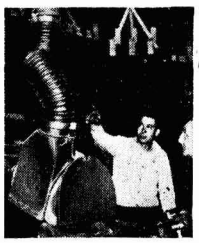
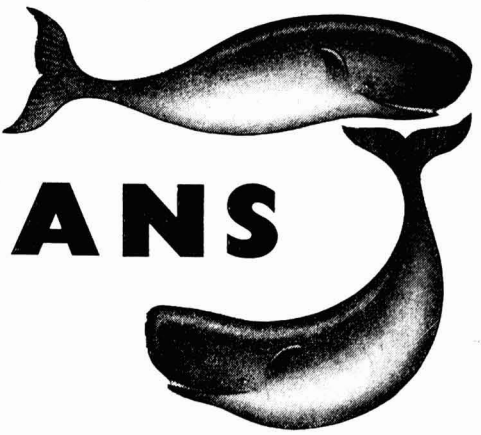
THE Chemical Age

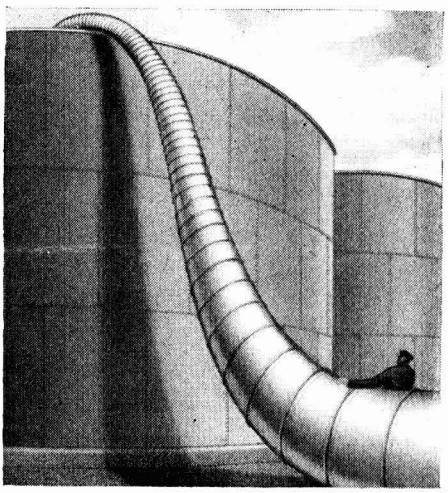
VOL. LXXIV 10 MARCH 1956 No. 1913



TIDDLERS



or TITANS



SPIRATUBE

A simple machine-shop installation or a giant job of fume extraction—industry today is specifying SPIRATUBE the light, tough, flexible ducting with a wide choice of diameters, from 3″ to 30″—and in a variety of coverings.

SPIRATUBE is easily and quickly installed by your own maintenance staff—no structural alterations—no heavy hangers—no special elbows. SPIRATUBE is economical too, because it can be dismantled and used again and again. It is so light and retractable that one man can carry many feet with ease.

Write today for the SPIRATUBE Brochure which illustrates what this versatile ducting will do. Put your problem up to our design engineers. They will be glad to advise you without cost or obligation. The address is Flexible Ducting Limited, Maryhill, Glasgow.

FLEXIBLE DUCTING LIMITED, MARYHILL, GLASGOW, N.W,
Telephone: MARyhill 3729 Telegrams: Flexiduct,Glasgow, N.W.

AN ASSOCIATE COMPANY OF GEORGE MACLELLAN & CO. LTD. ***Established 1870***

Volume LXXIV
Number 1913

The Chemical Age

Established 1919

The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE · 154 FLEET STREET · LONDON EC4

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

CONTENTS . 10 MARCH 1956

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

Director : N. B. Livingstone Wallace

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

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

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

SINGLE COPY 1/3 (BY POST 1/6) ANNUAL SUBSCRIPTION 52/6

Triumph of the 'Techs'

THE new White Paper on 'Technical Education' is, or should be, a milestone in British progress. It gives at long last the recognition and support that our best technical colleges have deserved for a very long time. It says clearly and firmly that the part-time student of scientific subjects must face a minimum of discouragements. It serves notice that educational distinctions between 'sciences' and 'technologies' must be discarded. Much more can be found in the White Paper than this, for it is an excellent survey of Britain's technical training resources and needs—but the plum in the pudding is the great emphasis placed upon the 'Techs'. Modern conditions and urgencies have compelled the arrival of the glass slipper.

Twenty-four Colleges in England and Wales are named for speedy development. They have since 1952 been receiving a special 75 per cent grant for advanced projects, but the Government 'now wish to see the proportion of advanced work at these colleges vigorously increased . . .' Among these centres, invidious though it may be to select names, are the Battersea, Chelsea, and Woolwich Polytechnics, the Technical Colleges of Bradford, Brighton, Huddersfield, Sunderland, and Glamorgan. Other centres not listed in the White Paper may be brought into the '75 per cent grant scheme', and, though this is implied rather than stated, may eventually be selected, like these others, for special expansion. No glamorous but dubious wand of words and lip-service is being waved by the Government. Indeed, this new White Paper is almost unusual, for it does not confine itself to the statement of desirable objectives—it deals with means as well as ends. The difficult plight of the youthful student who must earn while he learns is catered for—'the Government propose in future to allow ordinary State Scholarships to be held not only for honours courses at universities, but also for courses leading to a Technological Award'—and the number of Technical State Scholarships, already available for outstanding 'learning-while-earning' students will be increased. The present and unsatisfactory monopoly of the London external degree as the only high level and national qualification for the best students of the 'Techs' is to be ended. This is not perhaps a new factor in the situation; the creation of new Technological Awards has already been set in motion by the formation of a National Council for that purpose. No doubt this fresh emphasis will fortify the Council's determination and hasten their deliberations. Here, then, are two major encouragements for the raw material of technical education—more scholarships including State scholarships, and the certainty of an ultimate award that has degree-equivalence but which is not decided remotely or within inappropriate limitations.

But none of this progress can be possible if the existing centres rapidly burst at their seams. The Government's programme for expanding the facilities of technical education is bolder and more forthright than many enthusiasts can have hoped. The present £9,000,000 building programme has virtually been discarded. Instead, 'the general intention is to start

£70,000,000 worth of work within a period of five years, i.e., over the years 1956-57 to 1960-61 inclusive. These projects are estimated to require the expenditure of a further £15,000,000 for equipment. This at a time of economic caution and investment cutting can hardly be called parsimonious. It is for any government in any country a most commendable piece of courage. We are reminded of the contrast of an earlier post-war economic crisis when a universal policy of curtailment was applied to DSIR research costs and educational building projects. The present Government has been frequently attacked for indecision and deficiencies of firmness, but in this field, whose importance is readily appreciated only by sections of the public, the decision and firmness displayed deserves far more praise than is likely to be given.

Not even vigorous building plans and newly encouraged streams of students will add to our resources of technical manpower if the supply of teachers proves inadequate. This is recognized in the White Paper, but there seems to be little fear that expansion will be bottle-necked for this cause. At present there are 40,000 part-time and 9,000 full time teachers in our technical colleges. Of the part-time 40,000, just under 1 in 4 are school-teachers and the rest are suitably qualified or experienced visitors from industry and commerce. It is admitted that many more teachers will be required. The fact that the supply of full-time teachers has recently been 'growing at the very satisfactory rate of 700 to 800 a year' is perhaps over-optimistically presented. For posts on technical college staffs authorities have 'a substantial measure of discretions over salaries' and it is apparently expected that through this they will be able to obtain a 'reasonable share' of the available technical manpower for teaching. In addition, it is *hoped* (our italics) that industry will be ready to release more of its employees for day-time teaching in technical college courses. This vital problem certainly seems to be dealt with somewhat vaguely in the White Paper, and it is difficult not to suspect that wishful thinking rather than constructive thinking has been applied. The total supply of science teachers is deplorably inadequate; if the expanded colleges attract more, schools will get less; and there is no difference between the technical college and the science faculty of a university in this one respect, the quality of student raw material they must both receive depends upon previous school education. That slightly less than a single page of this 42-paged White Paper has been devoted to this topic is surely strange! Possibly it was regarded as an over-sensitive topic? But problems that can be presented and considered in numerical terms are not solved by evading them for political reasons. It is with regret that we feel obliged to make these critical remarks about a single section in an otherwise praiseworthy document.

Less is said about technician training than about the education of technologists. Yet 'as many as five or six technicians may be required to every technologist.' Here, however, the traditional method of training is apprenticeship, and formal technical education is an adjunct to it. The extent to which industry releases young employees for external courses is considered, and data given show that in England and Wales 27 per cent of the under-18 pay-roll of industry and commerce is allowed some time off in working-hours for approved courses. Also, almost as many over-18 workers are similarly released. The Government's aim is to see that this total figure is doubled, and the Government 'will be ready to do its share' in providing facilities to match any rise in numbers. The determination here is obviously clear-cut, and if the White Paper is to be taken with literal truth (and there is no reason to do less), the main problem of encouraging an increased production of technicians is passed to industry. The practice of withdrawing the privilege of daytime release when the age of 18 is reached, sometimes even in the middle of an educational year, is rightly criticized. Whether this is enough to produce the ever-rising number of technicians we need remains to be revealed, but the policy in the White Paper will not be unacceptable to most thinking people—for this is a task in which industry must make the larger contribution.

Notes & Comments

Invitation Piece

HAVING frequently called for more publicity work by the British chemical industry, we must salute the good example when it arrives. A few weeks ago (see THE CHEMICAL AGE, 1955, **74,** 429) we awarded an unofficial 'Oscar' to a chemical company's product-informative booklet; this week the ABCM's 'Chemical Industry Calling You' justifies as much attention. It is not as voluminous as general industrial publicity publications tend to be, a 25-page booklet. But this tidy space is amply adequate, for the text sticks simply and straightforwardly to its theme, and the fault of much 'trade association' literature—the kind of pomp and circumstance that ruder people call 'blah'—is firmly avoided. Whether the writing was entrusted to one person or to several is not known, but much praise is due to 'anonymous' in person or *in toto*. The theme is recruitment, the industry's career potentiality. It would be easy to regard this booklet as yet one more symptom of the current malaise of overfull employment, but there is certainly more to it than that. Wisely the text has not attempted to understudy the employment exchange or situations-vacant columns, and it is the life rather than the job that chemical industry can offer youth that is described. And this it does without any nonsense. It is one answer—the chemical industry's offering—to the eternal question of generations, 'What shall I do when I leave school?'

Case-Histories

FIRST-CLASS journalism has been utilized in the case-history method of treatment. After a concise introduction, we read about 'John Simpson, B.Sc.' (who learned while he earned, after ending his school hopes with a failed inter-B.Sc.), a pair of identical twins who both took university degrees and then reached the same types of post by very different post-graduate routes, a chemist as an export-salesman-cum-technical-adviser (perhaps a tiny amount of 'blah' here in the entitlement of the man as 'technical adviser to a chemical firm's sales representative', for what he is described as doing is selling, no less and no more); and there are two case-histories of non-technical or at any rate non-chemical careers, McKay, an accountant, and Miss Jones, an assistant personnel manager. The case of 'John Simpson, B.Sc.' is by far the most important, and by topical coincidence the conditions of his career are also much discussed in the White Paper on 'Technical Education' (see this week's leader). There are two major sentences in this chapter of the booklet. 'And work he did. Let there be no mistake about that.' In 1956 it is courageous to back this kind of appeal to youth—the appeal of challenge. But it is much more likely to be useful than appeals to glamour.

No Window-Dressing

THIS publication will succeed in its objectives. Whether it can attract a sufficient number of young people into the industry or into educational efforts for ultimate careers in the industry must be settled by other influences as well. The merit of this booklet is that it will attract the right quality. It has not window-dressed a story that in fact needs no artificiality.

Piping Cold

AGAIN reverting to one of our recent comments (also see THE CHEMICAL AGE, 1955, **74,** 429), the arctic attacks of February upon our persons and household plumbing led us into a plea for plastics pipes. In advocating this we have certainly not been alone, and in a variety of newspapers the pros and cons of polythene piping have been debated. A letter from the Royal Society of Health drew attention to risks associated with both copper and polythene piping; for the former, a risk of metallic contamination by corrosion—for the latter, a risk of permeation by coal gas. As to copper, we see no particular reason to rush to its defence; it

may offer certain advantages as a pipeline material, but so far as durability under 'freeze-thaw' conditions is concerned, it has many disadvantages; it seems to develop splits. The query about polythene piping seems to be confined to its use underground, an important point of distinction which was not made at all clear in the expression of opinion from the RSH. However, the Metropolitan Water Board, for a long time a fence-sitter on this subject, has apparently been impelled by February's hard facts to approve the use of polythene piping for above-ground cold-water services. In this the Metropolitan Water Board is following the policy of several other authorities in this country. For polythene and plumbers the decision is one of major significance.

No Risk

ACCORDING to the British Plastics Federation, there is no risk of gas permeation with underground polythene pipework if the pipes are laid 'with the correct degree of separation from other mains supplies', and 'even if there were a burst gas main lying right alongside the polythene tubing in which water has been standing for some time, there is no evidence that there would be any effect on public health. The degree of permeation of gas would be infinitesimal and no bacteria can penetrate this type of piping at all.'

Great Demand

HOWEVER, for the time being we doubt if the technical battle for underground cold-water piping and polythene matters appreciably. By far the biggest risk of freeze-bursting of water-pipes is associated with the exposed above-ground positions. If polythene piping is heavily substituted for metal piping in the next few years in these positions only, the demand seems likely to place all the pressure that production could stand. The question of using polythene below the surface for cold water carrying can be deferred. A fact stated by the British Plastics Federation is worth quoting as a tail-piece. There are some 5,000 miles of polythene cold-water piping already in use here, and in the 1956 cold spell no reports of bursts were received 'even in the most affected areas'.

IN THE EDITOR'S POST

Fluoridization of Water

SIR,—In common with many other scientists I am always somewhat behind with my technical literature, and so that must be my excuse for commenting on your issue of 4 February now (p. 333).

I am utterly opposed to the addition of fluorine to drinking water, also to iodine in salt, vitamins in margarine, calcium in bread etc.; but in spite of this I am still an enthusiastic chemist. The reasons for my objections are not the oft published ones: I am quite willing to believe my fellow scientists when they tell me that these additives are 'good for me', what I resent is being made to have them whether I will or no. Fluorine is good for my teeth, right! But I am the one to decide whether or not my teeth shall have good done to them.

This compulsory fluoridization of water is just another example of the ever encroaching bureaucratic interference in our private lives, and if the administration of preventative medicine is not private, then I don't know what is!

I submit, sir, that a responsible scientific journal, such as yours, should confine itself to reporting the facts, i.e. fluorine is good for the teeth, and leave the question of administration to be discussed in other spheres.

Yours truly,

P. W. G. RAYNER.

Luton, Beds.

DR. F. H. BANFIELD, M.Sc., Ph.D., F.R.I.C., director of research, British Food Manufacturing Industries Research Association, has been appointed a member of the committee of management of the Low Temperature Research Station at Cambridge University. The appointment, which is on the nomination of the committee of the Privy Council for Scientific and Industrial Research, is until 31 December, 1959. It follows the recently-announced close participation of the BFMIRA in the Government's research programme at the Station into the preservation of food through the use of ionizing radiations. Two members of the Association's staff have been seconded to the work.

High Density Polythene

New ICI Product Has Exciting Properties

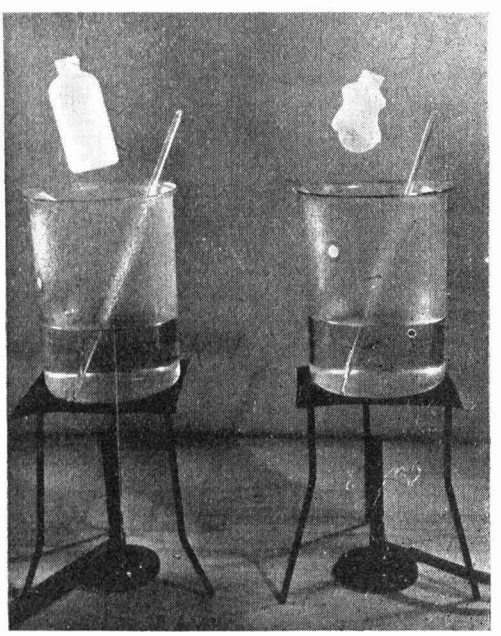
THE discoverers of polythene, Imperial Chemical Industries Limited, have done it again! Just when many people were beginning to think that they were lagging behind in the polythene field they come out with a new announcement; just when many firms decide to put their faith in the new low-pressure processes ICI turns up with a modification of their high-pressure process which will produce a high-density, stiff polythene which can be sterilized. (cf. THE CHEMICAL AGE, 1955, **73**, 1149). Although they have not entirely dropped work on the low-pressure product the firm have complete confidence in their high-pressure process (which is operated under licence in practically every country in the world) and are going ahead with long-term expansion plans. With the product which can be made by means of modifications to their time-proven process they are firmly convinced that the market for polythene will greatly expand.

Although ICI's new high-density polythene has many advantages over normal low-density polythene it has not yet been able to produce a product equivalent to the low-pressure polythene being made by Ziegler or Phillips licence holders. A spokesman for ICI on Friday last stated that the two products were supplementary rather than competitive at the moment. It was likely, however, that products with improved properties would be developed as work continued and that the two ranges might some day overlap. If this became the case the determining factor might well be that of price and he was confident that ICI's high-pressure, high-density polythene would have the advantage.

Discovered less than a year ago the new polythene (to be known as Alkathene HD) can be processed in the same way as normal low-density or flexible polythene. Articles injection-moulded or extruded from Alkathene HD can be treated without distortion for 15 minutes at 110°C, as the Vicat softening point of the new product is 116°C compared with 83°C for normal polythene. The rigidity of Alkathene HD moulded objects is one and a half times as great as those made with the older product. Alkathene HD is less permeable than normal polythene to most vapours and gases, e.g., for hydrogen the figures are Alkathene HD 0.2×10^{-9} (ccs./cm./cm.^{2}/cm.Hg/sec.) compared with 0.9×10^{-9}.

During 1956 one to two hundred tons of Alkathene HD will be available, mainly for trial purposes at home and overseas and once other polythene manufacturers become acquainted with its properties it is expected that they will take out manufacturing rights. In this country ICI intend to establish commercial manufacture on a progressively increasing scale, although it may not be possible to meet all demands for some time, particularly in face of the constantly increasing demands for the conventional product.

Initially, the price of Alkathene HD will be 4s per pound independent of quality. This is only a few pence per pound more than the current price of Alkathene 20 (ICI's normal polythene). Compounds with carbon black or anti-oxidant, or both, will be made available at increased prices.



Polythene mouldings after boiling in ethylene glycol at 110°C. Left: Alkathene HD, right: Alkathene 20

Amongst the many advantages which the high density product has over the normal polythene is that it can be sterilized at temperatures of 110°C without distortion. Mouldings will have an improved finish and will be stiffer and there is the possibility that there will be a saving in raw material through reduction in wall thickness. Alkathene HD pipes will have higher working pressures and greater heat resistance. Film will be less permeable to water vapour and gases and more resistant to oils and fats. The colour possibilities are the same.

Compared with low pressure polythene the advantages are said to be that there is no risk of a catalyst residue to spoil moulding properties and no danger of oxidized particles in the finished article. Furthermore, Alkathene HD can be produced on the existing plants of those firms already using the ICI polythene process.

Typical properties of Alkathene HD are compared with those of standard polythene (Alkathene 20) in the following table:—

Property	Alkathene HD	Alkathene 20
Melt flow Index (Grade Number)	0.7	20
Density	0.940 grams/cc.	0.92 grams/cc.
Ultimate Tensile Strength		
Straining Rate 6″/min.	2,580 p.s.i.	1,600 p.s.i.
,, ,, 12″/min.	2,750 p.s.i.	1,580 p.s.i.
,, ,, 18″/min.	2,900 p.s.i.	1,500 p.s.i.
,, ,, 30″/min.	3,200 p.s.i.	1,400 p.s.i.
Elongation at Break		
6″/min.	380%	450%
12″/min.	300%	490%
18″/min.	200%	490%
30″ min.	180%	500%
Vicat Softening Point	116 C	83 C
Stiffness Modulus at 20 C	5×10^4 p.s.i.	2.6×10^4 p.s.i.
Environment Stress Cracking Test (ICI test using Lissapol N)	1.75 hours	0.25 hours
Low Temperature Brittle Point	below—70 C	—30 C

Pure Water

The Advantages of Ion-Exchange

THE inefficiency and expense of distillation for providing pure water was emphasized on Monday 5 March by Mr. W. F. Lorch of Elga Products Ltd. in the course of an informal talk and demonstration entitled 'Will Ion-Exchange Replace the Laboratory Still?' The talk took place at Kings College, London, by courtesy of the secretary of the Institute of Science Technology.

There were three methods available for the purification of water by ion-exchange resins said Mr. Lorch, the batch method, the two or multi-column method and the single column mixed bed method.

The batch method was the simplest and consisted simply of shaking the water with a suitable resin for a short time. Its practical use was limited to small laboratories where small quantities of pure water were required from time to time.

The multi-column method was of greater practical value but suffered from the disadvantage that about 40 per cent of the water produced had to be reserved for rinsing during regeneration of the resins. It appeared to be Mr. Lorch's view that the mixed bed single column plant was the most suitable for general use.

The criticism that this method is only suitable for the large user has been answered by Elga Products who have produced a mixed bed deionizer which is about the same size as a laboratory balance. A demonstration of this apparatus was given and it was shown to produce water of greater purity than triple pass distilled water. The cost varies with the district but is in all cases very much less than that for distilled water. No regeneration is necessary with this small apparatus as the column is replaced by the makers when exhausted.

It was emphasized by Mr. Lorch that water produced by this type of plant was not pyrogen free and therefore could not be used for certain pharmaceutical purposes. However, investigations had shown that whenever the specific resistance was greater than 1,000,000 ohm cm., a value fairly easily reached with ion-exchange methods, no bacteria were found in the water.

Some New Sources for Waxes

by G. W. WOOD

INVESTIGATIONS are constantly being made of various substances with the object that some hitherto unknown material may be discovered which can replace the costly vegetable waxes, in particular carnauba wax.

The growth of the range of substitutes for this particular wax has reached such proportions in America that the Brazilian producers are now finding that for the first time since the War they have a surplus supply of carnauba, which is causing some concern.

Many of these substitute waxes are being produced as by-products from existing processes, and examples of these are largely waxes obtained from vegetable sources. On the other hand, some are obtained from mineral sources, and probably the most important in this class, are the Fischer-Tropsch waxes, which are now commercially available in America and Europe (1).

The history of the development of these waxes goes back some 30 years, when Franz Fischer and Hans Tropsch in Germany noted that a mixture of carbon monoxide and hydrogen passed over alkalized iron turnings at a pressure of 100 atmospheres and a temperature of 400°C, produced a mixture of liquid hydrocarbons together with some oxygenated compounds.

A great deal of work was subsequently done on this reaction, and a few years before the last War commercial development of this process was achieved by the Ruhrchemie AG, in Germany.

Fischer-Tropsch Waxes

Post-war development of the Fischer-Tropsch synthesis culminated in the production of Fischer-Tropsch waxes and their derivatives, Duroxon mineral waxes, in America by the Dura Commodities Corporation, and in Europe, by Krupp Kohlchemie GMBH, the corresponding European waxes being known as 'Ruhr waxes'.

At present, the following waxes are available:— Hard waxes, FT-wax 200, FT-wax 300; Duroxons J-324, R-11, R-21, H-110, C-60A; Soft waxes, Duroxons D-150, D-250, FT-200, FT-300.

These are hard waxes consisting entirely of aliphatic hydrocarbons of high molecular weight, some of which are branched chain products with comparatively short side chains.

Both of these waxes have high melting points, FT-200 melts at 100°C, and FT-300 at 105°C, this latter wax being the harder of the two. They are compatible not only with mineral waxes but with most vegetable waxes and resins in all proportions, and an important feature is that these mixtures retain the favourable hardness and high melting characteristics of the Fischer-Tropsch wax.

Varied Uses

These waxes are useful materials for raising the melting point and hardness of any given wax. They are soluble hot in common solvents, and are very suitable for the manufacture of polishes, carbon paper, coated and impregnated papers, candles, cosmetics, modelling waxes etc., and they both possess outstanding electrical properties.

The Duroxon hard waxes comprise combinations of high molecular weight oxygenated products, consisting principally of carboxylic acids and esters. These waxes differ from oxidized montan wax both in composition and chemical structure.

Of particular interest in this group are J-324 and H-110. J-324 has a high solvent retention for naphtha or turpentine, and forms pastes with a high resistance to temperature changes, which suggests that this grade would be very suitable for the formulation of tropical wax polishes. H-110 is particularly suitable for emulsion polishes, especially 'dry-bright' formulations, wax stains, and partially saponified polishes.

Duroxons D-150, melting point 47-52°C, and D-250, melting point 45-50°C, are soft waxes containing large amounts of free carboxylic acids which impart very useful dispersing qualities to these grades. These waxes can be used to formulate stable emulsions from mineral oils, in the production of greases with high or low drop-points.

Two other grades are worth mentioning, R-11 and R-21. R-11 is a hard wax, melting point 100°C, and can be used for the manufacture of shoe and floor polishes. R-21 is a synthetic hard paraffin, and was developed for the manufacture of liquid floor polishes.

R-21 eliminates two of the main difficulties encountered by manufacturers of liquid solvent polishes—excessive penetration of the polish into the surface to be polished, and solidification of the gel on standing. Polishes containing up to 20 per cent of this wax remain liquid even at temperatures around 0°C.

New Vegetable Waxes

Among new waxes obtained from vegetable sources are several worthy of mention, although these are practically all in the development stage at present, and commercial exploitation could, properly directed, influence their supply.

One of these, sisal wax, does appear to have some worthwhile characteristics and it has been suggested (2) that for paste polishes, sisal wax can directly replace carnauba wax in the formulation, producing comparable products to carnauba containing polishes as regards gloss production, and showing no sign of solvent separation. An important point about sisal wax is that it is a by-product in the preparation of sisal fibre, which is obtained from Kenya, so that supplies could be made available from a colonial source.

From America, research workers have shown (3) that a wax can be extracted from alfalfa, although this wax can only become available commercially if other materials can be isolated at various stages of the extraction procedure. According to data obtained in this study, one ton of dehydrated alfalfa meal will yield about 2¼ pounds of wax. Further work is proceeding on this project with the object of possibly increasing the wax yield, coupled with a thorough examination of the various non-wax materials which may be extracted.

N. S. Kraggs, a Cincinnati chemist, recently discovered a wax which originates in Brazil. This wax, called cauassu, cauacu or big leaf wax is obtained from the cauassu leaf. These leaves are about 3 feet long and a foot wide, and the tree, resembling the banana plant, grows close to the ground, being thickest and tallest in the dense jungles of the Amazon Valley of Brazil.

The wax is flaked off the dried leaves, and the wax flakes are refined in a very similar manner to carnauba wax. One crop of wax is produced during the first year from cultivated plants and thereafter two crops a year are obtained.

Cauassu wax melts at 85.5°C and since it resembles carnauba wax in many of its properties, it is possible that this material will make a good natural substitute, if availability is sufficiently large for economic production to be effected.

A somewhat odd source of wax is cork, which German workers report (4) consists of a mixture of sterol esters and suberinol. Cork wax has an acid value of 100-115 and an iodine value of 20-25. This wax gives a resinous polyester on heating, which suggests that it could be used as a basis for the preparation of lacquers etc., since it possesses film-forming properties.

We have discussed waxes derived from mineral sources, and vegetable sources such as sisal and alfalfa, and there are many others which can be obtained from such materials as sugar-cane, cotton and rice bran, but a recent report (5) describes a comparative newcomer to this list—moss wax, which appears to be the cheapest wax with possibilities yet obtained.

Purified Moss Wax

Purified moss wax has a melting point of 79-80°C, and possesses a density close to water. This wax is extractable from Spanish moss, which grows profusely from Texas to Florida, and from Virginia to South America.

Spanish moss is closely related to the pineapple, and in actual fact is neither a true moss nor is it connected in anyway with Spain. So far, reports indicate that large scale solvent extraction of the plant gives a yield of about 4½ per cent of wax, and the Americans are examining this material as a possible indigenous replacement for imported carnauba wax.

REFERENCES

(1) Marsel, C. J., *Chemical Specialties Manufacturers' Assoc. Proc.*, 41st Meeting, 1955, Dec., 175.
(2) Raymond, W. D., *Colonial Plant & Animal Products*, 1955, 5, (1), 58-61.
(3) Blair, E. H., *et al.*, *Ind. Eng. Chem.*, 1953, 45, (5), 1140.
(4) Anon., *Farbe und Lack.*, 1950, 56, (1), 14-15.
(5) Anon., *Ind. Eng. Chem.*, 1955, 47, (4), 7a.

£20,000,000 Expansion Scheme

Mr. M. S. Beringer, president of the British Oil Co., said in Montreal that his company will spend £20,000,000 on expansions this year.

Analysis of Phosphorus Compounds

X-Ray & Infra-Red Methods Described

AT a meeting of the Midlands Section of the Society for Analytical Chemistry held on 7 December in the University, Edmund Street, Birmingham, Dr. D. E. C. Corbridge (Research Department, Albright & Wilson, Ltd., Oldbury) gave a lecture on 'Some Physical Methods for the Analysis of Phosphorus Compounds'.

In his introduction, Dr. Corbridge said that he had chosen two particular techniques to be the subject of his lecture. These were X-ray diffraction and infra-red spectroscopy. He hoped to present a general picture of the scope of the two techniques in the field of analysis of phosphorus compounds. There was not time to discuss each technique in detail, or to give examples of all types of application. Therefore, greater emphasis would be laid on some of the newer and less widely known aspects with which Dr. Corbridge had been particularly concerned.

Diffraction Patterns

It was well known, said Dr. Corbridge, that X-ray powder methods had a considerable use for the identification and analysis of chemical compounds in general. Over the last 25 years the diffraction patterns of several thousand crystalline substances had been recorded, and data from a large number of these were available in the index of the American Society for Testing Materials (on 19 cm. photographs).

In more recent years, with the advent of focusing cameras it had become possible to obtain powder diffraction data in more precise form. Focusing cameras, originated by Guinier (**1**) and developed by de Wolf (**2**) and others, were now commercially available. The main difference between a focusing cameras, it had become possible to powder camera was that whereas the latter employed a parallel beam of approximately monochromatic X-rays, the focusing camera employed a convergent and strictly monochromatic X-ray beam.

These two factors were responsible for producing a photograph with much greater resolution of the powder lines, with a general increase of definition. Such factors had been found particularly useful in dealing with phosphorus compounds.

The increased resolution and sharpness of the lines had several potential advantages:—

(1) More lines were produced and hence a better characterization of the substance was possible.

(2) Weaker diffraction lines were likely to show and smaller amounts of materials in mixtures would be detectable.

(3) There was a greater choice of lines for quantitative work and because of the better definition of the lines, there was a greater chance of detecting components in multicomponent mixtures.

As regards limits of detection, it had been found in several cases that the lower limit of detection had been reduced from about five per cent on the ordinary 19 cm. camera to about one per cent on the focusing camera.

A simple example was afforded in the case of sodium triphosphate (Phase II. $Na_5P_3O_{10}$) containing small quantities (up to 15 per cent) of sodium pyrophosphate, ($Na_4P_2O_7$). Minimum detectable quantities were five per cent on the 19 cm. camera and one per cent on the focusing camera using visual estimation of the same diffraction line in each case. These limits might, of course, be subject to some variation depending on the particular set up of the apparatus used. By the method of visual comparison of the unknown with the photographs of standards, the amount of pyrophosphate could be determined to within about $\pm$ 2 per cent on the 19 cm. camera, and about $\pm$ 1 per cent on the focusing camera, on the lower concentration ranges.

It was only recently, in fact during the last four years, that any systematic studies of the infra-red absorption spectra of phosphorus compounds had been carried out.

The first major study was undertaken by Daasch and Smith (**3**), who in 1951 published the spectra of 60 organophosphorus derivatives. By the method of empirical

correlation, they showed that a number of phosphorus containing groups produced characteristic absorptions in certain frequency ranges. These groups included: P-H, P-F, P-Cl, P=O, P=S, P-O-C, P-C and P-O-H, and their paper showed that these characteristic frequencies could be used for the interpretation of molecular structure.

Bellamy and Beecher (**4, 5, 6**) in 1952 examined the spectra of about 120 organophosphorus compounds and carried out extensive correlations, confirming most of the conclusions of Daasch and Smith. Other important spectral studies of organophosphorus compounds had been made by Gore (**7**) and by Meyrick and Thompson (**8**).

The spectra of over 150 inorganic phosphorus compounds had been studied by Corbridge and Lowe (**9, 10**) and the results had suggested a number of new correlations as well as confirming the results of the workers previously mentioned.

It had been found that the various phosphorus oxyions each absorbed in a number of characteristic frequency regions which enabled them to be identified.

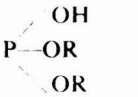
These correlations were based not only on the published work just mentioned, but also on the interpretation of the spectra of about 70 more phosphorus compounds which had been recorded in Dr. Corbridge's laboratory.

Systematic Observations

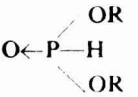
There was not time in this lecture to examine each of these correlations in detail, but they were based on systematic observations of many types of phosphorus compound. The intense P=O absorption for example occurred at 1,250-1,300 cm^{-1}. It appeared in $POCl_3$ and $MePOCl_2$, but was absent in PCl_3, $PSCl_3$ and $MePCl_2$. The absorption due to P-F stretching occurred at 900-720 cm^{-1}. This had been observed in PF_3, POF_3, PF_5 and over a dozen salts containing phosphofluoridate ions. By systematic correlations of this type it had been possible to build up a series of spectra-structure relationships.

Two examples of the use of the spectra-structure correlation chart were as follows:—

(1) The spectra of dialkyl hydrogen phosphites showed they existed in the phosphonate form:—



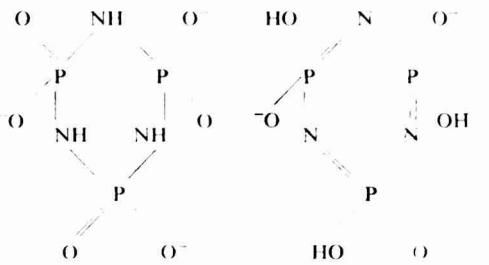
Dialkyl Hydrogen Phosphite



Dialkyl Phosphonate

This was shown by the appearance of P=O and P−H absorptions, but the absence of P−O−H absorptions.

(2) The phosphonitrilate anion $[P_3N_3(OH_3)O_3^{3-}]$ existed in form (b) rather than (a) in its crystalline salts:



(a) *(b)*

This was indicated by the appearance of P−O−H stretching and deformation absorption bands, but the absence of the characteristic  absorptions.

Dr. Corbridge next described briefly the techniques employed in the infra-red analysis of phosphorus compounds.

For liquid samples, the absorption cells and sampling techniques etc., followed the usual methods employed in infra-red analytical work. In the case of many organophosphorus liquids, however, special precautions had to be taken on occasions. A high proportion of liquid organophosphorus compounds readily hydrolysed or oxidized in contact with the air. Moreover, they were often corrosive or toxic.

For example, phosphorus trichloride would attack amalgamated lead spacers and generally corrode absorption cells of conventional types. The use of dry boxes together with special cells employing polythene or Teflon spaces and lead in tubes, had been found necessary in dealing with awkward compounds of this type.

In order to obtain the spectrum of a solid it was first necessary to grind it into a fine state of subdivision, preferably with the particles smaller than the minimum infra-red wavelength used. This was necessary to reduce scattering losses and secure sharp, well-

defined spectra. This could be accomplished with most phosphates by grinding in a small agate pestle and mortar for five to 10 minutes. Small mechanically driven mills could now be obtained commercially for this purpose.

A spectrum could be obtained from a powdered sample as follows:

(1) Dry powder—the fine powder was spread evenly over a rocksalt plate.

(2) Nujol—a mush of sample and paraffin oil was spread over a plate.

(3) Pressed disc—see below.

The Nujol technique had an advantage over the dry powder method in that scattering losses were less. The disadvantage of the Nujol technique was that sample bands might be obscured by those of Nujol and might even be shifted.

The pressed disc method recently introduced by Scheidt (**11**) was much more satisfactory in many respects. It involved mixing a small amount of the powdered sample with potassium bromide (or other suitable alkali halide) and compressing the mixture to form a small pellet. For qualitative purposes it had the advantages of:—

(1) Greatly reduced scattering losses and usually much better defined spectra.

(2) The amount of sample in the path of the beam could be controlled more easily.

(3) Materials which 'mush' on attempting to grind could often be incorporated in a disc.

The spectra of some sodium phosphates had been obtained by this method (**12**). It should be noted that the spectra are:

(a) Very sharp.

(b) That different crystalline forms give rise to differences in spectra.

In general, the spectra of solids were liable to be influenced to a minor extent by effects of crystal structure such as:—

(1) Mutual interaction of adjacent ions.

(2) Combination with long wave lattice frequencies.

(3) Water of crystallization.

Such effects might cause broadening, splitting or shifting of the absorption bands, and the complete interpretation of such spectra might be quite complicated. However, by considering a large number of salts it was reasonable to suppose that some of these effects would tend to be averaged out and certain spectral features persist. Examination of a large number of phosphates (**9, 10**) had indeed shown this to be the case. These features would be characteristic of the anions and related to specific molecular groupings present. The effect of cations was relatively small.

The table of absorption regions could be used in a purely empirical manner for the qualitative identification of phosphates in the form of dry powders. In general, identification of the anion was possible but for identification of a specific crystalline form of a specific metal salt a comparison spectrum was needed. The advantages of this technique were:—

(1) Rapidity—a result being obtained in less than $\frac{1}{2}$-hour.

(2) Only a small quantity of sample was needed.

(3) It was sensitive to differences of crystalline form.

(4) Non-destruction of sample.

(5) It dispensed with the usual difficulties associated with 'wet' chemical analysis.

Methods and techniques for the quantitative analysis of liquids followed conventional lines in common use and would not be dealt with, said Dr. Corbridge. The intense absorption from P=O in $POCl_3$, for example, enabled small quantities of it to be readily estimated in PCl_3 or PSC_3. With a 0.1 mm. cell, and by measuring the intensity of the P=O absorption at 1,300 $cm.^{-1}$, the $POCl_3$ content of PCl_3 could be estimated down to 0.01 per cent or less. As an example of the routine use of the method, it was on one occasion found possible to estimate the $POCl_3$ content of $PSCl_3$ at the rate of 18 samples per hour (at concentrations of about two per cent to within $\pm$ 0.1 per cent).

The technique of the pressed disc method was first discovered by Scheidt (**11**) in Germany. Variations in technique had been studied by different workers, and in Dr. Corbridge's laboratory the disc method had been applied to the quantitative analysis of phosphate mixtures.

The method used for making the discs was briefly as follows:—

A mixture of finely ground sample with potassium bromide (about $\frac{1}{2}$ gm.) or say potassium chloride, was placed in a small die constructed from 60-ton steel. The powder was then compressed by a plunger operated by a hydraulic jack. Evacuation of the die by a water pump was carried out immediately prior to, and during, pressing.

This removed air from the powder and helped to ensure that a transparent disc of even thickness resulted. A pressure of about 10 tons per sq. cm. was applied for some three minutes, after which time the pellet could be removed. The absorption spectra were recorded on a Perkin-Elmer Model 21C double-beam instrument.

If I = the intensity of the light transmitted by a sample at a given frequency,
I_o = the intensity of the incident light,
k = the absorption coefficient,
c = the concentration of the sample through which the light was transmitted,
and t = the thickness of the sample,
then according to Beer's Law,

$$I = I_o e^{-kct}$$

Hence,

$$\text{Absorbance} = \log I/I_o = -kct$$

Thus, if k and t remained constant, on plotting absorbance against concentration a straight line would be obtained.

To analyse quantitatively a phosphate mixture, a calibration curve was first obtained from a series of mixtures of known composition. If a minor component was to be estimated in a major one, it was desirable that:—

(a) The minor component had a strong absorption peak.

(b) This peak be in a position where the major component absorption was at a minimum.

In the case of estimating small quantities of barium phosphite ($BaHPO_3$) in barium hypophosphite ($Ba(H_2PO_2)_2$), a strong absorption peak of the former was chosen and the absorbance for a series of discs of known concentration recorded.

The potassium bromide pressed disc method had been found to be particularly applicable to the analysis of commercial sodium triphosphate mixtures (**12**). The triphosphate occurred in two crystalline phases (Phase I. $Na_5P_3O_{10}$ and Phase II. $Na_5P_3O_{10}$ and was sometimes contaminated with small quantities of sodium pyrophosphate ($Na_4P_2O_7$) and sodium trimetaphosphate ($Na_3P_3O_9$).

Frequencies were chosen at points where the effect of the remaining constituents was negligible, and calibration curves constructed for binary mixtures of each impurity with Phase II. $Na_5P_3O_{10}$. Once these calibration curves were set up, it was only necessary to record the disc spectrum of the unknown in the region of the chosen frequencies. In this four-component mixture the amounts of Phase I triphosphate, pyrophosphate and trimetaphosphate, could be determined with accuracy within ± 0.5 per cent over the range of concentration occurring in commercial material.

The infra-red method of analysis compared very favourably with existing X-ray and chemical methods in regard to speed and accuracy, and should be readily applicable to any phosphate mixture in which the individual components gave reasonably strong and non-overlapping absorption maxima.

The use of an internal standard removed the need for careful repetition of a given concentration of mixture in potassium bromide, and total thickness of disc. This method had been used to estimate barium phosphite ($BaHPO_3$) and barium hypophosphate ($Ba_2P_2O_6$) in barium hypophosphite ($Ba(H_2PO_2)_2$) where 15 per cent barium carbonate was incorporated in all the mixtures and peak intensities measured relative to the carbonate peak.

Following his account of the X-ray diffraction and infra-red spectroscopy methods for the analysis of phosphorus compounds, the meeting was opened for questions to be put to Dr. Corbridge. The first query concerned the measurement of the pressure applied in the disc technique, and whether this pressure was critical. The pressure was measured on a simple pressure gauge, said the lecturer, as it need not be known too accurately. It was only necessary that the sintering pressure of the potassium bromide be reached, otherwise a good spectrum was not obtained. Any further increase in pressure did not lead to variations in the spectrum.

Chloride Preferred

Dr. Corbridge was asked why potassium chloride was now preferred to the bromide in the preparation of the pressed discs. It appeared that the chloride was less hygroscopic than the bromide. Furthermore, it was readily obtainable in a finely divided state (this could be better dried than the bromide which needed to be kept at 120°C for several days) by precipitating from aqueous solution with hydrochloric acid.

Much of the sample preparation, prior to insertion in the hydraulic press, must be carried out in a specially constructed dry box. Unless this precaution was taken, moisture was absorbed rapidly by the

potassium bromide, and in some cases by the sample material itself, e.g. Phase I triphosphate which changes to the hexahydrate. Excessive absorption of moisture produced discs of variable opacity, and some hydrated products produced interfering absorption peaks.

The question of hydration of the discs might be a limiting factor in the examination of hydrated salts, since errors might arise from partial dehydration of the sample in the vacuum press, differential hydration of the components in a mixture, or even salt double decomposition with potassium bromide.

The question of the spectra being truly additive in X-ray quantitative work was raised. Dr. Corbridge thought that self-absorption effects may have to be considered here, but for the sodium phosphates the intensities were approximately additive.

Dr. H. Weisz raised an interesting point with regard to the pressed disc technique. He wondered whether the effect of different lengths of time for the actual pressing of the discs, all other conditions remaining constant, resulted in any noticeable effect on the absorption spectra of materials under investigation. For instance, solid-solid reactions might be induced in this way (i.e. under the presurse of about 10 tons per sq. cm. if applied for a sufficient length of time), and the displacement of the absorption peaks which occurred might then be used to follow such reactions. Dr. Corbridge said that no work had been attempted in this direction as yet.

REFERENCES

(1) Guinier, A., *C.R. Acad. Sci.* (Paris), 1946, **223**, 31.
(2) de Wolf, P. M., *Acta Cryst.*, 1948, **1**, 206.
(3) Daasch, L. W. & Smith, D. C., *Anal. Chem.*, 1951, **23**, 883.
(4) Bellamy, L. J. & Beecher, L., *J. Chem. Soc.*, 1952, 475.
(5) *Idem, ibid*, 1952, 1701.
(6) *Idem, ibid*, 1953, 728.
(7) Gore, R. C., *Disc. Faraday Soc.*, 1950, **9**, 138.
(8) Mevrick, C. I. & Thompson, H. W., *J. Chem. Soc.*, 1950, 225.
(9) Corbridge, D. E. C. & Lowe, E. J., *ibid*, 1954, 493.
(10) *Idem, ibid*, 1954, 4555.
(11) Scheidt, U., *Z. Naturforsch.*, 1953, **8b**, 66.
(12) Corbridge, D. E. C. & Lowe, E. J., *Anal. Chem.*, 1955, **27**, 1383.

MR. W. G. MILLS, a founder member and a director of Mills Packard Construction Co. Ltd., chemical engineers and contractors of Ipswich, died on Monday 5 March. The funeral was at Bramford, near Ipswich, yesterday, 9 March.

D

SCI 75th Annual Meeting

Lecturers & Subjects Announced

THE names of the speakers who have been invited to give the series of lectures planned the connection with the 75th Annual Meeting of the Society of Chemical Industry have been announced. The meeting is being held in London from 9 to 14 July.

The series of lectures will be given under the title 'Achievements of Industrial Chemistry,' and will be introduced by Dr. L. A. Jordan, C.B.E., F.R.I.C., on 11 July. He will speak on 'Modern Methods of Research.' The lectures will fall into two parallel series, the first of which, under the title of 'Products of Industrial Chemistry' will consist of the following papers:—

Thursday 12 *July*: 'New Products of the Fermentation Industry,' by J. J. H. Hastings, M.B.E., M.Sc., F.R.I.C., and 'Hydrocarbon Macromolecules,' by C. W. Bunn, M.A., B.Sc.

Friday 13 *July*: 'Carbohydrate Macromolecules,' by Professor M. Stacey, D.Sc., F.R.I.C., F.R.S., and 'Nitrogen and Chlorine Containing Macromolecules,' by Professor H. W. Melville, D.Sc., F.R.I.C., F.R.S.

The second series, entitled 'Tools of Industrial Chemistry,' will be as follows:—

Thursday 12 *July*: 'Metals as Plant Construction Materials,' by Dr. N. P. Inglis, and 'Non-Metals as Plant Construction Materials,' by Herbert W. Cremer, C.B.E., M.Sc., F.R.I.C., and G. Brearly, B.Sc., F.R.I.C.

Friday 13 *July*: 'Manufacturing Techniques,' by W. d'Leny, M.A., and 'Records and Controls,' by Dr. G. M. Dyson, M.A., F.R.I.C.

Canadian Chemical Prices

The Canadian Association of Purchasing Agents, in its latest survey of Canadian business conditions, states that lower prices may be expected for anhydrous ammonia as additional capacity comes into production. Methanol has been placed on allocation with deliveries in Western Canada running to two or three weeks. Chemicals produced from base metals continue firm with possibilities of rises in copper sulphate, zinc oxide and zinc sulphate. Most sodium phosphates were increased 20 cents a hundredweight at the beginning of the year.

Patent Infringements

Dow Chemical Bring $18,500,000 Actions

TWO legal actions have been brought by Dow Chemical Company of the United States and its Canadian subsidiary, Dow Chemical of Canada, against the Crown-owned Polymer Corporation of Canada. The actions together are for the recovery of a total of $18,500,000 dollars damages.

The larger action (for $15,000,000) alleges that Polymer Corporation has infringed on patents covering methods and processes of styrene production and preservation and an invention described as distillation of polymerizable organic compounds. It is claimed that Dow Chemical of Canada is the sole licencee in Canada which has the right to use these patents and that Polymer Corporation has been infringing them since 25 October 1954.

Injunction Sought

An injunction is asked for restraining Polymer Corporation from further infringement. Dow Chemical have also asked for an order directing the Crown company to return all articles made in infringement of the patent or to destroy these articles.

The smaller action (for $3,500,000) involves only Dow Chemical Co. of the US and alleges breach of the Canadian General Styrene Agreement, breach of trust and confidence, or conversion. The action also seeks an injunction restraining Polymer Corporation from using technical information acquired from Dow Chemical of Canada, together with a demand for royalties for the use of technical information covering manufacture and production of styrene and payment of profits made by Polymer Corporation from the use of confidential and technical information.

The statement of claim says that in October 1942 an agreement involving Dow Chemical Co. of the US, Dow Chemical of Canada and other US companies was made with Canada to provide for exchanges of technical information and patent rights covering styrene. This was done to help Canada's war programme.

Dow Chemical of Canada operated the Sarnia plant as agent from May 1942 till January 1951 when Polymer Corporation took over. An agreement was worked out covering payment of royalties to Dow Chemical of the US in return for a licence to manufacture styrene in Canada. Dow made available all technical information which has since been used in the styrene plant, says the statement.

In July 1954, the statement alleges, Polymer gave written notice that the agreement would be terminated on 24 October 1954. Since then Polymer has continued to use the technical information made available but has refused to pay any royalties, the statement adds.

This action, which is alleged to be a breach of the Canadian General Styrene Agreement, has resulted in substantial damages to Dow Chemical because of loss of royalties.

The statement notes that the technical information was provided to help Canada's war effort at a time of serious national emergency and was given on the assumption that this assistance in time of national crisis would not be used later to give commercial advantage to a competitor.

Bulletin on Turpentine

MANUFACTURERS of the major part of the 20,000,000 gallons of crude sulphate wood turpentine produced annually in the US have formed an association to promote knowledge about their product. Known as the Sulphate Turpentine Division of the Pulp Chemicals Association, it is located at 122 East 42nd Street, New York 17, New York.

One of the association's first activities was to publish an eight-page bulletin entitled 'Something About Turpentine' describing the different kinds of turpentine, their methods of production, relative size, their uses, and a concluding discussion of sulphate turpentine and its uses. Copies of the bulletin can be obtained, free of charge.

Production Exhibition

The second Production Exhibition and Conference will be held at Olympia, London, from 23 to 31 May. The exhibition is sponsored by the Institute of Production Engineers and is designed to show some of the research and development which lie behind improved productivity in the UK. Sections will deal with information and training, aids to production, metals and materials, new production methods and automation and work study.

Furoic Acid Available

Commercial Preparation by Howard Lloyd & Co.

FOR the first time furoic acid is being manufactured in commercial quantities in Great Britain. The manufacturers are Howard Lloyd and Co. Ltd., Batley, Yorkshire. In the past furoic acid has been imported from America.

A process has been evolved which, it is claimed, yields a high quality technical grade, containing not less than 98 per cent furoic acid. There is a recrystallized grade also available, containing not less than 99.8 per cent furoic acid. Production is greater than foreseeable requirements and can be stepped up to satisfy any probable demand.

Furoic acid has been used in the manufacture of special photographic developers and photo-sensitive dyes, in the manufacture of synthetic resins and in the refining of lubricating oils and resins; it has an application as a wetting agent in the moulding of grinding wheels; it is used as a bacteriocide and preservative and its esters are used as perfume and flavouring ingredients. Small quantities go into textile processing.

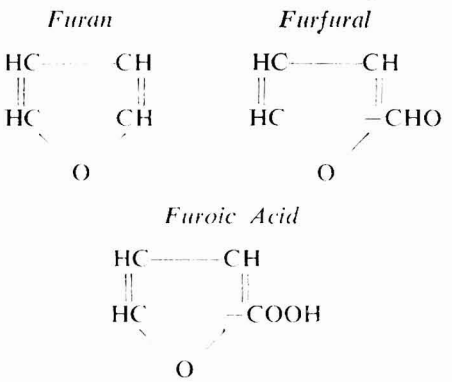
Pharmaceutical Applications

Experimental evidence obtained in the research laboratories of Hamol AG of Zurich, an associated company of Howard Lloyd, showed that esters of furoic acid with certain therapeutically active phenols possessed unique properties which made them of great value for certain pharmaceutical applications.

Furoic acid forms well defined crystals, free from water of crystallization, which do not change on ageing or exposure to air, and this has led to its use in the laboratory as an acidimetric standard.

Furoic acid belongs to a class of products, the simplest of which is furan. The basic constitution of these products is represented by a five membered ring consisting of four carbon atoms and one oxygen. In America, large scale chemical production is in progress which transforms oat husks, cotton seed hulls, cobs and similar products into furfural. However, it is only the recent growth of the plastics industry which has made this development possible.

Previous to this there were no applications for furfural which could absorb quantities large enough to make this process economical. Furfural goes into the manufacture of many moulded plastics, is used as a solvent and helps in the manufacture of synthetic fibres. It is a cheap raw material readily made available in large quantities as production is based on agricultural by-products. Furfural has thus made the whole field of furan chemicals available for exploitation by the chemical industry. In furfural the furan ring contains the aldehyde grouping—CHO. If this is oxidized further it yields furoic acid, containing the acidic grouping—COOH attached to the furan ring.



This acid is a white solid containing the furan grouping in stable form, and has the following properties:—

Molecular weight: 112. *Melting point*: 133°C. *Solubility*: Sparingly soluble in cold water. Soluble in hot water. Soluble in most organic solvents.

With any chemical becoming generally available, it is impossible to indicate all the probable applications. The best procedure is to place working samples at the disposal of the laboratories for their own experiments. These laboratories may be attached to individual firms or may be collective research laboratories such as are now being run by various industries. Producers of chemicals generally prepare pilot quantities of any new chemical which in their opinion should find fairly widespread application. They state the basic properties and describe the product but leave it to the potential user

to judge whether the product is likely to have any advantages. In order to facilitate the testing of furoic acid for any new applications, the manufacturers will place working samples at the disposal of interested organizations.

Howard Lloyd also manufacture on a semi-industrial scale furoyl chloride, which is an intermediate in the manufacture of esters or other furoic acid derivatives. The manufacturers are prepared to co-operate by preparing any other derivatives of furoic acid for testing purposes. Quantities are available of the following compounds: Methyl furoate, Ethyl furoate, Isopropyl furoate, Allyl furoate, 5-nitro-ethyl furoate.

REFERENCES

General

Bacteriostatic activity of furan types : Dodd, Cramer & Ward, *J. Amer. Pharm. Assoc.*, 1950, **39**, 313.

Furoic acid and derivatives as insecticides : Yeager, Worley & Brown, *Proc. Soc. Exptl. Biol.*, 1932, **30**, 19.

Fungicidal and fungistatic properties of furoic acid derivatives : *Chem. Abs.*, 1940, **34**, 4843 ; 1941, **35**, 5464 ; 1949, **43**, 8595.

Use of acids and esters : *Chem. Abs.*, 1952, 10148.

Furoic Acid

Use as an acidimetric standard : Kellog & Kellog, *Ind. Ing. Chem., Anal. Edit.*, 1934, **6**, 251.

Germicide and fungicide. Action against *E. Coli* and *S. Aureus* : Kaufman, *Ber.* 1922, **55**, 289 ; *Ber. Pharm. Journ.*, 1933, **33**, 132.

Toxicity of furoic acid to micro-organisms : *Chem. Abs.* 1953, 7028h.

Alkyl Furoic Acids

Germicidal action of : *Pharmacol. Exp. Therap.*, 1936, **58**, 155 ; *Chem. Abs.*, 1935, **29**, 266 ; *J. Amer. Pharm. Assoc.*, 1941, **30**, 41.

Counter-Current

A lecture entitled 'Continuous Counter-Current Distribution of Batches of Material' will be given by Dr. J. D. Johnson, Beecham Research Laboratories Ltd., in the Chemistry Lecture Theatre, King's College, London, on Friday 16 March at 7.30 p.m.

Titanium Pigment Prices

INCREASED prices for the range of titanium pigments produced by Laporte Titanium Limited came into force on Monday 6 February owing to increased costs in wages, raw materials, freight and other charges. The increases are as follows: Runa R.H. £10 per ton, Runa R.G. £8 per ton, Tiona G and Tiona W.D. £12 per ton, Tiona S. £10 per ton, Tiona 80 £9 12s per ton, Tiona 50 Titanium White £9 per ton and Tiona 25 Titanium White and Tocarba 25 Titanium Pigment both £6 per ton.

The new prices are as follows and not as were given on p. 431 of our issue of 18 February.

For spot delivery in lots of :—	'Runa' Rutile Type Titanium Oxide Grade R.H.	'Runa' Rutile Type Titanium Oxide Grade R.G.	'Tiona' Titanium Oxide 98/100% Grades G. & W.D.	'Tiona' Titanium Oxide Grades
	Per ton	Per ton	Per ton	Per ton
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1 cwt. and under 5 cwts.	175 0 0	167 0 0	157 0 0	155 0 0
5 cwts. and under 10 cwts.	173 0 0	165 0 0	155 0 0	153 0 0
10 cwts. and upwards	172 0 0	164 0 0	154 0 0	152 0 0
For a contract for:—				
5 tons and under 20 tons	171 5 0	163 5 0	153 5 0	151 5 0
20 tons and under 100 tons	170 5 0	162 5 0	152 5 0	150 5 0
100 tons and under 250 tons	170 0 0	162 0 0	152 0 0	150 0 0
250 tons and under 500 tons	169 15 0	161 15 0	151 15 0	149 15 0
500 tons and upwards	169 10 0	161 10 0	151 10 0	149 10 0

For spot delivery in lots of:—	'Tiona' 80	'Tiona' 50 Titanium White	'Tiona' 25 Titanium White	'Tocarba' 25 Titanium Pigment
	Per ton	Per ton	Per ton	Per ton
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1 cwt. and under 5 cwts.	135 7 0	103 10 0	77 10 0	76 5 0
5 cwts. and under 10 cwts.	133 7 0	101 10 0	75 10 0	74 5 0
10 cwts. and upwards	132 7 0	100 10 0	74 10 0	73 5 0
For a contract for:—				
5 tons and under 20 tons	131 12 0	99 15 0	73 15 0	72 10 0
20 tons and under 100 tons	130 12 0	99 0 0	73 0 0	71 15 0
100 tons and under 250 tons	130 7 0	98 15 0	72 15 0	71 10 0
250 tons and under 500 tons	130 2 0	98 10 0	72 10 0	71 5 0
500 tons and upwards	129 17 0	98 5 0	72 5 0	71 0 0

CHEMICAL PILOT PLANT PRACTICE. By Donald G. Jordan. Interscience Publishers Inc., New York. 1955. Pp. viii + 152. $3.50.

This book is the first of a new series which is being published by 'Interscience' with the general title of Chemical Engineering and Technology Library. The author begins by defining his subject matter and goes on to deal with scale-up problems and the particular problems of the handling of solids, liquids and gases in pilot plants.

There are two chapters on special units involving chemical reactors and separation processes and finally the inevitable American conclusion on cost estimation and report writing.

The literature references are collected together at the end of the book and are carefully selective rather than exhaustive.

It is almost inevitable with a book of this type that there should be many generalizations, some of them rather sweeping. In particular the statement that 'the present day status of distillation theory and practice is so advanced that it is not necessary to operate a pilot plant distillation for the purpose of obtaining technical information or that it is not necessary to scale up a distillation column' cannot be accepted. In general, however, the book is essentially practical and full of acquired commonsense and useful know-how.

It should be a valuable guide to those starting chemical engineering research and pilot plant work and a useful and interesting refresher to those who already have some experience in this field.

It is a pity that this attractive text should be put together somewhat shoddily with a weak binding and a smudgily printed cover and it is hoped that subsequent volumes will receive a better treatment in this respect.—D.C.F.

PORPHYRIN BIOSYNTHESIS & METABOLISM. Report of the Ciba Foundation Symposium. Ed. by Dr. G. E. W. Wolstenholme. I. & A. Churchill, Ltd., London. Pp. xii + 308. 30s.

This volume is one of the series of the reports of symposia which are organized by the Ciba Foundation. It consists of some 20 papers given by leading workers in the porphyrin field and the discussion arising from the papers at the meetings. In the preface it is stated that the book, amongst other things, will give the readers 'a sense of participation in an informal and friendly occasion'. This is certainly the case and it is quite an unique experience to read a paper with a suggested hypothesis, which appears to the non-specialist to be fully substantiated by the experimental evidence, and then to read the criticisms of the workers in the field.

The papers that are given fall into three main groups. First to be considered are the early stages in biosynthesis (pre pyrrole and porphobilinogen). Isotope studies have shown that glycine and succinic acid are donors of certain carbon atoms in a large number of substances such as the porphyrins, ureido group of purines, serine and methyl groups. It is suggested that there is a succinate-glycine cycle which builds up the intermediates in the synthesis of these compounds and groups. These papers illustrate the important fact that the large naturally occurring molecules are constructed from small units. Attention is now focused on the enzymes connected with these syntheses with the aim of carrying out the reaction with a soluble system. In the case of the synthesis of porphyrins a number of these enzymes have been identified and are reported.

The second group of papers deals more

The Chemist's Bookshelf

particularly with the role of porphyrins in the binding of iron. Finally, communications are included relating to the use of Sedormid and allyl-iso-propylacetamide in causing deranged porphyrin metabolism.

The text certainly justifies the hopes of the editor in that it is both informative and stimulating.—K. REES.

THE CHEMISTRY OF LIVING CELLS. By Helen R. Downes. Longmans, Green & Co., London. 1956. Pp. 549. 45s.

During the last few years two or three excellent textbooks on biochemistry have been published, and since the problem of authorship in these cases is to order facts rather than to express opinions, it might be thought that once the job had been well done, later authors would be dissuaded from the major effort which is undoubtedly required to add to their number. The task would seem thankless and redundant. Yet there is evidently something wrong with this argument; for when a new book appears—with its preface striving to prove a difference—and when we have scanned its main divisions from the 'Historical Introduction' to the addendum on 'Photosynthesis in Plants,' our interest is invariably aroused anew and we settle in our armchair or twine our legs uncomfortably round our laboratory stool in the hope that this fine pearl that is biochemistry will once more give off new lights as it turns in another's hands.

Professor Downes's book has been fashioned out of the course she has been giving to 'senior majors in chemistry or in one of the biological sciences' and, while it follows the usual plan for introductory textbooks of this sort and is in no way revolutionary, except in its admirable biographical footnotes, it has a great fund of solid virture in its presentation which should make it a favourite with students having a background of pure chemistry.

Its distinguishing feature is the recurring emphasis on the chemistry of biochemically important substances. Thus in the chapter on carbohydrates we find the Killiani synthesis, the reaction of sugars with periodic acid, with boric acid, and with *p*-toluenesulphonyl chloride, and the function of acetone derivatives, all dealt with more fully than usual. Moreover rather more care than usual is devoted to descriptions of those techniques—electrophoresis, infra-red absorption, chromatographic analysis—which are the day-to-day tools of biochemical investigation.

In the metabolic section this note is still sounded and a chapter on methods used in the study of intermediary metabolism prefaces the author's remarks, referring, amongst other things, to the preparation of tissues for metabolic work, the Warburg manometer and the use of isotopes in biological experiments. Perhaps the most original chapter in the book, however, is the last, where Professor Downes rounds off her treatment of metabolism with a section devoted to biosynthetic mechanisms which, with some justification, she refers to as a 'survey of work in progress and some indication of the direction in which contemporary biochemical thought is moving'. This allows her to group together those systems engaged in energy transfer in living organisms and by this very juxtaposition she will surely earn the gratitude of many readers. The phosphate bond, acetyl-coenzyme A, active formate, CO_2 fixation and the function of chlorophyll are subject which only gain in clarity when brought into such clear relation with each other.

The book is both accurate and very 'readable'; and it is perhaps not the least of its virtues that it compasses its task in 550 pages. Professor Downes has given little time to the hormones and the vitamins except where an understanding of them helps an understanding of metabolism; but since, in their other aspects, these topics are rather specialised their absence here is no great fault. There are innumerable byways in biochemistry but there is only one high road for a general textbook, and along this Professor Downes's book with its sure feeling for what is more and what is less important, will lead any student interestingly and with profit.—F. R. MALPRESS.

CHEMICAL TRADE NAMES AND COMMERCIAL SYNONYMS. By William Haynes. D. Van Nostrand Co. Inc., New York; Macmillan & Co. Ltd., London. 2nd Edition. Pp. 466. 60s.

This edition is, in our opinion, a great improvement over the first edition which

appeared in 1951. New entries, says the author in his foreword, have brought about a 25 per cent increase in entries. Most of the new entries are manufacturers specialities, supplemented by the trade names of companies who failed to respond to questionnaires sent to them during the compilation of the first edition.

The style of printing adopted in this edition is a considerable advance over the earlier edition in which a lithographic process was used to reproduce typewritten manuscript. The use of bold face type for the names of materials and companies, with the remainder in lighter type, makes reference quicker and surer.

One serious error was noted. On page 338 polythene is spelt with a capital 'p' and referred to as a du Pont trade name. Du Pont of course manufacture polythene, but the name polythene was coined by Imperial Chemical Industries' chemists as a generic name for polymerized ethylene. We believe, therefore, that no proprietary rights can be attached to it by any company. The author has presumably been misled by American claims, which were perhaps aided by British reticence. On the same page polyvinyl is spelt with a capital 'p' suggesting that it is also a trade name.

Despite these criticisms we confidently recommend this volume to anyone who requires information on American chemical terms, trade names and manufacturers. —J.P.S.J.

PAINT & VARNISH MANUFACTURE. Edited by H. W. Chatfield. George Newnes Ltd., London, 1955. Pp. 440. 35s.

No less than 33 authors have contributed to this book which is a severely practical account of the modern paint and allied industries. The organizations with which they are associated provide a representative cross-section of these industries and as a result the coverage is very complete, ranging from the production of antifouling compositions for ships bottoms to the use of Formvar films in the replication of surfaces for microscopical examination.

The book is divided into two sections, the first dealing with the materials from which the paints are compounded and the second with the production of all the varieties of paints classified under their end-use. As there are 14 separate chapters some of which contain as many as five topics it is impossible to give more than an indication of the contents which include drying oils, driers, pigments, solvents plasticisers, resins, emulsifiers and fillers.

The Chemist's Bookshelf

Among the specialized paints which are described are those for the car, furniture, tinplate and shipbuilding industries. As a result of this the treatment is sometimes very casual, it is possible to speculate, for example after reading the short paragraph dealing with the phthalocyanines, how such an outline will assist the non-informed reader. Again lecithin is described as a mixed triglyceride of saturated fatty acids containing phosphorus and nitrogen. While this is true in a general sense, surely it is a meaningless statement to all but the organic chemists, and only to those with a nodding acquaintance with the lipids.

The final assessment must be, therefore, that the book constitutes an excellent elementary practical guide to the paint and varnish industry. Some assistance is given to the student and semi-technical reader in the problem of supplementing the information given by the provision of short bibliographies at the end of each chapter. It is suggested that in future editions the index be revised and expanded; at present it is only general in character so that specific items can only be traced if it is already known in which section they are likely to appear.—J. R. MAJER.

METALLURGICAL THERMOCHEMISTRY. By O. Kubaschewski and E. Ll. Evans. Second Edition (completely revised and reset). Pergamon Press Ltd., London. 1956. Pp. ix+410. 55s.

This book on chemical thermodynamics with particular application to the metallurgical field is intended for the research worker and for the process metallurgist who wishes to apply thermodynamic data to the solution of practical problems. It assumes that the reader is acquainted with the elements of chemical thermodynamics and it is divided into five sections. The first part deals briefly with the fundamental basis of the subject while the second part describes the main experimental methods used in the determination of thermodynamic data. This section is particularly valuable for the

The Chemist's Bookshelf

relative advantages and disadvantages of the various methods are compared and apparatus is illustrated.

Information is summarized and references given which would normally have to be sought in larger works of reference and in the literature. Calorimetric methods, EMF measurements and the determination of vapour pressures and other heterogeneous equilibria are discussed. No reference is made to spectroscopic methods.

The third part of the book deals with the estimation of thermochemical data including heat capacites, entropy and entropy changes and heats of formation. The fourth part comprises a compilation (126 pages) of data in tabular form on heats of formation, standard entropies, heats of transformation, fusion and evaporation, heat capacities, vapour pressures, standard free energies of reaction etc., for the elements and metal compounds.

This second edition has been completely revised and the tables of data have been brought up to date. Critical assessments of data by the National Bureau of Standards in Washington, and by well-known workers in the field have been incorporated. Two new sections on non-regular solutions and on slag-metal equilibria have also been incorporated in the early part of the book.

The final part of the book provides examples of the application of chemical thermodynamics to metallurgical problems. References to the tables and a bibliography are provided together with a subject index and a name index.

The second edition of this monograph will be of considerable interest and value not only to metallurgists but also to many chemists and technologists working in related fields.

As a valuable compilation of data and as a source of information on experimental methods it should find a place in all chemical libraries.—R. LONG.

GUIDA DEI PRINCIPALI PRODOTTI CHIMICI. By Cesare Ferri, Vol. I. Nicoli Zanichelli Editore, Bologna. 1955. Pp. 737.

The contribution of Italian chemistry to the progress of our science has often been overlooked, although since mediaeval times the genius of the Apennine peninsula has been so constant and indispensable that both in theory and practice chemical developments in the world would not be at their present high level without the concourse of our Italian colleagues.

While the English and German languages are today dominating the publications of chemical text books and treatises, the Latin derivation of the majority of our specific chemical terms makes the Italian language particularly apt to provide a readable vehicle for a chemical text. The 2-volume 'Guida Dei Principali Prodotti Chimici' of which the first volume has just appeared, confirms this impression and both the principal editor Cesare Ferri and the individual contributors ought to be congratulated upon the splendid effort they have made to provide an up-to-date reference book on modern industrial chemical products in their language.

A glance at the co-authors reveals that each major section of Italian chemical industry has provided specialists to deal with subjects most familiar to the individual chemical manufacturer. Therefore, the 737 pages of this first of two volumes presents an extremely readable compilation of up-to-date knowledge, and references to individual articles provide a speedy and worthwhile introduction to each subject treated, while brief but excellent bibliographical notes enable the reader to trace additional data if he finds the text too concentrated. However, glancing, for instance, at the 160 pages on pharmaceuticals the reader will, undoubtedly, be able to find as much basic information on this particular subject as he will want to find in a reference book of this kind.

It is particularly gratifying to find the latest international data and reference material from both European and American chemical literature quoted throughout the volume. Two and more page tables, for instance on ceramics, electrodes, plastics and plasticizers provide comparative data at a glance. More complicated subjects, such as solvents for spectroscopy, sequestering agents, polymerization catalysts and other auxiliaries are treated in detail. Altogether, the volume is in line with the best international dictionaries of this type.

That occasionally small mistakes occur in individual articles—for instance that Ontario is on page 200 stated to be located in the US—does not mar the general

impression of an extremely well produced and well written compendium which will be of help to chemists all round the world. The extremely clear print, particularly of chemical formulæ, is an added attraction and everybody who may feel the need for an Italian language publication on chemical technology would be well advised to consider C. Ferri's GUIDA as an addition to his library.—A. E. LAURENCE.

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY. VOLUME 3—POWER REACTORS. Compiled & Published by the United Nations Scientific Secretariate, New York. 1955. Pp. 389. 54s.

The value of the revelations at the 'Geneva Conference' requires no emphasis and this complete record of the proceedings has been published within four months as a series of 16 volumes so that all may have quick access to them. The limitations on what information is now withheld are largely those of industrial expediency. This Sir Christopher Hinton pointed out when some French members paid us the compliment of inquiring for further details of the Calder Hall Reactors (discussion on paper P/406, Vol. 3, p. 369).

In this volume on power reactors, we have a current assessment of progress towards the goal of a vast new industry. The other 15 volumes discuss the need for this new source of power, its cost, the physical factors on which it is based, purification and fabrication techniques employed, the control of hazards, legal and administrative problems, as well as the range of uses its by-products find in industry, medicine and agriculture.

The volume would have been improved by the provision of a detailed index. This was presumably sacrificed in order to prevent delay in publication. One notices that some conference members have lost their titles in this record but not their reputations. The illustrations are good and well produced. On the whole, it is a stimulating volume which bears witness to the feasibility of such power production and its ultimate economic utilization.

The United Kingdom's programme seems to have been defined by conditions of safety and lack of heavy water (though research reactors using it are listed in an appendix).

The Chemist's Bookshelf

The graphite-moderated, gas-cooled plutonium production piles at Windscale are inherently stable. This form is being developed further in the Calder Hall Reactor for the commercial production of electricity where pressurized CO_2 is used as the heat transfer agent within a closed shell. At the other extreme of the reactor family, some details were given of the Dounreay Fast Reactor which is being developed because of the very much greater degree of uranium utilization which is then possible. Under such conditions of extremely high heat fluxes, technological problems are enormously increased and liquid metals must be used as the heat transfer agent.

In the United States, similar gas and water-cooled, graphite-moderated reactors have been operated but are only mentioned in the catalogue of nuclear reactors. The first fast reactor, EBR, to produce electrical power on an experimental scale is described together with its successor EBR II. In between these extremes are included, among others, details of a pressurized light-water reactor using highly enriched and natural uranium fuel and the Sodium Graphite Reactor (SGR) which is designed to generate 75 MW. of electrical power and promises economic advantages.

In all the above reactors, the fuel elements are in the form of rods or compound plates. In some reactors, however, the fuel is dispersed uniformly in solution throughout the core. Such homogeneous reactors offer very interesting design problems. One which uses uranyl sulphate in heavy water is very fully described. The fuel solution is circulated under pressure through the reactor core and a heat exchanger. From this loop, fission product gases can be removed. No normal control rods are required since the reactor is made 'critical' by increasing the uranium concentration in the core and, due to the concentration decrease on liquid expansion, the reactor is inherently stable should it tend to overheat.

One noticeable omission is that no one has yet attempted a gaseous uranium hexafluoride reactor.

There are also Canadian, Russian, French, Dutch and Norwegian contributions while members from seven other countries asked questions.—J. S. M. BOTTERILL.

The Chemist's Bookshelf

CELLULOSE & CELLULOSE DERIVATIVES. 2nd Edition, Part III. Editors: E. Ott, H. M. Spurlin, M. W. Grafflin. Interscience Publishers Ltd., New York & London. 1955. Pp. viii + 544. $12.

This is the final part of the second edition, forming Volume 5 of the well known High Polymers Series, of a work which has been a standard reference text for cellulose chemists since its original publication in 1943. As in Parts I and II, previously reviewed in this journal, much of the first edition has been rewritten and new material included, each topic being contributed by a different American author. Part III deals with solution and physical properties of cellulose and its derivatives and includes a new chapter on tests and an appendix containing data of technical and commercial importance. Parts I and II were not provided with an index and comprehensive author and subject indices to all three parts are provided at the end of Part III.

Because of the fundamental work carried out in recent years on the solution properties of cellulose and its derivatives, a chapter dealing with this topic is largely new material. Following a consideration of general aspects of polymer solubility, special factors affecting the solubility of cellulose and its derivatives, such as chain flexibility, crystallinity and solvation, are discussed and the evaluation of solvent power is considered. There is a new section on the behaviour of cellulose xanthate as a polyelectrolyte. Others on the viscosities of dilute solutions and the determination of molecular weights and their distribution have been rewritten. Sections on thermodynamic and flow properties of solutions are similar to those in the first edition.

A chapter on the mechanical properties of cellulose and it derivatives deals with static and dynamic stress and strain and other properties, with molecular and morphological considerations of extension and with factors, such as molecular structure, orientation and the presence of weak spots, which may affect the strength of cellulosic materials. It provides a sound basis for the understanding of the mechanical properties of fibres and plastics.

The new chapter on tests is divided into two sections, the first of which deals with cellulose. General methods are given for the determination of moisture and inorganic constituents, for solvent extraction and for tests on pulping and bleaching liquors. Viscosity measurements on solutions of cellulose, the estimation of sugars other than glucose, alkali solubilities and copper numbers are included and physical tests related to sheet and fibre properties. The second section is concerned with cellulose derivatives and includes methods for determination of solution viscosities, solubility and stability tests, analyses for functional groups and the determination of such physical properties as melting point, density and moisture sorption. Although methods are only outlined full references are given to standard American and European procedures. The appendix gives such data as degree of substitution and commercial viscosity relationships, qualitative information regarding solubility, a scheme for the identification of cellulose derivatives, trade and generic names and some useful definitions and constants.

As was the case with Parts I and II, the book is very well documented with references. The new chapter on tests is a welcome addition and the book by itself is a reliable and authoritative work. The three parts together constitute what is probably an unequalled text and reference work on the chemistry and chemical technology of cellulose and its derivatives which will be read with pleasure and profit by cellulose chemists of all kinds.—W. R. MOORE.

Cadmium Poisoning

Poisoning by cadmium is now prescribed under section 55 of the Industrial Injuries Act and insurance is provided for all persons exposed to cadmium fumes. The regulations came into force on 8 February and copies (SI 1956 No. 118) can be purchased from HM Stationery Office.

Employment Figures

According to the February issue of the *Ministry of Labour Gazette* the total number of people employed in the chemicals and allied trades at the end of December 1955 was 523,600, of whom 373,100 were men and 150,500 women.

HOME

Chemical Society Library

The Chemical Society Library will close at 1 p.m. on Thursday, 29 March, and will re-open at 10 a.m. on Wednesday, 4 April.

British Celanese Trade Mark

British Celanese Ltd. announces that it will in future be marketing a range of chemicals under its trade mark, Syncel. Among products in the range of Syncel chemicals are the company's trichlorethylphosphate and vinyl acetate monomer. Bulk production of vinyl acetate monomer, which is an addition to the company's range, has now commenced.

Ceramic Society Meeting

The three sections of the British Ceramic Society will hold a joint meeting at the Imperial Hotel, Torquay, from 25 to 28 April. During the meeting several visits will be made to local works. Applications for hotel accommodation should be made to the assistant secretary, British Ceramic Society, Federation House, Stoke-on-Trent.

Making Research Films

The Scientific Film Association announces that a meeting on 'The Making of Research Films' will be held on 20 March, 1956, at 6.30 p.m. in The Mezzanine Cinema, Shell-Mex House, Strand, London WC2 . The meeting will take the form of discources illustrated by films and demonstrations of equipment. Professor F. H. Garner, O.B.E., director of the department of chemical engineering, Birmingham University, will be in the chair.

ICI Also Interested

Considerable interest is being shown in America and on the Continent in the possibilities of polypropylene manufacture and last week, in reply to a question from THE CHEMICAL AGE, a spokesman for Imperial Chemical Industries Limited, Plastics Division, admitted that investigations were being carried out in this country. ICI, he said, had produced a certain amount of this new material on a laboratory scale and were carefully examining the samples. The work had not yet reached the pilot plant stage. It was recently announced that a German firm had built a pilot plant capable of producing up to 1 ton per day of polymerized propylene.

Proabd Move

Proabd (England) Ltd., the well-known chemical engineering concern, has moved to new premises situated at 9 Marble Arch, London W1. The new telephone number is Paddington 2666.

ICI Expansion Should Go On

Mr. E. A. Blench, ICI Billingham Division production director, referring to the Government's latest 'financial squeeze', said at the annual dinner of Billingham Supervisors' Welfare Association on 24 February that 'If there are to be restrictions, we can only hope that it is recognized that ICI is so important to the economy of the country that its expansion programme should go on'.

Borough Polytechnic Courses

The two weeks intensive course in practical plastics technology to be held in April at the Borough Polytechnic, London, is now fully booked up, and a duplicate course has been arranged for the period 25 June to 6 July. The course of lectures by Dr. Swallow on 'Chemical Reactions Induced by Ionizing Radiations', will be given on Wednesdays, from 6.30 p.m. to 8.30 p.m., from 11 April to 2 May.

Hinchley Medal Presentation

Mr. T. McLachlan, D.C.M., A.C.G.F.C., F.R.I.C., will be presented with the British Association of Chemists' Hinchley Medal for 1955 at a ceremony at the Royal Society of Medicine (Barnes Hall), 1 Wimpole Street, London W1, at 6 p.m. on 16 March. Mr. McLachlan, who is vice-president of the Association, and president of the Association of Public Analysts, will afterwards give an address entitled 'The Analyst—Chemist, Technician or Magician?'

Monsanto to Make Polythene ?

It is reliably stated that negotiations are under way between Monsanto Chemicals Limited, the largest manufacturers of polystyrene in the United Kingdom, and the Esso Petroleum Company for the regular supply of ethylene from Fawley refinery. If the negotiations are successful Monsanto will use the ethylene for the production of polythene using the high pressure process of the German firm, Badische Anilin- & Soda-Fabrik AG.

• OVERSEAS •

NZ Salt Works

About 10,000 tons of salt is expected to be harvested at the Grassmere salt works near Blenheim in New Zealand. This would be more than three times the previous best yield, and worth something like £120,000.

Indian Pharmaceuticals & Dyestuffs

A survey of India's pharmaceutical and dyestuffs industry is being carried out by six Russian experts in conjunction with Indian experts. The object of the survey is to indicate the lines on which further developments should proceed.

First Year at Kwinana

Since BP's Kwinana refinery, Western Australia, was commissioned a year ago, some 2,000,000 tons of crude oil from the Persian Gulf have been processed. During the first year of operation, the refinery's oil port handled more than 250 ships, including tankers carrying away finished products—motor spirit, diesel and gas oil, kerosine and aviation turbine fuel and fuel oil—to markets in Australia and elsewhere.

Carbon Black Project

Phillips Chemical Co., a wholly-owned subsidiary of Phillips Petroleum Co., will build a carbon black plant with an annual output of 64,000,000 pounds in the Gulf Coast area. The plant will produce both Philblack 'O' and Philblack 'I', special types of carbon blacks which, when combined with natural or synthetic cold rubber, increases wear-resistance, it is claimed.

Canadian Chemical Industry

Mr. Herbert H. Lank, president of Du Pont Company of Canada Ltd., in his submission to the Royal Commission on Canada's Economic Prospects, said that the Canadian chemical industry was developing at a rate of seven per cent per annum. Last year the value of its production passed the billion-dollar mark for the first time. Assuming Canada's gross national product reached $57,000,000,000 by 1975, Canadian chemical production by then should be valued at $3,500,000,000—3½ times its present worth, he estimated. Mr. Lank pointed out that between 1946-55 Canada's chemical industry had spent $590,000,000 on new plant capacity, the most spectacular in its history.

Queensland Uranium for UKAEA

The United Kingdom Atomic Energy Authority has entered into a contract with Mary Kathleen Uranium Ltd. to buy uranium concentrates produced in the Mary Kathleen mine in north-west Queensland. Mary Kathleen Uranium Ltd. is a member of the Rio Tinto group of companies.

West German Imports

Western Germany's chemical imports amounts to DM 1,210,000,000 in 1955, according to figures just released. This is an increase of 28 per cent over 1954. At the same time West German exports of chemicals rose by 15 per cent to DM 3,400,000,000.

Indian Fuel Oils

India exported fuel oils for the first time during the second half of 1955, when it exported 78,000 tons of motor spirit and 123,000 tons of furnace oil. Australia, the Philippines, Burma, Ceylon and Pakistan were the main importers. Exports were permitted because there was a net surplus after making adequate provision for Indian stocks.

Kellogg Contract

The Kellogg International Corp., the London-based subsidiary of the M. W. Kellogg Co., has been awarded a contract by the Raffinerie Belge de Petroles of Antwerp for the design and construction of a combined catalytic de-sulphurizer and catalytic reforming unit. It will be the first unit in Europe designed by Kellogg to utilize the new Sinclair-Baker RD-150 platinum reforming catalyst.

Australian Coal Gas

The Australian State of Victoria is putting the final touches to its plan to pipe gas made from the extensive deposits of brown coal in Gippsland, in the east of the State, to Melbourne. The pipeline, 89 miles long, is expected to carry its first gas in six months' time. The project will cost £A10,000,000. At the West Melbourne gas works the brown coal gas will be mixed with gas from Altona oil refinery and with black coal gas.

• PERSONAL •

MR. H. C. TETT and MR. R. J. PINDER have been appointed managing directors of the Esso Petroleum Company. MR. C. CHILVERS, manager, co-ordination and economics department, has been appointed to the board.

MR. R. S. LEINSTER, MR. H. S. SCOTT and MR. M. K. SMITH have been appointed directors of Rugby Portland Cement.

MR. GILBERT WRAY, manager of the general sales division, Fort Dunlop, has been appointed to succeed MR. E. F. MITCHELL as the Dunlop Rubber Company's sales manager for the Midlands.

MR. F. C. HALL has been appointed to the board of General & Industrial Paints and will act as general sales manager in support of the assistant managing director, MR. A. G. JORDAN. Mr. Hall has been managing director of Allied Paints & Chemicals since 1954, a position that he will retain for the time being.

MR. J. K. BATTY, joint managing director of ICI, has been appointed Alkali Division chairman as from 1 March, in succession to MR. W. M. INMAN, M.Sc., who retired from the company on 29 February.

MR. LOUIS FLETCHER, F.R.I.C., chief chemist of Wm. Younger & Co. Ltd., the Edinburgh brewers, has been elected chairman of the Edinburgh and East Scotland Section of the Royal Institute of Chemistry.

A well-known and popular figure in British and Continental chemical and engineering circles, MR. CHRISTOPHER J. PRATT, A.M.I.Chem.E., A.M.I.P.E., A.I.I.A., relinquished his post as Work Study and Productivity Officer with the Association of British Chemical Manufacturers on Friday, 2 March. Mr. Pratt flew out to New York on Sunday and reported for work at Stamford, Connecticut on Monday morning. Mr. Pratt was born at Wellingborough, Northants in 1916 and was educated at the Rutherford College of Technology, Newcastle-on-Tyne. He has had exceptionally wide experience as a metallurgist, chemical engineer and industrial consultant. In July, 1952, he joined Eimco (Great Britain) Ltd. as chemical engineer and manager of the British Filter Division. He also worked for the parent company, The Eimco Corporation, in the US and Europe. He has travelled widely in Canada and the US as well as on the Continent. Mr. Pratt, who joined the ABCM in January, 1955, is now working for Dorr-Oliver Incorporated and will probably be employed as a senior chemical engineer in the firm's International Consulting Division.

MR. R. EMRYS JONES, A.M.C.T., F.R.I.C., has been appointed area chemist, research department of British Railways at Crewe, in succession to the late MR. V. BINNS, M.Sc., F.R.I.C. The Crewe laboratory, of which Mr. Jones will be in charge, is the oldest in the railway laboratories, having been founded in 1864. Mr. Jones, who was born at Blaenau Ffestiniog, North Wales, went to Crewe in 1923. He studied at the College of Technology in the evenings and obtained his A.M.C.T. in 1930 and his A.R.I.C. two years later. In 1943 he became a Fellow of the Royal Institute of Chemistry.

DR. W. R. A. D. MOORE, senior lecturer in physical chemistry at Bradford Technical College, is flying to Israel to take part in an international symposium on macromolecular chemistry. The expenses of Dr. Moore's visit are being shared by a commercial firm and the Bradford Education Committee.

MR. C. T. COOPER, manager of Cooksons Antimony Works, Willington Quay-on-Tyne for 36 years has retired, and has been succeeded by DR. L. R. SANDERSON of Monkseaton who joined the works after the last war.

Two awards of 150 guineas each have been made by the administrators of the Sir George Beilby Memorial Fund to DR. F. D. RICHARDSON, B.Sc., Ph.D., and DR. F. WORMWELL, M.Sc., Ph.D., D.Sc. Dr. Richardson graduated in chemistry at University College, London, in 1933, and carried out research for his Ph.D. at the same college. He also studied for some time at Princeton University. During the war he served in the RNVR and was particularly

concerned with the 'wiping' method of degaussing ships. In 1941 he invented the two-pounder star shell which was used extensively in night actions by coastal forces. After the war he joined the British Iron and Steel Research Association where he built up the chemistry department. In 1950 Dr. Richardson joined the Imperial College as Nuffield Fellow to establish the Nuffield research group in extraction metallurgy. The award has been made in recognition of his work on the thermodynamic properties of high temperature systems, with special reference to iron smelting and steelmaking. Dr. Wormwell is a graduate of Manchester University and received his M.Sc. in 1927. In 1928 he was appointed a junior assistant in the corrosion of metals section of the Chemical Research Laboratory at Teddington, finally becoming head of the corrosion of metals group in 1954. Much of his earlier work dealt with the mechanism of metallic corrosion in salt solutions and natural waters, with special reference to the influence of oxygen supply, temperature, pressure and movement, by means of accurate rate measurements over long periods in carefully controlled conditions. Dr. Wormwell receives his award for his work on surface reactions, with special reference to the mechanism of metallic corrosion, oxidation, and passivation processes.

Sheffield University is to confer the Honorary Degree of Doctor of Laws on MR. LAWRENCE H. A. PILKINGTON, senior technical director of Pilkington Brothers Ltd., and chairman of the British Glass Industry Research Association. Closely associated for many years with the College of Glass Technology in Sheffield, Mr. Pilkington was formerly chairman of the University's Glass Delegacy. He is responsible for the whole of the technical activities of the Pilkington Group both at home and overseas, and has special responsibility for research.

Obituary

MR. WILLIAM ALFRED SEDGEWICK, production manager at Courtaulds' rayon factory at Greenfield died on 2 March, aged 58. Mr. Sedgewick had been with Courtaulds for 43 years, starting at Coventry and later going to Wolverhampton, before moving to Flintshire 20 years ago when the Greenfield factory was opened. In recent years he made a trip to America to start the firm's new factory at Alabama.

MR. GILBERT J. GUGAN, the secretary of Samplers (Middlesbrough) Ltd., analytical chemists, collapsed and died on South Shields railway station while on a business trip to Tyneside. Mr. Gugan, who was 56, had been secretary of the firm for 26 years.

PROFESSOR JOHN REGINALD HARVEY WHISTON, O.B.E., associate professor of applied chemistry at the Royal Military College of Science, has died at Limpsfield, at the age of 63. Joining the department of chemistry of the Royal Military College of Science in 1922, he became associate professor in 1936. When the college was reorganized after the war, he became associate professor of the newly-formed branch of applied chemistry. Professor Whiston specialized in the study of explosives.

The death has occurred in Leyden of PROFESSOR WILLEM HENDRICK KEESOM, the physicist who was well known for his work on the properties of matter at low temperature. He was 79. Professor Keesom was the first person to solidify helium, but of greater importance than this was his discovery of the so-called lambda point of liquid helium. He was co-director of the Kammerlingh-Onnes laboratory at Leyden and was also one of the founders of the Institut International du Froid.

Double Celebration

THERE were two reasons for celebration when L. H Manderstam and Partners, consulting chemical engineers, gave a cocktail party at their offices at 38 Grosvenor Gardens, London SW1, on Friday 2 March. The first reason was that these offices have been modernized and redecorated; the second and more important was that the firm has now been in existence for 15 years.

L. H. Manderstam are consultants in many branches of chemical industry, including heavy chemicals and synthetic fertilizers and they have associates all over the world. They also act as Crown Agents and are advisors to the Ceylon Government.

Mr. Manderstam, the founder of the firm, is well known in the industry and has been a chemical engineer and consultant for some 25 years.

Company News

Monsanto Chemicals Ltd.

Consolidated trading profits of Monsanto Chemicals Ltd. amounted to £2,818,568 for 1955, compared with £2,940,407 for the previous year. Net balance, however, is higher than in 1954, owing to lower provisions for depreciation and taxation, the 1955 figure being £1,097,311 compared with £880,739 for 1954. The company's net income was £1,789,573, against £1,791,083, before tax, and £998,150 against £806,499, after tax. A second interim declaration of 15 5/6 per cent repeats the previous 22½ per cent total dividend on the £2,700,000 Ordinary stock.

British Oxygen Co. Ltd.

Group trading profits of British Oxygen Co. Ltd. for the nine months and of the subsidiary companies for the 12 months ended 30 September, 1955, after depreciation of £2,015,484, amount to £4,277,152. This compares with £4,168,369 adjusted to a period corresponding to the current results and with £4,736,856 (after £2,189,618 depreciation) for the year 1954. Net profit for the period is £1,764,673, compared with £2,008,079 for 1954. A final dividend of 9 per cent is recommended on the £11,364,777 Ordinary capital as increased by a two-for-five 'rights' issue at 50s per £1 share.

Unilever Group

Combined trading profits throughout the world of Unilever Ltd. and Unilever NV for 1955 are estimated at £85,556,000, compared with £70,095,000 for 1954. Consolidated net profit is estimated at £45,180,000 against £31,854,000. The board of Unilever Ltd. is to recommend a final dividend on Ordinary capital of 9¾ per cent, making 15¾ per cent for 1955. The board of Unilever NV is to recommend a final dividend of 8¾ per cent, making 14 per cent for 1955. The total dividends are at the same rates as for 1954, but are payable on capitals as increased by the one-for-four scrip issues in December 1955.

Shawinigan Water & Power Co.

Mr.. J. A. Fuller, president of the Shawinigan Water & Power Co., has announced that net earnings per common share for the year 1955 of the company were $3.48 on the 2,422,164 shares outstanding at 31 December, compared with $2.91 per share on 2,195,945 shares in 1954. The statement is a consolidation of the earnings of The Shawinigan Water & Power Co. and the wholly-owned subsidiary, St. Maurice Power Corp., for both years. Gross revenue from power sales for the year totalled $47,898,994, an increase of 12.9 per cent over 1954, and total operating expenses, including $6,765,000 provided for depreciation, amounted to $30,789,386, which was $2,213,347 more than in 1954. Provision for income and profits taxes for the year amounted to $6,443,000 as against $4,954,000 the previous year. The earnings available for both preferred and common dividends, after deduction of all charges, amounted to $9,451,984 as compared with $7,413,784 in 1954.

D. Macpherson & Co.

Group trading profits of Donal Macpherson & Co., paint manufacturers, for the year ended 31 October, 1955, amounted, before tax, to £452,871, against £356,458 for the previous year. The company is raising the dividend from the equivalent of 18 per cent to 22½ per cent on £500,000. The final dividend recommendation is 15½ per cent, compared with 20 per cent for a 30 per cent total for 1953-54.

Negretti & Zambra

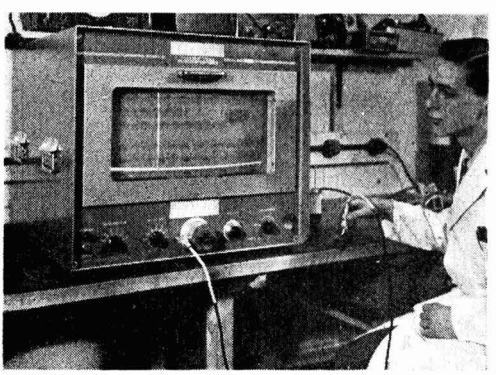
For the year ended to 30 September 1955 the company, after making provision for depreciation and tax, made a profit of £116,338 to which has been added £272,163, brought forward from last year's accounts. The balance available, after leaving £357,417 to be carried forward, is £20,125 from which the directors recommend the payment of a final dividend on the ordinary 'A' and the ordinary shares for the year to 30 September 1955, at the rate of 10 per cent per annum, less tax. The annual general meeting will be held on 14 March at the Criterion Restaurant, Piccadilly Circus, London.

Glass Makers Freeze Prices

UK glass container manufacturers will not increase prices for at least six months, according to a statement issued this week by the Glass Manufacturers' Federation. The decision was taken at a recent meeting of producers of the bulk of glass bottles and jars in this country.

Publications & Announcements

EXTENDING their range of ultrasonic thickness gauges, a new model, the Type 1107B Visigauge, has been introduced by Dawe Instruments Ltd., 99 Uxbridge Road, London W5. By this instrument the thickness of components, of which only one side is accessible, can be measured non-destructively with high accuracy. To measure the thickness of a component the operator places the probe of the Visigauge on it, using a little oil or vaseline to obtain a good acoustical coupling. The probe consists of a piezoelectric transducer in a stout casing which transmits a continuous signal of ultrasonic waves into the material being gauged. The signal is generated by an electronic sweep oscillator plugged into the main instrument and connected to the probe by means of a cable. Direct reading scales are available for the measurement of thicknesses between 0.005 and 2.5 inches with a claimed accuracy of between ±0.0005 and ±0.003 inches.



The Dawe Type 1107B Visigauge

* * *

TORNADO bifurcated fans, which were introduced to the UK market by Keith Blackman Ltd. in 1952, are now available with solid pvc casings and impellers. They are said to offer various advantages when handling corrosive fumes from an extensive list of chemicals. Firstly, it is claimed that the solid material used overcomes the possibility of corrosive attack which might be experienced by a specially coated fan with a damaged surface. Two additional advantages are that the new fans are quieter in operation and comparable in price with the alternative, specially coated steelplate bifurcated fans.

* * *

MACHINES and equipment for the chemical industry manufactured by Sulzer Bros. (London) Ltd., Bedford Square, London WC1, are described in the latest issue of the *Sulzer Technical Review*. It is frequently essential that the gases used in chemical reactions should be free from oil and other impurities. This requirement cannot always be met by the turbo compressor as in many cases the pressure ratio is too high in relation to the volume of gas handled. Sulzer claimed a few years ago to have found a solution to this problem in the Sulzer compressor for oil-free delivery in which there is no contact between the piston and cylinders walls, sealing being obtained entirely by labyrinth action. The life of the machine is prolonged by the absence of friction. Among other plant manufactured by Sulzer are evaporating installations, spray drying plant, distillation plant, and adsorption and absorption plant. This issue also contains a review article on 'The Use of Demineralization in Steam Raising Plant'. A short survey is given of the principle demineralizing systems together with an account of the operation of two-bed and mixed-bed plants. Demineralization is carried out by ion exchange using specially prepared resins. The water first gives up its cations in exchange for hydrogen ions in the cation exchanger, then its anions for hydroxyl ions in the anion exchanger. The radicals of the dissolved salts remain in the exchangers while the liberated hydrogen and hydroxyl ions combine to form water.

* * *

A PAINT capable of resisting and preventing the growth of mildew, mould and fungus has been developed by Factron Products Ltd., Tretol House, The Hyde, London NW9. It is said that this anti-mould and fungus paint may be used internally or externally; it is easy to apply and dries with an 'eggshell' finish. A range of 12 colours is available. The makers recommend this paint for use in breweries, refineries, dairies, bakeries, fermentation cellars and similar buildings.

Next Week's Events

MONDAY 12 MARCH

Incorporated Plant Engineers

Liverpool: Royal Institution, Colquitt Street, 7.15 p.m. Annual general meeting.

TUESDAY 13 MARCH

Royal Institution

London: 21 Albermarle Street W1, 6 p.m. 'Colloids & Their Behaviour' by Sir Eric Rideal, M.B.E., M.A., D.Sc., F.R.S.

The Chemical Society

Leeds: Chemistry Lecture Theatre, The University, 6.30 p.m. 'Troplium' by Professor M. J. S. Dewar, M.A., D.Phil.

Belfast: Queen's University, 7.45 p.m. Meeting for the reading of original papers.

RIC (London)

Hatfield: Hatfield Technical College, Herts, 7.30 p.m. 'The Development of Pharmaceutical Chemicals' by N. R. Campbell, B.Sc., Ph.D., A.R.I.C.

SCI (Chemical Eng. Group)

London: Apartments of the Geological Society, Burlington House, Piccadilly W1, 5.30 p.m. Meeting for the presentation and discussion of a paper 'The Use of Reinforced Plastics in the Chemical Industry & Some Chemical Problems Connected Therewith'.

Institution of Chemical Engineers

Chester: Grosvenor Hotel, 7 p.m. 'A Study of the Motion of the Solid Phase in a Solid-Liquid Fluidized System' by N. L. Franklin, M.Sc., Ph.D., A.Inst.Chem.E.

WEDNESDAY 14 MARCH

Institute of Sewage Purification

Glasgow: 39 Elmbank Crescent, 7.30 p.m. 'The Effects of Metal Finishing Wastes on Sewage Purification' by A. E. J. Pettet, M.A., M.Inst.S.P. All members of the Institute of Metal Finishing invited.

Society of Leather Trades' Chemists

Leeds: The University, 2 p.m. General discussion on E.I. Kips.

Society of Instrument Technology

Sheffield: The University, 7 p.m. 'A University Course in Instrumentation' by A. Pollard (Leeds University).

Institute of Metal Finishing

Birmingham: Exchange & Engineering Centre, Stephenson Place 2, 6.30 p.m. 'Problems of Communication Between Science & Industry' by J. Hooper.

SCI (Microbiology Group)

London: Rooms of The Chemical Society, Burlington House, Piccadilly W1, 6.30 p.m. 'The Preservative Action of Acidic Substances in Food' by M. Ingram, M.A., Ph.D., F. J. H. Ottaway, B.Sc., J. B. M. Coppock, B.Sc., Ph.D,. F.R.I.C.

SCI (Yorkshire)

Leeds: The University, 6 p.m. Fifth Brotherton Memorial Lecture 'Current Trends in the Chemical Industry' by Dr. C. H. Clarke, O.B.E. The chairman and directors of Brotherton & Co. invite those attending to tea in the central research laboratory at Kirkstall Lane from 3.45 to 5.15 p.m.

THURSDAY 15 MARCH

The Chemical Society

London: Science Museum, South Kensington SW7, 6.30 p.m. Reception and Conversazione.

Bristol: The University, 5.15 p.m. 'Some Recent Developments in the Chemistry of the Vitamins D' by Professor B. Lythgoe, M.A., Ph.D.

Edinburgh: North British Station Hotel, 7.30 p.m. 'The Application of New Techniques to Some Problems in Brewing' with contributions from Professor I. A. Preece, L. Fletcher, and Dr. J. O. Harris.

SCI (Road & Building Group)

London: Institution of Engineers, Pepys' House, Rochester Row SW1, 6 p.m. 'The Assessment of the Properties of Mortar & Plastering Mixes' by A. H. Thornloe, B.Sc., M.A., A.R.I.C.; 'Mortar Plasticizers' by J. W. Skeen.

Textile Institute

Manchester: 10 Blackfriars Street, 7 p.m. 'Teaching Textile Chemistry' by H. A. Turner, M.Sc., F.R.I.C., F.T.I., F.S.D.C.

RIC (London)

Chatham: Medway College of Technology, Maidstone Road, 4.30 p.m. Film Display.

FRIDAY 16 MARCH

SCI (Fine Chemicals Group)

London: King's College, Strand WC2, 7 p.m. 'Continuous Counter-Current Distribution of Batches of Material' by Dr. J. D. Johnson (Beecham Research Laboratories Ltd.). Annual general meeting.

[continued on page 612

Next Week's Events

continued from page 610

The Chemical Society

Southampton: The University, 5 p.m. 'Gas-Phase Chromatography' by Dr. A. T. James.

SCI (Aberdeen)

Aberdeen: Marischal College, 7.30 p.m. 'Distinguished Men of Science Living in Britain in 1807/08' by A. Clow, M.A., Ph.D., D.Sc.

SCI (Liverpool)

Liverpool: Senate Room, The University, 6.30 p.m. 'The Establishment & Administration of Food Standards in Jamaica' by L. H. Greenwood-Barton, B.Sc., F.R.I.C., F.R.S.H.

SCI (South-West)

Plymouth: Technical College, 4.30 p.m. Annual general meeting.

Market Reports

LONDON.—Steady trading conditions continue to be reported from most sections of the industrial chemicals market, with contract deliveries well up to schedule and export inquiries about the average for recent weeks. The price position is generally firm particularly copper sulphate and other non-ferrous metal compounds. The coal tar products market remains strong with output endeavouring to meet demand.

MANCHESTER.—On the whole satisfactory trading conditions have been experienced on the Manchester market for heavy chemicals during the past week. The textile and allied trades are absorbing fairly good supplies of a wide range of products, and a steady demand from other leading outlets has been reported. As regards prices the undertone, especially in the non-ferrous metal compounds, remains firm. A fairly steady movement of supplies of the fertilizer materials continues, and a good demand for most of the tar products is also a feature.

GLASGOW.—A rather improved position has to be reported from the Scottish heavy chemical market during the past week, and has covered quite a varied range of chemicals. On the fertilizer side, the demand here has been steady with emphasis on forward bookings. Prices remain steady with a slight firming in some directions. The usual flow of export inquiries is being received, and on the whole the market continues favourable.

Condensed-Milk Technology

TECHNOLOGY in the condensed milk industry has eliminated many of the former uncertainties in its processes and, as a result, products of standard grade and quality have been achieved from a variable raw material, Mr. G. B. Wright, director, The Northern Dairy Group, told the Sugar Confectionery Panel of the British Food Manufacturing Industries Research Association on 21 February.

Mr. Wright, who was speaking on 'The Technology of Milk Condensing', said that the effects of heat on milk at various stages of concentration were of governing importance in milk condensing, but they were not completely understood.

The lecture covered a wide field, including advances in processing technique centred round the development of the vacuum evaporator, problems in the cooling of sweetened milk and the control of lactose crystallization. Benefits resulting from the development of the continuous cooker and cooler in the production of sterilized evaporated milk were also dealt with.

Mr. Accles & Mr. Pollock

For many Britons it has become a habit to stop and read the cartoon advertisements of Accles & Pollock whenever they appear in the National or Technical Press and it is doubtful if over a long period of time the publicity of any other firm whose products are not consumed by the public has attracted such widespread interest. The firm has now issued a new publication (Ref. P.201), 'Booklet of Advertisements' which contains reproductions of some of the more popular of their advertisements. Readers can obtain copies of this publication by writing to Accles & Pollock Ltd., Oldbury, Birmingham.

Provisional figures for industrial building schemes granted location approval in the UK during 1955 have been published by the Board of Trade. The chemical industry comes fourth on the list with a total of 8,300,000 square feet.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

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

ARMSTRONG SIDDELEY MOTORS have a vacancy for a **SENIOR CHEMIST** in their Chemical Laboratory. This is a new position of unusual responsibility, since the successful applicant would be expected to take charge of chemical work and be directly responsible to the Chief Chemist. A Degree in Chemistry is essential, although in certain circumstances an Honours Degree in general science would be acceptable. Applicants should be over 25 and have had previous experience in executive positions. The position carries commensurate salary and senior executive status. Applications will be treated in strictest confidence and should be sent to the TECHNICAL PERSONNEL MANAGER, ARMSTRONG SIDDELEY MOTORS, COVENTRY quoting Reference SC/Lab.

CHEMISTS, with a bias towards Physical Chemistry, required by the Research Laboratories of a rapidly expanding company specialising in Timber Preservation. Applicants must possess an Honours Degree in Chemistry. Salaries according to qualifications and experience and will not be less than £700 per annum. In addition to the basic salary, successful candidates will participate in a generous bonus scheme. Applications should be addressed to **THE TECHNICAL DIRECTOR, HICKSON'S TIMBER IMPREGNATION CO. (G.B.), LTD., INGS LANE, CASTLEFORD, YORKS.**

IMPERIAL CHEMICAL INDUSTRIES LIMITED
METALS DIVISION
CHEMIST

There is a vacancy for a
CHEMIST,
University Graduate, or equivalent, in our Ceramics Factory at Stourport-on-Severn, Worcs.
Experience in this type of work, although not essential, would be advantageous. This post offers great scope for advancement to the right man.
Excellent conditions of employment include Pension Fund, Profit-Sharing Scheme, etc. Financial assistance towards removal expenses is available for married men. Out-of-pocket expenses are paid to applicants invited for interview.
Application forms may be obtained from the
STAFF MANAGER,
I.C.I. METALS DIVISION,
KYNOCH WORKS,
WITTON, BIRMINGHAM, 6,
quoting ST/2/CA.

SENIOR Chemical Engieeers with considerable experience are invited to apply for consideration for appointment to a large Industrial Consultancy Organisation currently undertaking expansion at its offices in the West of England and London. Applicants must be corporate members of the appropriate institutions and have had wide experience in engineering projects of magnitude. It is intended that appointments will be approximately three months' time, but preliminary interviews will be arranged in the near future. Norris Industrial Consultants, Ltd., 3, Unity Street, College Green, Bristol, 1.

FOR SALE

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

MORTON, SON AND WARD, LIMITED,
STAINLESS STEEL VESSELS

VESSELS of all shapes and sizes, jacketed or unjacketed —with stainless steel mixing gear to requirements; also stainless steel storage tanks and vacuum vessels.
"MORWARD" "U"-shaped TROUGH MIXERS — up to 2 tons in stainless steel, with agitators, scroll or paddle type, jacketed or unjacketed.
Stainless Steel **TROUGHS, TANKS** and **CYLINDERS** made to requirements.
These items can also be fabricated in mild steel.

JACKETED PANS

100g., 150g., and 200g., new in mild steel, for 100 lb. p.s.i. w.p.—with or without mixing gear.
3 cwt. **TROUGH MIXERS** by **CHALMERS** and **GARDNER** —stainless steel lined troughs.
50g., 75g. and 100 g. heavy duty **MIXERS** by **FALLOWS** and **BATES.** Agitators driven through bevel gears from fast and loose pulley.
200g. cast-iron **JACKETED MIXING VESSEL** with nickel-chrome impellor type agitator driven through bevel gears from fast and loose pulley.

BROADBENT HYDRO EXTRACTORS

21" **EQUAL TO NEW,** galvanized baskets, electrically driven through centrifugal clutch or belt driven. Safety nter-locks.

PUMPS

Selection of new MONO and second-hand Pumps in stock—2 in. to 5 in.

Inquiries Invited.

MORTON, SON AND WARD, LIMITED,
WALK MILL,
DOBCROSS, NEAR OLDHAM,
Lancs.
Phone Saddleworth 437

TOGGLE PRESS, "David Bridge" table 15½ in. by 14 in. Stroke 6½ in., with hand wheel on side, 65 in. diam. Price, £80. **THOMPSON & SON (MILLWALL), LTD., LONDON, E.14 TEL. EAST 1844.**

TWO Torrance 6' **EDGE RUNNER MILLS** & one 5' by Cox.
GARDNER MIXER. trough 17' × 8' × 8'
Two **GARDNER SIFTER/MIXERS** size "H" and one"G"
FILTER PRESSES, C.I. and Wood.
Two Scott **S.E. EVAPORATORS** with Pumps & Motors.
MIRACLE MILLS, sizes 1, 2 and 4W.
No. 1 motorised **KEK** Mill, pin disc type.

RICHARD SIZER, LTD., HULL.
Tel. **HULL CENTRAL** 31743

For Sale—*continued*

PHONE 98 STAINES.

(Two) 5,500 gall. 18′ × 8′ **CYL. TANKS. S.S. EMULSIFIERS** or **MIXING ARMS** ¼, ½, 1 and 2 H.P. A.C. (Unused) **ELEC. STIRRING ARMS** ½ H.P./350 R.P.M./A.C. 2,400 gall. **CYL. GLASS LINED TANK. S.S. JAC. MIXERS** 39″ × 32″ and 40″ × 24″. **OVENS, AUTOCLAVES, CONDENSERS, MIXERS, PUMPS, PANS. HYDRO'S** etc. **HARRY H. GARDAM & CO. LTD.,**

WANTED

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

IF you have any high-class Chemical Plant for disposal, please let us know.
WINKWORTH MACHINERY, LTD.,
65, HIGH STREET, STAINES.

WORK WANTED & OFFERED

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

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

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

AUCTIONEERS, VALUERS, Etc.

EDWARD RUSHTON, SON AND KENYON (Established 1855).

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

Telephone 1937 (2 lines) Central Manchester.

INDEX to advertisers in this issue

Printed in Great Britain by THE PRESS AT COOMBELANDS LTD., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154 Fleet Street, E.C.4, 10 March, 1956. Registered at the General Post Office. Entered as Second Class Matter at the New York, U.S.A. Post Office.