally planned to a minimum of 70,000,000 gal. Provision is also being made for a large number of by-products, including low-temperature tar, paraffin waxes and ammonia gas.

The total capital requirements for the establishment of the plant alone, which were put at £18,000,000 when the building contracts were concluded in 1951, are now estimated to be well beyond £20,000,000. This does not include expenditure needed for housing and other staff necessities. All the main foundation works for Sasol are virtually finished, and the erection of the surface installations is now in full progress. The plant site, which is in the area from which coal supplies will be obtained, covers about 150 acres. Another 5,500 acres have been acquired for housing and associated amenities for the newly created township of Sasolburg, now being built on the banks of the Vaal River, about 60 miles south of Johannesburg.

The corporation hopes that its plant will be ready for testing operations before the end of next year. Process equipment is flowing steadily from manufacturers in the Union, Britain, Germany and other countries in Europe. So far about 150 technical specialists from Germany, the Netherlands and Denmark have settled at Sasolburg to supervise and help local engineers and workmen in the erection work. The oil press service reports that 'initial output will include 55,000,000 imperial gal. a year of petrol—equivalent to about one-sixth of the Union's present requirements—and also 4,500,000 gal. of diesel oil and 1,800,000 gal. of fuel oil. The plant will thus yield an annual total of some 210,000 metric tons of liquid oils and about 10,000 tons of low-temperature tar, 14,000 tons of paraffin waxes, 9,000 tons of ammonia gas, and appreciable quantities of other by-products. To obtain this production, about 2,200,000 tons of coal will be needed annually, or more than ten tons of coal per ton of liquid fuel. Nearly half the coal used will be for the gasification process, about a quarter will be consumed by the works power station, and the remainder will provide process steam and heat to the various plant components.'

* * *

A pilot plant to produce cement from slag has been built by the South African Iron and Steel Industrial Corporation, Ltd., Iscor, and the output will probably be used at the end of this year for building a small dam and some houses, according to a statement issued by the Council for Scientific and Industrial Research. In November last year it was reported that good cement could be made from blast-furnace slag in South Africa, and sold at 1s. a pocket, about one-fifth of the cost of ordinary cement.

Blast furnace slag, it was thought, might provide the country with 20,000 pockets of cement a day. At Iscor and Vanderbijl Park about 2,000 tons of slag are produced daily, and about half of this is suitable for the making of cement. About 20 pockets can be produced from one ton of slag. At the Iscor plant only experimental batches of cement will be made.

* * *

The South African Commercial Secretary in Stockholm reports in regard to trade in 1952 that miscellaneous chemicals from the Union continued to be sold in Sweden in increasing quantity, the 1952 total of 2,279,000 Sw. Kr. being well above the 1951 figure of 1,829,000 Sw. Kr. The main single item in this statistical group was again chrome tanning materials, of which periodical shipments were made from the Union.

* * *

The chemical industry in South Africa is based on the production of explosives for the mines. Modderfontein and Somerset West have the two biggest dynamite factories in the world relying on synthetic ammonia for the production of nitric acid and sulphuric acid produced from local iron pyrites and imported sulphur. Superphosphates are produced from sulphuric acid and North African rock phosphate. The modern insecticides like DDT and hexachlorbenzene, involving large amounts of chlorine, are

manufactured in large quantities. Chlorine and caustic soda are produced by the electrolysis of salt also for the young paper industry, based on the very rapid growing pine and eucalyptus trees introduced into South Africa. A large Kraft paper plant is being built at the mouth of the Tugela River and a rayon pulp plant using eucalyptus wood is envisaged at the mouth of the Ukomaas River, south of Durban.

* * *

Conditions in the paint industry remain satisfactory and despite a seasonal contraction in demand, manufacturers report that sales have been fair and turnovers have been well maintained. No shortage of labour has been encountered. The competition between manufacturers has resulted in some easing of the price of their products. Raw materials are generally available at steady prices, but quotations for linseed oil are showing a tendency to harden.

* * *

The local chemical industry has been showing keen interest in the latest annual report of the Council for Scientific and Industrial Research table in the House of Assembly. This is because its features include a survey of the South African resources of titanium and of other raw materials, including the supply of salt and related chemicals, on the kaolin industry with a special report on the possibility of refining such clays in South Africa, and on the composition of whale liver extracts. It is suggested that research projects might be based on some of these reports.

* * *

Among the ingredients needed in the manufacture of paint are pigments, oils, resins and solvents, and all these have been tested separately by the South African Bureau of Standards, which has completed specifications for a large range of raw materials, such as zinc oxide, yellow, orange and green chrome pigments, white lead dehydrated castor oil and linseed oils, in all about 20 different types of materials. The tests have covered many different qualities. Elasticity has been measured by stretching apparatus, resistance to cracks by bending the panel over a mandrel, and hardness assessed by the rocker test. Drying time has been tested with slowly moving serrated wheels which run over the surface of freshly painted panels at a fixed rate. When the wheel no longer leaves a mark on the panel the paint is dry and the time can at this point be read off the scale. The brittleness of the paint is determined by the impact test, in which a 2 lb. weight is dropped from varying heights. The climatic acceleration tests have yet to be standardised, but much progress has been made to that ideal.

* * *

The manufacture of chemicals of all kinds for the textile industry, with particular application to the finishing processes, was started by Textile Chemicals (Pty.), Ltd., in Johannesburg. In addition to the experimental and research work that is being done by this company into the special problems of the textile industry in the Union, the chemists employed in the large laboratory in Johannesburg are also adapting to local use many of the formulae and other data available from the Erka organisation in Europe. The fact is widely appreciated in the local textile industry, which has been receiving from the Johannesburg firm many of the chemicals specially adapted to meet their particular requirements. Chemicals for the local textile industry are thus being modified to meet special needs without reliance on standard lines.

Indian Fertiliser Output

MR. K. C. REDDY, Indian Production Minister, told the House of the People recently that the cost of sulphuric acid production in India should be examined, and, if necessary, suitable action should be taken under the Industries (Development and Regulation) Act to maintain the prices of this essential material at a reasonable level.

He added that the Sindri Fertiliser Factory and the Ordnance Factories should jointly examine the possibility of manufacturing synthetic nitric acid, nitro-benzene and aniline. Efforts were being made to step up production by the Sindri Fertiliser Factory so that daily output would be over 900 tons.

The quantity of ammonium sulphate in stock at the factory at the end of April, May and June 1953, said Mr. Reddy, was 75,364 tons, 61,645 tons and 43,319 tons respectively. The factory had employed a transportation officer to plan, co-ordinate and supervise despatches in consultation with the railway authorities. As a result of this there were no transport difficulties now, and fertiliser was being cleared smoothly.

Swiss Chemical Industry

International Demand for High Quality Products

DURING the past few months, sales abroad of Swiss chemical products have amounted to 15-20 per cent of Switzerland's total exports. In 1951/52 these reached a value of 715,000,000 Swiss francs, divided among the different sectors as follows:—Pharmaceutical products, 296,000,000 francs; essences and synthetic flavourings, 36,000,000 francs; dyestuffs, 240,000,000 francs; intermediate chemical products, including insecticides, plastics, 123,000,000 francs; and greases, oils and miscellaneous, 20,000,000 francs.

Research Emphasised

Almost totally lacking in raw materials of its own, the Swiss chemical industry has endeavoured from the start to produce high quality articles which could hold their own against international competition. Hence, the laboratories of the various concerns, as well as the universities, have devoted themselves to scientific research in a manner both thorough and systematic: hundreds of qualified chemists study fields that are already known and explore new ones, too. Only articles that have stood rigorous tests and mark a real step forward are put on the market.

Factories use modern methods, aided by efficient assistance from the machine industry and skilled manpower. The greatest care is taken in application of the products; teams of experts and technicians are at the disposal of industrial clients, while complete scientific particulars are at the disposal of doctors and hospitals using the pharmaceutical products.

The oldest branch of the Swiss chemical industry is that of synthetic dyestuffs. Thousands of products, among them hundreds of patented specialities, are used in the textile, paper, leather and plastics industries, as well as in many others. The industry has also contributed considerably to the progress of the last few years in the field of synthetic resins and plastics; this is also true in the field of insecticides.

The pharmaceutical industry has also succeeded in making an enviable reputation for itself during the half century that has passed since it first started. Alongside the products forming the basic stocks of the pharmaceutical chemist, it is mainly the work done in the fields of hormones, vitamins, alkaloids, glucosides and chemo-therapeutic products (including anti-TB agents) that has contributed to its development.

The essences and synthetic flavourings industry, using highly specialised processes, produces a whole range of odoriferous and flavouring materials which are used in perfumery, the foodstuffs industry, soapmaking, etc. These are not, as is often thought, finished and luxury products, but the basic materials of industries for which they constitute the essential ingredients in the subsequent processes of manufacture.

To these branches, which dispose of their products mainly in the world markets, must be added a number of others which export to a lesser degree; those manufacturing bases, acids, salts, lacquers, explosives, etc. This forms a picture of a vast field which is characterised not only by the diversity of its products, but by their quality, too.

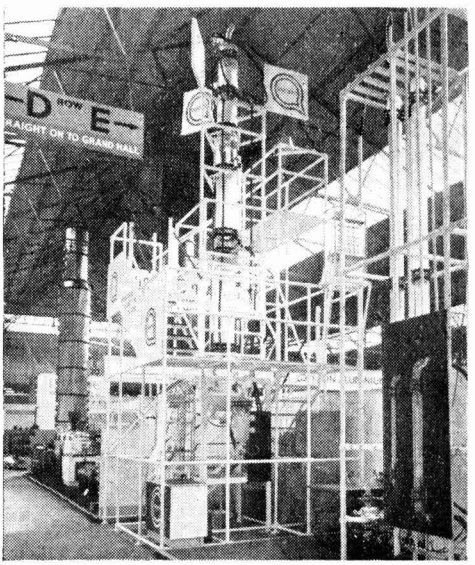
C

Argentina's Linseed Oil

ARGENTINA will export 75,000 tons of linseed oil to Russia during the next twelve months under the terms of an agreement signed earlier this month in Buenos Aires and about 60,000 tons of linseed oil to Western Germany under another agreement signed a few days earlier.

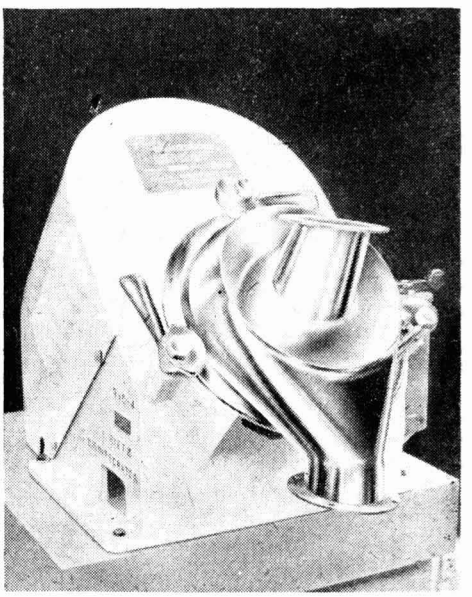
It has been pointed out that these two commitments, representing a grain equivalent of about 405,000 metric tons, are considerably in excess of the exportable surplus afforded by Argentina's last linseed harvest, officially estimated at 570,000 tons. From this total, seed requirements, harvesting losses and domestic linseed oil needs have to be deducted, and the balance of about 370,000 tons is further reduced by other commitments entered into earlier, but the available balance of about 90,000 tons (representing some 30,000 tons of oil) can be augmented by the large stocks of unsold oil from previous harvests which Argentina was still holding at the time of the 1952-53 harvest, estimated at 157,000 tons on 31 December last.

Seen at Olympia . . .

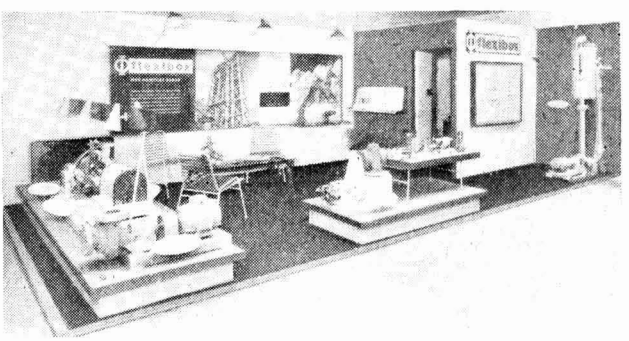


More exhibits at the Chemical Plant Exhibition :—

Prominent on the stand of Quickfit & Quartz, Ltd. (left), was a large all-glass vacuum still, using steam as the heating medium. It included multiple heat-exchangers using steam at 50 psi. to provide reboil heat, packed column sections and total condenser, reflux control and vacuum off-take system



(Right) The Scott-Reitz Laboratory Angle Disintegrator is capable of handling wet, moist or dry materials without clogging, working on such diverse subjects as grapes for wine-making, tomatoes, vegetable wastes, cannery wastes, oil seeds and so on



A general view of the Flexibox stand. The Flexibox mechanical seals exhibited are widely used in every industrial process concerned with fluid handling

More Chemical Engineers Needed

Sir Harold Hartley on Growing Competition from Overseas

THIS country needs more chemical engineers, declared Sir Harold Hartley when speaking at a meeting of the Institution of Chemical Engineers in London last week.

He said he was convinced that chemical engineering was destined to play a vital part in the industrial future of Great Britain. The expansion of the world's population meant a growing need to process food and raw materials so that they could be used with the utmost efficiency, a growing need for synthetics, an increasing dependence on low-grade metal ores, and a need for nuclear power. In all this chemical engineering would have to play a major part, far transcending the scope of the chemical industry in which it was born. The future for this country, with its pre-eminence in its schools of physics and chemistry and its intuitive gifts for engineering, was bright.

There was growing competition from Germany, Japan, and the rising countries of Asia, and there were three urgent needs which would help this country to meet this competition by new ideas and developments. 'We need more chemical engineers and more schools of chemical engineering in our universities and technical colleges,' said Sir Harold. 'We need chemical engineering construction companies with resources more nearly equal to those across the Atlantic, so as to secure design and construction contracts in the world market. We need more financial support for chemical engineering research both in the universities and technical colleges, and in a specialised laboratory with support from Government and industry as was envisaged in the Cremer report. Above all, we need a more general recognition of the part that chemical engineering is bound to play in modern industry.'

Sir Harold was opening a discussion on two reports recently issued on the chemical industry in the United States of America—first, a report by a technical assistance mission sent by the Organisation for European Economic Co-operation, the other produced by a productivity team representing the British heavy chemical industry working under the aegis of the British Productivity Council.

The report of the mission was quoted by Sir Harold Hartley to show that there was no lack of individual brilliance in Europe and that many important chemical advances originated in Europe. But, none the less, they had received their full development and commercial exploitation in the United States. The leading position achieved by the American chemical and allied industries was due partly to her vast home market with free competition, to 'the effects of two world wars when she was outside the theatre of operations,' and to her superior natural resources. But there were other reasons. The mission had emphasised that a large part of the American success was due to the efficiency of her chemical engineers and to the schools in which they were trained.

Exemptions from KID

THE Treasury has made an Order under Section 10(5) of the Finance Act, 1926, exempting the following articles from Key Industry Duty, for the period 14 September, 1953 to 18 February, 1954:

Activated carbons and decolourising carbons, not being of animal origin, the following: Activated carbon which, in the form in which it is imported, on subjection to extraction with acetic acid of a strength of 30 per cent by weight at 50° for 30 minutes, yields (a) a total of extractable solids which, when dried at 105°, does not exceed 0.2 per cent by weight of the material, and (b) extractable phosphate, which, expressed in terms of phosphorus pentoxide, does not exceed 50 ppm. by weight of the material.

Synthetic organic chemicals, analytical reagents, other fine chemicals and chemicals manufactured by fermentation processes, the following: 1-aminopropan-2-ol, *n*-butyl acrylate, ethyl vinyl ether, pentaerythritol.

The Order is the Safeguarding of Industries (Exemption) (No. 7) Order, 1953, and is published as Statutory Instruments 1953, No. 1357. Copies may be obtained (price 2d. net, by post 3½d.) from H.M. Stationery Office, Kingsway, London, W.C.2.

Census of Production

Preliminary Notice

THE scope of the census of production to be taken in 1955 in respect of the year 1954 and the information to be obtained have now been considered by the Census of Production Advisory Committee. It has been decided that all establishments within the field of production will be included in the census, which will be on similar lines to the full census for 1951.

The statutory form of return will include questions on (1) working proprietors; (2) number of employees; (3) wages and salaries, etc.; (4) capital expenditure on plant, machinery and vehicles; (5) capital expenditure on new building work; (6) materials and fuel purchased; (7) work given out; (8) stocks at the beginning and end of the year; (9) output; and (10) transport payments. The questions on (1), (2), (4), (5), (7), (8) and (10) will be broadly the same as for 1951. In the wages and salaries section (3), firms will be asked to give information about employers' payments to superannuation and other pension funds, etc., as well as their contributions to all National Insurance Schemes. This will help to complete the information available about labour costs.

Materials Common to Most

In the materials section (6), firms will be asked to state, as in the 1948 census, the total cost of materials and fuel purchased with details, by quantity and value, of the principal items purchased. Information will be sought about certain materials which are common to virtually all trades, e.g., replacement parts and packing materials. In the output section (9), firms will be asked to show the total value of sales and work done, with details of sales of each of a number of products, on the lines of the detailed form used for 1951. In the light of the information obtained from the censuses for 1948 and 1951, some modifications of the headings in the materials and fuel section and in the output section will be made in the forms used for certain trades. No information will be required about merchanted goods.

Details of the output and materials headings which are to be specified for 1954 will be sent for comments to the trade associations concerned as soon as possible. Any firm in the field of production requiring further particulars about the census for 1954 should address its inquiries to the Census of Production Office, Neville House, Page Street, London, S.W.1, stating the nature of the business carried on.

Oil Refining in India

THE three oil refineries to be set up in India will together have the capacity to refine 3,710,000 long tons of crude oil per annum. This will yield 146,900,000 gal. of motor gasoline and 120,300,000 gal. of kerosene.

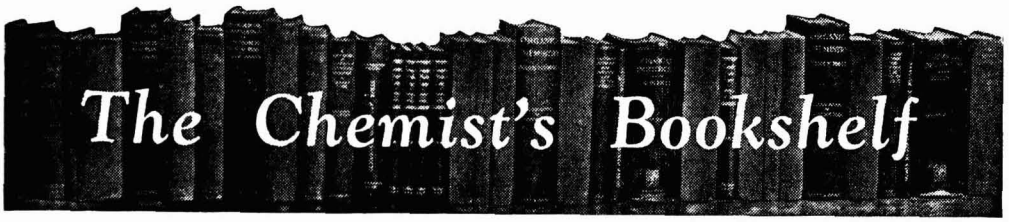
The refineries—two of them are being set up by American companies at Bombay and Visakhapatnam respectively, and the third by a British company at Bombay—will thus meet, when in full operation, a little over 60 per cent of the present demand of motor gasoline and a little less than half the demand for kerosene.

All three refineries will also produce 147,325,000 gal. of diesel oils and 307,650,000 gal. of fuel oils. Moreover, the refinery being set up at Bombay by the British company will produce 25,000 tons of bitumen.

The three refineries will be owned and operated by Indian companies incorporated under the Indian Companies Act and in which foreign investment will amount to more than R.500,000,000 (£37,500,000).

Copper Restrictions Go

COMPLETE cancellation of the common list of end-use prohibitions for copper and copper alloys, agreed upon by member-countries in September, 1951, has been decided upon by the Council of the Organisation for European Economic Co-operation. The new decision came into effect on 4 September. This common list was suspended in December, 1952, owing to the improved position of copper supplies, but the Organisation's Non-Ferrous Metals Committee was instructed to keep a close watch on the situation in case the re-imposition of restrictions became necessary. The committee has now reported that the maintenance in abeyance of a common list of prohibitions serves no useful purpose, since the present satisfactory situation of world supplies has enabled all member-countries to remove their national end use restrictions.



CATIONIC POLYMERISATION AND RELATED COMPLEXES. Edited by P. H. Plesch. W. Heffer and Sons, Cambridge. 1953. Pp. 166 + xii. 20s.

The formation of high polymers from monomers may occur by a free radical type of polymerisation or by a cationic type involving such catalysts as metallic halides. The first of these types of polymerisation has been fairly well understood for some years, but the mechanisms of cationic polymerisation have only recently been clarified. This book, consisting of the papers and discussions at a conference held in 1952, represents an up-to-date review of the subject. It is divided into two parts, the first of which deals with complexes likely to be involved in polymerisation, the second part being devoted to cationic polymerisation mechanisms and processes.

Contributions to the part dealing with complexes are mainly concerned with those formed between such organic compounds as olefins, aromatics, acetone and ether and metal or hydrogen halides. In an introductory paper by D. D. Eley, Friedel-Crafts complexes generally are considered and the topics of catalysts, complexes with ethylenic compounds, aromatics and electronegative atoms, energy and bond type of co-ordinate links, and the problem of reactivity introduced. Such topics are elaborated in other papers, some of the most interesting perhaps being those dealing with the Energetics of Co-ordinate Link Formation (H. A. Skinner) and the General Chemistry of Olefine-metal Salt Complexes (J. Chatt). Mechanisms of complex formation, bond type and stability, among other aspects, are dealt with in discussions following the papers. A brief summary of the main points in the contributions is given by Eley.

The second part of the book is further divided into sections dealing with cationic polymerisation of arylenes and alkenes respectively. Most of the papers on arylenes are concerned with the polymerisation of styrene using different halide catalysts. Water co-catalysis in styrene-stannic chloride polymerisation is discussed by D. C. Pepper. Co-polymerisation of substituted styrenes and polymerisation of *cis*- and *trans*-stilbene are also subjects of papers. The section on alkenes includes contributions on the polymerisation of isobutene, 1-alkenes, vinyl ethers and cyclopentadiene. Mechanisms of polymerisation, the role of carbonium ion reactions, co-catalysts and the effects of solvents are some of the topics discussed in the second part of the book, the contributions to which are clearly summarised by F. S. Dainton. The book concludes with a brief review of a Symposium on Carbonium Ion Reactions held at Lieden in March, 1952, and some collected activation energies of cationic polymerisations.

The large number of references, some of which are more recent than the conference, make it a very useful guide to the literature of the subject. The discussions contain many original suggestions and ideas. The book provides a large amount of material in an accessible form, and while its primary value is to research workers in the field of polymerisation, it is of considerable interest to the high polymer chemist generally and to those interested in complex formation.—W.R.M.

DECHEMA-WERKSTOFF-TABELLE. (Dechema Tables of Engineering Materials). By E. Rabald and H. Bretschneider. 3rd. edition. Chemie GmbH, Weinheim—Bergstrasse. 1953.

Over a period of 20 years the authors have systematically collected all data and information helpful to the chemist or engineer in the choice and use of engineering materials. On this basis they have compiled this guide, a standard work of inestimable value which, though it can be compared with the American 'Corrosion Data Survey,' is far more extensive, embracing as it does almost 100 engineering materials and

approximately 900 chemical agents as compared with the 25-30 engineering materials and 500 agents of the American publication. It must also be borne in mind that these chemical tables will never be out of date. This truly monumental work is on loose leaf, 100 sheets being sent out at any one time. New discoveries and experiences can therefore be added easily either as extra sheets or by revising one or another of the tables already published.

The aim and purpose of this Dechema publication is to collect the widespread experience and knowledge of possible uses of engineering materials and to present these clearly and precisely. The style adopted has resulted from the amount of material. Space saving and clarity are maintained, as each reagent and each engineering material is given a separate page.

'Dechema-Werkstoff-Tabelle' is made up of two sections. The first is concerned with 'Physical Properties' and deals with roughly 95 engineering materials. None of these pages has yet appeared, however. The remaining section deals with 'Chemical Resistance' and in it the action of over 850 chemical agents on the said engineering materials is to be set out.

A separate page is devoted to each agent and they are arranged alphabetically. The front of the page is given over to the actual table, the back to 'Notes and Remarks.' If necessary, as for example in the case of ethylalcohol, these are extended to another page.

The engineering materials are subdivided into three groups: (1) metals and alloys (2) non-metallic inorganic materials and (3) mainly organic engineering materials.

The chemical agents are given in English and French as well as in German, but it is to be hoped that the explanatory directions for the use of these tables, now only given in German, will also be issued in the other two languages, thus greatly increasing the value of the tables.

Up to the present the first 100 or so pages have been issued, covering chemical agents from abietic acid to ammonium sulphite. A few chemicals are mentioned without as yet any details. Space is provided for them, but their tables will be issued at a later date. Further sections will be published at intervals of approximately two months. The price for each instalment is DM12.50 or the whole can be ordered in advance for DM300.

The compilation has been carried out with the greatest care and should prove a standby in laboratory and workshop. The Dechema and the two compilers, Rabald and Bretschneider, are to be congratulated on their work. May the future sections be equally useful.—FELIX SINGER.

MERSEYSIDE: A SCIENTIFIC SURVEY. Edited by Wilfred Smith. University Press, Liverpool. 1953. Pp. 300. 21s.

Published by the British Association for presentation to each member and student attending the annual meeting in Liverpool, this book is now available to the public. It is a symposium edited by the Professor of Geography at Liverpool University, and it is well illustrated with maps and diagrams, together with a small number of photographs, but it is primarily a geographer's view of the district. The first part of the book is concerned with the geology, climate and natural ecology of the region; the second with the urban structure of Liverpool, its history and its trade; and the third includes a description of the main industrial areas around Liverpool—Chester and the North Wales coalfield, the West Lancashire coalfield, and the Middle Mersey and chemical district.

This last section is mainly historical, and is written by three lecturers in geography, but it is nevertheless interesting in its study of how the growth of chemical industry in the area was affected by the proximity of the Cheshire saltfield.

As a whole, the book is well produced and well written, the introductory chapter by Professor Smith happily relating the various sections to the form of the complete study. —B.I.

Atomic Reactor for India

India will have her first atomic reactor within three years, Dr. H. J. Bhabha, chairman of the Indian Atomic Energy Commission, said in Bombay recently. Adequate funds had been made available by the Government of India to the Atomic Energy Commission to set up an atomic reactor, he said, but its location had not yet been decided. The proposed uranium-cum-thorium factory at Trombay, about 10 miles north-west of Bombay, was expected to be ready within 15 months.

'Terylene' in Italy

IMPERIAL Chemical Industries, Ltd., have concluded negotiations with the Italian chemical company, Montecatini, of Milan, as a result of which Montecatini will, under licence from I.C.I., manufacture and sell in Italy the polyester fibre known in this country as 'Terylene.'

As already announced, I.C.I. have decided to spend nearly £20,000,000 on the 'Terylene' plant which is now being built at Wilton, in North Yorkshire. The first stage of this great plant is due to be completed before the end of 1954 and to be in production in 1955. The second stage is due to be in production in 1956, giving a total output of 'Terylene' of 22,000,000 lb. a year.

The decision to sell the Italian 'Terylene' rights to Montecatini results from the big demand throughout the world for this new fibre. 'Terylene' is expected to make such an impact on the world's textile markets, because of its superiority for many apparel and industrial applications, that it will be impossible to meet the demands in the large textile-producing countries from the British plant alone, big as it is.

In America the rights to produce and sell polyester fibres were acquired by E.I. Du Pont de Nemours in 1947. In order to meet the potential demand in Canada, the I.C.I. subsidiary, I.C.I. of Canada, Ltd., is building a large 'Terylene' plant at Millhaven, near Kingston, Ontario.

Obituary

Dr. Bernard Mouat Jones

Many in the world of chemistry will regret to learn of the death, at the age of 71, of DR. BERNARD MOUAT JONES, one time Vice-Chancellor of Leeds University. Born in London in 1882, Dr. Jones was educated at Dulwich College and Balliol College, Oxford, and after obtaining honours in chemistry and first-classes in mineralogy and crystallography he graduated in 1905. Among his subsequent academic appointments were those of research assistant in mineralogical chemistry at the Imperial Institute in 1905; professor of chemistry at the Government College, Lahore, 1906; assistant professor at the Imperial College, 1913; warden of the University Hall of Residence, Chelsea, 1913.

Joining the London Scottish Regiment as a private in 1914, he was made captain and assistant director of the GHQ laboratory the following year. He returned to civilian life in 1919 as professor of chemistry and director of the Edward Davies Laboratory in the University College of Wales. After two years in that capacity he became principal of the Manchester College of Technology and remained there for 17 years.

Mr. Francis Crossley

With regret we announce the death recently, after a short illness (poliomyelitis), of MR. FRANCIS PATRICK IRWIN CROSSLEY, who was the youngest director of Crossley Brothers Ltd., Openshaw, Manchester. Grandson of the chairman, Sir Kenneth I. Crossley, and his heir, Mr. Francis Crossley joined the board on 19 September, 1950. Thus has a most promising young life been cut short and his co-directors and all at Crossley Brothers Ltd., and Crossley-Premier Engines Ltd. feel a keen sense of loss and sympathy for Sir Kenneth and family, which will be shared by all who know them.

Phthalates Price Reduced

CONSEQUENT upon an improvement in the cost of phthalic anhydride, A. Boake, Roberts & Company, Ltd., London E.15, have found it possible to reduce the prices of their range of phthalate plasticisers as follows, with effect from 14 September:

Plasticiser	*Reduced by* (*per lb.*)	*New 10-ton Rate* (*per lb.*)
Di-ethyl phthalate to B.S.574 : 1950	4½d.	1/10¼
Di-methyl phthalate to B.S.1996 ..	3½d.	1/7½
Di-butyl phthalate to B.S.573 : 1950	1d.	2/0
Di-*iso*-butyl phthalate	1d.	1/9½
Phthalate 79	2d.	2/1
Di-ethylhexyl phthalate to B.S.1995	1d.	2/9
Di-nonyl phthalate	1d.	2/3½

Australian Uranium Finds

More uranium deposits, discovered in South Australia, are all suitable for deep mining. They are at Yankaali, in the hills south of Adelaide, at Etnabella, the site of a native mission near the Northern Territory border, and at Wallaroo and Moonta. The uranium field being developed by the South Australian Government at Radium Hill, in the far north-east of the State, was inspected recently by the British Minister for Supply, Mr. Duncan Sandys, and the Australian Minister for Supply, Mr. Beale.

HOME

Glassware Demonstrated

Glass apparatus for double distillation of water was demonstrated by Quickfit and Quartz, Ltd. at the 12th annual congress of the International Association of Limnology at Cambridge.

Wage Increases

In an award of the Industrial Disputes Tribunal, made known this week, wages of workers in the drug and fine chemical manufacturing industry have been raised by 5s. a week for men and 4s. a week for women, with effect from 4 September. Proportionate increases have been granted for juniors.

Institute of Metal Finishing

The second annual general meeting of the Institute of Metal Finishing will be held at the Charing Cross Hotel, London, W.C.2, on 13 October. The business of the meeting will be succeeded by the induction of the new president, Mr. J. W. Cuthbertson, D.Sc., F.I.M. A.M.I.E.E., who will deliver an address on 'Education and research in the metal finishing industry.' The annual dinner will take place in the evening.

Insecticide Fraud Alleged

A sample from a 5-gal. drum of liquid, alleged to have been sold to a householder for £5 as 'wood-worm insecticide spray, containing DDT,' was stated at Bournemouth Police Court this week by Dr. I. G. Holden, senior scientific officer at the Metropolitan Police Laboratory, to be essentially paraffin and to contain no DDT. The two men stated to have sold the liquid—they traded as the 'Acme DDT Service'—were sent for trial at Bournemouth Quarter Sessions.

Glasgow Exhibition

Plans for the Scottish Industries Exhibition which is to be promoted by the Scottish Council (Development and Industry) in the Kelvin Hall, Glasgow, from 2-18 September next year, were outlined at a Press conference in Edinburgh last week. Mr. R. A. Maclean, chairman of the exhibition committee, said the exhibition would not be a trade fair only but a pageant of Scottish industry. The Scottish industry on show would include engineering exhibits, chemical productions, and aluminium castings.

Consumption of Zinc

Consumption of zinc (virgin, remelted and scrap) in the UK during July was 19,226 long tons, of which 13,140 tons was the virgin metal.

Lead Figures for July

Stocks of lead in the UK at the beginning of August totalled 25,820 long tons. Consumption during July was 23,455 tons, 52.3 per cent being imported virgin lead, 20.7 per cent English refined metal, and 27 per cent scrap.

Fall in Tin Consumption

Consumption of tin in the UK decreased in July as compared with June, being 1,328 long tons, against 1,519. About 44 per cent of this figure was consumed by the tinplate industry, and 31 per cent went to the manufacture of alloys. Consumption in July 1952 was 1,898 long tons. Exports are again rising.

Phthalate Prices Reduced

British Industrial Solvents announce reductions in the prices of the main 'Bisol' phthalate plasticisers with effect from 14 September. The changes, with the new prices for 5-ton lots (carriage paid UK), are as follows: Bisoflex 81 (DOP), reduced by 1d. to 2s. 10½d. per lb.; Bisoflex 791, by 2d. to 2s. 2½d. per lb.; Bisoflex 91, by 1d. to 2s. 5d. per lb.; dibutyl phthalate, by 1d. to 2s. 1½d. per lb.; di-*iso*butyl phthalate, by 1d. to 1s. 11d. per lb.; diethyl phthalate, by 4½d. to 1s. 11¾d. per lb.; dimethyl phthalate, by 3½d. to 1s. 8¾d. per lb.

Spark Did It

Escaping gas was ignited by a spark from a pick which was being used by a North Eastern Gas Board employee when he and others were digging to uncover a leaking main at Haworth recently. Shoring timbers caught fire and firemen had to be called from Keighley. The outbreak was soon extinguished and the firemen stood by until the gas was turned off and a new main laid. (This incident, although fortunately not of serious consequence, serves to emphasize the value of using non-sparking tools in hazardous situations, as advocated in THE CHEMICAL AGE on 5 September [pp. 501-503]—EDITOR.)

• OVERSEAS •

Change of Address

The Fleischmann Laboratories have moved from their previous address in Bronx County, USA, to newly-acquired premises in Connecticut. The new address is: Standard Brands Incorporated, The Fleischmann Laboratories, Betts Avenue, Stamford, Connecticut.

Bolivian Tin for USA

Bolivia is about to sign a one-year tin contract with the United States of America, according to the Bolivian Minister of Economics, Senor Sanchez. The contract, he said, would provide for a maximum purchase by the USA of 10,000 tons—about one-third of Bolivia's annual production.

Phosphatic Sulphur for India

The Indian National Chemical Laboratory at Poona has successfully completed a pilot plant for the manufacture of dicalcium phosphate from Trichinoply phosphatic nodules, employing hydrochloric acid. The large-scale preparation of dicalcium phosphate is a recent development for India and the use of indigenous raw material in this way is a contribution towards self-sufficiency.

Celanese Corporation of America

Directors of Celanese Corporation of America recently declared a dividend of 25 cents a share on the common stock, payable 25 September, 1953, to holders on record at 4 September, 1953. The board also voted regular quarterly dividends of $1.12½ on the preferred stock, series A, and $1.75 on the 7 per cent second preferred stock. Both preferred stock dividends are payable 1 October, 1953, to holders as at 4 September, 1953.

Italian Natural Gas

Consumption of natural gas in Italy during the first six months of this year totalled 36,000,000,000 cu. ft., an increase of 67 per cent over the total for the same period last year. It is estimated that the daily capacity of the Italian gas fields already under exploitation is about 423,000,000 cu. ft. The transportation of gas to industrial and domestic centres of consumption is hindered by the difficulties encountered in laying pipelines as legislation declaring them a public utility has not yet been introduced.

New American Fibre

It is reported from Avon Lake, Ohio, that the B.F. Goodrich Chemical Co. has begun production of a new synthetic fibre, 'Zetek.' Weaving, wearing and abuse tests have been completed, and output is expected to reach 5,000-10,000 lb. per month by the middle of 1954.

New Phosphoric Acid

It is reported that 99 per cent phosphoric acid in flake form is now being prepared in Vienna by the Hardig Co. The process is one developed by the Swiss company La Fonte Electrique Compagnie, and the acid may be packed in jute-covered plastic bags. No output figures are available.

West German Output Rises

The average monthly output of sulphuric acid in Western Germany in the first six months of this year was 5 per cent higher than last year, and has now reached the figure of 124,000 tons per month. The monthly average production of chlorine and caustic are also above last year's figures, being respectively 25,000 and 33,800 tons.

Oil Prospecting in India

To discuss terms for oil prospecting in the West Bengal basin, officials of the Government of India are to meet representatives of three oil companies—Burmah, Standard Vacuum and American Overseas—on 1 October. The extent of Government participation, taxation and guaranteed returns are among the issues expected to be discussed.

Petrochemicals in Israel

The Kadimah Chemical Corporation has begun to build what will be the first unit of a petrochemical industry in Israel. Foreign capital and local patents have been combined to manufacture a low-cost detergent from solar (gas oil) by a process of air oxidisation developed at the Zevah Works laboratory by Mr. Avraham Baniel, now research director of the Israel Mining Corporation. Operation on a small scale is scheduled to begin within six months, while the plant will be ready to operate at full capacity by the autumn of 1954. The new process, it is computed, will save the country $250,000 a year, now spent on raw materials for the manufacture of synthetic detergents, paint, and textile chemicals.

· PERSONAL ·

SIR GRAHAM CUNNINGHAM, chairman of Quickfit & Quartz Ltd., and chairman and managing director of the parent Triplex group of companies, has been appointed by the Minister of Labour to be a member of the Court of Inquiry into the pay dispute between the Electrical Trades Union and the employers. The Court was expected to hold its first meeting in London as this issue of THE CHEMICAL AGE was going to press.

DR. J. W. TREVAN has retired from his appointments as research director of The Wellcome Foundation and director of The Wellcome Research Laboratories, Beckenham, after more than 33 years with the company. DR. D. W. ADAMSON, formerly head of the chemical division of The Wellcome Research Laboratories, Beckenham, has been appointed research director of The Wellcome Foundation and director of The Wellcome Research Laboratories, also to the board of The Wellcome Foundation. MR. P. M. REES has also been appointed a director of The Wellcome Foundation.

MR. JAMES PEUTHERER, manager of the Niddry oilworks of Scottish Oils, Ltd., is retiring after 55 years in the industry. At a gathering recently held to mark his long service he was presented with a television set by Mr. Robert Crichton, managing director.

MR. PHILIP M. EVANS, director of the Manchester chemical firm of Norman Evans & Rais, Ltd., is to be the next chairman of the Manchester branch of the National Union of Manufacturers, which represents 500 firms in this area. He takes office at the annual meeting today (19 September) in succession to MR. C. T. HAWORTH.

PROFESSOR D. BURTON and MRS. BURTON were the chief guests at the recent annual dinner of the Society of Leather Trades' Chemists, held in the refectory of the University of Leeds where Professor Burton is head of the Department of Leather Industries. Society members had earlier presented Professor Burton with a television set and a refrigerator to mark his 30 years' service as hon. treasurer of the Society. At the dinner they presented him with a handsomely bound volume containing the signatures of more than 200 subscribers, while for Mrs. Burton there was a bouquet of flowers. MR. GEORGE FORSYTH, president, thanked the directors of the Yorkshire Dyeware and Chemical Company for their hospitality at a cocktail party before the dinner, at which the company was represented by MR. G. D. MARSHALL, managing director, and MR. L. L. BEDFORD, director.

MR. P. W. BLAYLOCK, hitherto assistant to DR. R. S. JANE, vice-president in charge of the research and development departments of Shawinigan Chemicals, Canada, has been appointed vice-president in charge of development, to direct studies of new products and processes of interest to the company and its subsidiaries and associated concerns. Dr. Jane is continuing as vice-president in charge of research.

DR. R. S. DICKS, who has been appointed manager of the Chemical Process Engineering section of the Textile Division of Celanese Corporation of America, was formerly senior process engineer for the Shell Oil Company in New York City and joined Celanese in April this year. After getting his chemical engineering degree from the University of North Carolina, he did graduate work in the same field at Virginia Polytechnic Institute and the University of Pennsylvania. He taught at the University of Pennsylvania before joining Shell in 1944. In his new capacity at Celanese, Dr. Dicks will supervise economic studies for new processes and plant improvements.

MR. JOHN B. CALKIN, chemical engineer and consultant with offices in New York City, has been named assistant to the president of Foster D. Snell, Inc., of 29 West 15th Street, New York, according to a recent announcement. He will also be director of market research. This appointment follows a long time connection with the firm. Mr. Calkin has recently been associated with the University of Maine, where he was director of the Department of Industrial Co-operation.

Law & Company News

Commercial Intelligence

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

Mortgages & Charges

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

R. D. CAMPBELL & CO., LTD. Ashford, Middx., manufacturing chemists. (M., 19/9/53.) 17 August, £800 charge, to J. R. Gilks, East Twickenham, charged on 19 Orleans Road, Twickenham.

DUX CHEMICAL SOLUTIONS CO., LTD., London, E. (M., 19/9/53.) 13 August, £7,000 charge, to Lambeth Building Society; charged on 33 Phillimore Gardens, Kensington. *Nil. 5 January, 1953.

Satisfaction

WALTERISATION CO., LTD., Croydon, rust preventing compound manufacturers. (S., 19/9/53.) 14 August, of mortgage registered 6 May, 1947.

Increase of Capital

The following increase of capital has been announced: NOSO PRODUCTS (1952), LTD., from £1,000 to £3,000.

Change of Name

The following change of name has been announced: Moore Medicinal Holdings, Ltd., to Bydand Industrial Holdings, Ltd., on 1 September, 1953.

New Registrations

Laleham Laboratories Ltd.

Private company. (522,886.) Capital £100. Manufacturing and general chemists, druggists. Subscribers: Mrs. A. L. Holden, Miss H. J. Malyon. First directors are to be appointed by the subscribers. Reg office: Timsway, Chertsey Lane, Staines, Mdx.

Chemical Services Ltd.

Private company. (14,777.) Capital £10,000. Importers, exporters and manufacturers of and dealers in general merchandise, including pharmaceuticals, chemicals. Subscribers: B. Nolan, T. Nolan.

M. B. Grabowski (Chemists) Ltd.

Private company. (522,997.) Capital £1,000. Manufacturers of and dealers in chemicals, gases, drugs, medicines. Subscribers: M. B. Grabowski, J. Winterburn. First directors are to be appointed by the subscribers. Reg. office: 187 Draycott Avenue, Chelsea, S.W.3.

Company News

Albright & Wilson Ltd.

The board of Albright & Wilson Ltd., at a recent meeting, declared an interim dividend of 5 per cent on the ordinary stock, less income tax at 9s. in the £, on account of the year ending 31 December next.

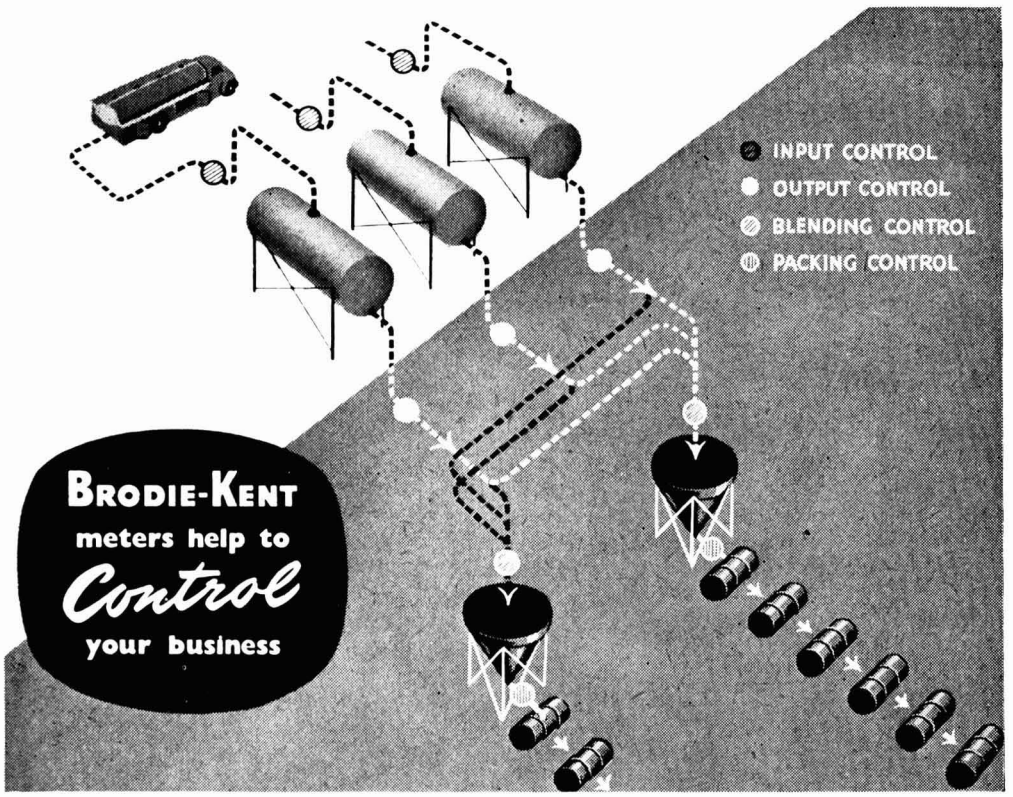
Powell Duffryn Ltd.

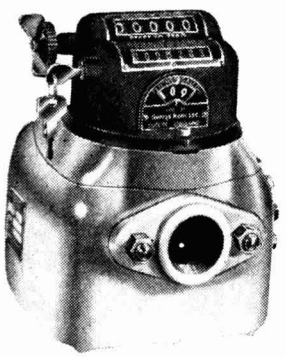
The directors of Powell Duffryn Ltd. have announced that the annual general meeting will be held on 21 October. The consolidated net profit for the year ended 31 March last is £556,883 (previous year £731,686) after crediting transfer from taxation reserves £50,000 (£51,704) and after charging depreciation £361,132 (£347,467) and taxation £920,027 (£1,253,045). The directors recommend payment of a final dividend of 5 per cent actual, less income tax at 9s. in the £, on the £9,660,471 ordinary stock in respect of the year ended 31 March (making with the interim dividend of 3 per cent actual, 8 per cent for the year). The amount at the credit of the consolidated profit and loss appropriation account to be carried forward to 1953/54 is £2,208,285 (£2,174,673).

Barton Refinery Ltd.

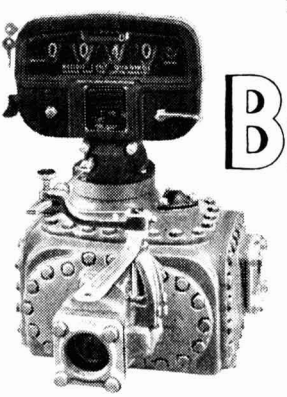
The reorganisation of the Manchester Oil Refinery Group was recently completed by the passing of a special resolution in order to change the name of the operating company, Barton Refinery Limited, to Manchester Oil Refinery Limited. This change will not affect any contracts made with Barton Refinery Limited, but all future correspondence and invoices should be addressed to the company under its new

continued on page 620





Brodie-Kent X-31 Meter with 'G' series counter. Maximum rate of flow 25 g.p.m.



Brodie-Kent X-77 Meter with Brodimatic Quantrol. Maximum rate of flow 85 g.p.m.

ALMOST every business concerned with the storage, processing or transport of liquid or fluid substances is confronted with problems of stocktaking, quantity-controlling, safe handling and loss prevention.

Whatever the products — chemicals, solvents, essential oils, petroleum spirit, fuel oils, jellies, greases, bitumens — when Brodie-Kent Meters control handling operations you know exactly how you stand. Fully automatic, fast, foolproof, Brodie-Kent Meters give a precise running record of inflow or outflow on both gravity and pump systems. Operating on the positive displacement principle, they employ calibrated twin pistons and are fitted with easily-read counters.

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name. The selling company, Manchester Oil Refinery (Sales) Limited, is unaffected by the change.

Murex Ltd.

A decline in group trading profits from £1,802,192 to £889,825 for the year ended 30 April last is reported by Murex Limited, metallurgists, refiners, etc. Net profit, after all usual charges, including tax, dropped from £659,649 to £393,590. The world price of wolfram fell substantially and selling prices of the company's tungsten products were reduced accordingly. A loss of about £250,000 was incurred on the turnover of stocks on falling markets. Taking that loss into consideration, together with the £500,000 profit arising from stock appreciation the previous year, the directors point out, it follows that about £750,000 of the total decrease in the profits of the year arose fortuitously from the rise and fall in market prices of certain raw materials. Apart from this, the normal trading profits declined by about 12½ per cent compared with the previous year.

Next Week's Events

MONDAY 21 SEPTEMBER

Institute of Metal Finishing

London: Northampton Polytechnic, St. John Street, E.C.1, 6 p.m. Dr. J. Edwards: 'The B.N.F. Jet Test on Organic Bright Nickel Deposits.'

Incorporated Plant Engineers

Liverpool: Radiant House, Bold Street, 7.15 p.m. Merseyside & North Wales branch. P. I. Gay: 'Paint in Industry.'

TUESDAY 22 SEPTEMBER

Society of Chemical Industry

London: Burlington House, Piccadilly, W.1, 6.30 p.m. Plastics & Polymer Group. Professor C. E. H. Bawn (Liverpool University): 'The Viscosity of Polymer Solutions.'

THURSDAY 24 SEPTEMBER

Incorporated Plant Engineers

Sheffield: Grand Hotel 7.30 p.m. Sheffield & District branch. H.M. Factory Inspector: 'Electrical Factory Regulations.'

FRIDAY 25 SEPTEMBER

Society of Public Analysts

Preston: Station, 1.45 p.m. Joint visit of North of England Section and Microchemistry Group with North-Western Section, Royal Institute of Chemistry, to Simpson's Gold Thread Works.

Institute of Metal Finishing

Sheffield: Grand Hotel (Fitzwilliam Room), 6.30 p.m. Sheffield & North-East branch meeting. Dr. J. W. Cuthbertson: 'Alloy Plating: The Problem and its Solution.'

SATURDAY 26 SEPTEMBER

Society of Public Analysts

Standish, nr. Wigan: 10 a.m. Visit of North of England Section & Microchemistry Group to Victoria Colliery, Chorley Road, Boar's Head. (Travel by motor-coach from 40 Nevill Street, Southport, 9 a.m.) Further visit to Southport Gas Works (travel by bus from Lord Street to Russell Street). Meeting at Southport Town Hall, 2.30 p.m. Dr. Cecil L. Wilson, Gerald Ingram and Rudolph Rothwell: 'Symposium on the Training and Education of Microchemists.'

Market Reports

LONDON.—A steady call against contracts and a fair volume of new business for the home market has been reported for industrial chemicals. The export demand remains reasonably good with rather more inquiry than of late. Prices generally are steady. The coal tar products market is again without feature, but some improvement in the demand for pitch is looked for and the call for creosote oil and carbolic acid continues active. With effect from 15 September, the basic price of dry red lead and litharge has been reduced to £123 per ton and that of dry white lead to £141 per ton.

MANCHESTER.—A steady demand continues to be reported on the Manchester chemical market from the cotton, woollen and rayon textile industries, and fresh inquiries from these outlets, as well as from most other branches of industry, have been on a fair scale during the past week. Export bookings also are fairly active. Prices throughout are well held. A moderate weight of new business has been reported in the fertiliser section, with basic slag still about the busiest. Most of the light tar products are going steadily into consumption.

GLASGOW.—Very little change to report in general trading conditions during the past week. The volume of business has, if anything, increased and the drop in the price of a fairly wide range of plasticisers and basic metal derivatives is welcomed.

CLASSIFIED ADVERTISEMENTS

BUSINESS OPPORTUNITY

AN EXCEPTIONAL OPPORTUNITY. For disposal, through ill-health, the whole of the issued share capital in young company recently making highest class English graded hardwood charcoal. There are no debentures or charges on the company, but nearly £3,000 trading losses are available for taxation purposes. Large stocks of wood are assured and complete plant includes several steel kilns, large grader, etc. **BOX NO. C.A. 3257, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

SITUATIONS VACANT

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

A VACANCY arises for a young **CHEMICAL ENGINEER** whose educational standard is equivalent to A.M.I.Chem.E. A person with a little industrial experience would be preferred, but this is not essential. The work will be of an extremely varied nature under qualified chemical engineers and will be invaluable experience to the successful candidate. Reply in confidence to **BOX No. C.A. 3259, THE CHEMICAL AGE, 154, FLEET STREET LONDON, E.C.4.**

CHEMICAL ENGINEERS, capable of leading development teams, required for vital and interesting new process. Reply to **BOX No. C.A. 3258, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**, when application form will be sent.

DRAUGHTSMEN—Excellent opportunity with leading Chemical Company in **CUMBERLAND** for Draughtsmen experienced in Chemical Engineering and Solid Material Handling. Housing facilities may be available to suitable candidates. Please state educational background, experience, age and salary expected, in your reply, which will be treated in confidence. **BOX NO. C.A. 3261, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

LABORATORY. Male required for Physical Testing and Development work on rubber and allied materials by important manufacturing company in the Manchester area. Applications are particularly invited from persons studying for or having attained B.Sc. or A.I.R.I. standard, who can progress with the development of the industry and the company. Five-day week. Bonus and Pension Schemes. Present staff aware of vacancy. State age, qualifications and salary required to **BOX No. C.A. 3262, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

WANTED, YOUNG CHEMICAL ENGINEERS OR APPLIED CHEMISTS for design and technical sales staff. Degree or A.M.I.Chem.E. essential. Industrial experience an advantage. Commencing salary according to age and qualifications. Contributory Pension Scheme. Reply in writing to **TECHNICAL DIRECTOR, POWELL DUFFRYN CARBON PRODUCTS, LTD., SPRINGFIELD ROAD, HAYES, MIDDLESEX.**

SITUATIONS VACANT

YOUNG GRADUATE CHEMIST required for a position as **ASSISTANT TO WORKS CHEMIST** with **THE ENGLISH ELECTRIC VALVE CO.,** Chelmsford. Candidates should have had previous experience or be interested in problems of cathode coatings. Please apply to **DEPT. C.P.S., 336/7, STRAND, W.C.2,** quoting Ref. No. 328.

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

ECONOMIC BOILERS—9 ft. diam. by 12 ft. 6 in Foster Yates, 200 lb. w.p.; 8 ft. diam. by 14 ft. Paxman, 180 lb. w.p. Twenty others, all sizes.
TWO Whessoe Open Top Riveted Steel **MIXING TANKS,** 13 ft. 9 in. diam., 15 ft. deep, 9/16 in. plate.
NEW GALVANISED PIPING. Immediate delivery. Johnson Filter **PRESSES,** 25 in., 18 Frame, practically new.
TWO 35 ft. long by 9 ft. diam. Lead-lined **TANKS.**
ONE Stainless **CONICAL HOPPER,** 7 ft. 3 in. diam., overall depth, 7 ft. 6 in.
TWO Broadbent **WATER-DRIVEN CENTRIFUGES,** 30 in. diam., 12 in. deep, 1,150 r.p.m., 150 lb. pressure.
SIX **O.T. TANKS,** 7 ft. diam., 14 ft. deep, rubber and brick lined.
Six Aluminium **CONDENSERS,** 14 ft. long by 2 ft. 6 in. diam. 386 Tubes, ⅞ in. o.d
FORTY Riveted **RECEIVERS,** 8 ft. 6 in. long, 5 ft. 9 in. diam., 76 lb. w.p.
CAST-IRON PIPES, 5000 ft. Each 6 in. and 8 in. **NEW VALVES** in Stainless, Gunmetal, Enamel Lined.
Free Catalogue. "Watkins Machinery Record," available

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12 BOUND Copies of the **TRANSACTIONS OF THE AMERICAN INSTITUTE OF CHEMICAL ENGINEERS,** 1935—1946 inclusive. What Offers? **BOX No. C.A. 3251, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

REGULAR supply of **CAESIUM** concentrates (pollucite) available. Write **BOX NO. C.A. 3250, THE CHEMICAL AGE 154, FLEET STREET, LONDON, E.C.4.**

SELWOOD FOR TANKS

1—1,500 gall. enamel lined **STORAGE TANK** ex milk storage. Cork insulated motor driven agitator fitted. Mounted on adjustable legs.
1—800 gall. ditto.
Full details of these and other **TANKS** on application to:

WILLIAM R. SELWOOD LTD.,
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BOILING PAN, C.I., jacketed, 150 galls.

BOILING PAN, 30 galls., copper with C.I. jacket, arranged for hand tilting.

STORAGE BINS in stainless steel cylindrical with covers, 40/20/14/10 galls. capacity.

Cannon Steam jacketed enamel lined **PANS,** 10 and 25 galls. All new and unused.

Doulton 25 gall. **COPPERS** with lids. New and unused.

Several new and unused double trough type steam jacketed **MIXERS,** Fitted twin contra-rotating Z blades. Arranged for hand tilting and suitable wet or dry mixing. Capacity 25 galls.

C. BARBER LTD.
SILVERDALE GARDENS
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Telephone—Hayes 2735/6

ROTATING PAN MIXER by **ARTOFEX.** Two **PANS,** 47 in. diam. by 22 in. deep; 2-sack capacity. Human arm type blades. Fast and loose pulley drive. £100 ex-works.

One Ditto by **T. COLLINS, BRISTOL.** Two **PANS,** 47 in. diam. by 24 in. deep; 2-sack capacity, with automatic feed. Chain drive to 5 h.p. motor. £85 ex-works.

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MIXERS

TROUGH MIXER by **CHALMERS,** 3 cwt. Stainless Steel Tilting Trough, motorised.

TWO TROUGH MIXERS by **GARDNER,** 3 cwt. Stainless Steel-lined Troughs; one motorised, one fast and loose pulley.

ONE WEIRNER PFLEIDLER Jacketed Trough Mixer. Tilting trough. Double " Z "-blades. 100 gallon. Double end drive.

" MORWARD " " U "-shaped TROUGH MIXERS in any size up to 3 tons.

Horizontal or Vertical **MIXERS,** jacketed or unjacketed made to requirements in stainless or mild steel.

JACKETED PANS

Selection available—40-500 gallons, with or without mixing gear.

HYDRO EXTRACTORS

36 in., 42 in., 60 in. and 72 in., by **BROADBENT,** and 42 in. by **WATSON LAIDLAW,** all electric, complete with starters.

PUMPS

A selection of **MONO** and other Pumps in stock, 2 in. to 6 in.—new and second-hand.

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STEAM-JACKETED MIXING PAN, 42 in. diam. by 45 in. deep. Square agitator shaft with cross-gear drive, made from ⅜ in. plate, 2 in. outlet.

Two Steam-jacketed **BOILING PANS,** each 42 in. diam. by 45 in. deep, 1¼ in. outlet, steel.

Steam-jacketed **" WERNER "** type twin Z-arm **MIXER,** tipping pan 20 in. by 20 in. by 17 in.

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FOR SALE

3 JACKETED INCORPORATORS, double " Z " arms, double geared, power-driven tipping motion, with counterbalancing weights.

3—Baker Perkins and Werner Jacketed **MIXERS,** screw tipping pattern, friction pulley drive, single geared, with double-fin type agitators.

4—Gardner **RAPID SIFTER MIXERS** and **MIXERS** only, various sizes, one with brass fitted interior and glass-lined end plates.

27—Various **POWDER DRESSING** or **SIFTING MACHINES,** totally enclosed, with barrels from 80 in. long by 22 in. diam. to 120 in. long by 30 in. diam., belt driven with collecting worm in hopper bottoms.

4—Recessed Plate **FILTER PRESSES,** 30 in. square 70 plates in each, centre fed.

2—Johnson **FILTER PRESSES,** 24 in. square, side feed and enclosed delivery, fitted 29 plates and 30 frames.

1—Johnson **FILTER PRESS,** 36 in. square, plate and frame type, double inlet and enclosed delivery ports.

Johnson Oil **FILTER PRESS,** Premier type, plates 2 ft. 8 in. by 2 ft. 8 in., of which there are 45, with angle lever closing gear.

1—Johnson **FILTER PRESS,** 42 cast-iron plates, 32 in. square, centre feed.

Steam-heated **FILTER PRESS,** Premier type, 32 in. square, with 30 recessed plates

1—Johnson **FILTER PRESS,** 46 plates, 32 in. square, centre feed, bottom corner open delivery

Wood **FILTER PRESS,** fitted 69 ribbed plates, 2 ft. 8 in. square, with top centre feed and bottom enclosed delivery channel.

1—24 in. and 1—30 in. **HYDRO EXTRACTOR,** self-balancing, swan-neck type, self-emptying bottom, belt driven.

1—30 in. and 2—36 in. Ditto with enclosed motors, 400 volts, 3-phase, 50 cycles.

Heavy Cake **CRUSHING MILL,** 2-pair high, by Nicholson, for cake up to 3 in. thick, rolls 30 in. long, top with coarse teeth 9 in. diam., bottom, with finer teeth 12 in. diam..

5—sets A.A. **CRUSHING ROLLS** for linseed, cottonseed, etc., 48 in. long, belt driven, with feed hopper, side frames, baseplate and striking gear.

Bennett Copper-built **EVAPORATOR,** 4 ft. diam. by 4 ft. 6 in. high, steam-jacketed bottom, mounted on legs, with swan-neck vapour pipe and separate vertical belt-driven vacuum pump.

" U "-shaped Horizontal **MIXER,** 7 ft. long, 3 ft. wide, 3 ft. 3 in. deep, belt and gear driven, end outlet, square horizontal centre shaft with cast radial type mixing arms, last used for linoleum paste.

3—5-roll **REFINERS,** fitted chilled iron, water-cooled rolls, 40 in. long, 16 in. diam., belt and gear driven with clutch drive suitable for motor, by Baker Perkins, Ltd.

7 ft. Torrance Positive-driven **EDGE RUNNER,** 2 vertical Paint Pug Mills, 2-bar Disc Paint Grinding Mills, and 2 Horizontal 40-gallon capacity Cox Pug Mills for paint.

1—No. 1A Water-cooled **CIRCULATOR MILL.**

1—4½ Christy & Norris **DISINTEGRATOR** with 60 h.p. A.C. motor and starter.

4—excellent **VACUUM OVENS** complete with Vacuum Pumps, trays and all belongings.

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9—Worsam **ROTARY PRESSES.**

2—Manesty **GRANULATORS.**

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24 in. by 24 in. heavy swing **BEATER PULVERISER** by Christy & Morris. C.I. constr. with steel iron alloy liners. Rotor fitted 6 sets of 9 beaters driven by 9 in. diam. pulley.

4 'Pulmac' **GRINDERS** by Int'l. Pulverisers Ltd. Size P4. Stator & Rotor rasped Grinding Discs 27 in. diam. Side feed admits material which is driven by centrifugal force into Mill.

Pascall **PIN DISC MILL,** type No. 1 motorised 400/3/50. Conical feed hopper approx. 24 in. diam. Permanent magnet of chute type. Discharge chamber enamel lined with bagging outlet 5¾ in. diam.

Vert. **CONE MILL** by Huxham & Brown, 34 in. diam. by 18 in. deep. Fluted grinding cone with renewable wearing plates. Fluted grinding chamber with bagging attachment. Underdriven through bevel gearing f. and l. pulley.

Micro-twin **REFINING MILL** by Torrance with steel Rolls 9 in. by 6 in. diam., and 9 in. by 4½ in. diam. F. and l. pulley drive.

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TWO M.S. HIGH PRESSURE AUTOCLAVES 4 ft. I.D. by 18 ft. 6 in. long over domed ends. Riveted construction, fabricated from 1⅛ in. thick plate, 625 lb. per sq. in. working pressure.

M.S. HORIZONTAL "U" TROUGH MIXER 3 ft. by 1 ft. 9 in. at top by 2 ft. deep at centre. Fin type agitating gear belt driven through helical gearing from f. and l. pulleys. Arranged for hand tilting.

WERNER TYPE MIXER having G.M. trough 13 in. by 12 in. by 12 in. and double "Z" G.M. agitators belt driven through spur gearing from f. and l. pulleys. Hand tilting.

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STEAM JACKETED COPPER BOILING PANS, 30 galls. capacity. Arranged for hand tilting. Jacket working pressure 40 lb. p.s.i.

STEAM JACKETED COPPER BOILING and **EVAPORATING PANS,** 50 and 100 galls. capacity. Open top. Jacket working pressure 40 lb. per sq. in.

KESTNER HORIZONTAL TUBULAR EVAPORATOR, having six turns 1½ in. bore copper tube, complete with copper reception pot.

TWIN PORCELAIN PEBBLE MILL, 12 in. by 12 in. Belt driven.

Belt driven **DISINTEGRATORS** by **HARRISON CARTER.** Size 00 and 2½.

STEAM JACKETED M.S. VACUUM DRYING OVEN, 3 ft. I.D. by 7 ft. long internally fitted 5-bank steam heating coil supporting 15 aluminium trays in five tiers of three. Rear end dished ; domed door secured by eight swivel clamps. Jacket and coil working pressure 20 lb. per sq. in.

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CONTINUOUS CONVEYOR-type HARDENING FURNACE, suitable 1100° C., with 12 in. conveyor. **BOX NO. C.A. 3256, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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