The
Chemical Age

VOL LXIX 3 OCTOBER 1953 No 1786

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N, NH_3, and Food

CROP responses to nitrogen are often spectacular and with few exceptions highly profitable. The leguminous crops have made their special arrangements with Nature, and for all crops severe deficiencies in other essential plant-foods can inhibit the influence of nitrogen; in general, however, more nitrogen = more food. The law of diminishing returns makes an entrance, but not at too early a stage; indeed, with one highly important crop, grassland, we have currently found that much greater annual applications of nitrogen can be given than were ever considered safe and sensible a generation or so ago. Crookes as far back as 1898 was essentially right and superbly foresighted when he warned the Western races that their future hung upon the achievement of industrial fixation of nitrogen, for without it the time would come when we 'would be squeezed out of existence by the races to whom wheaten bread is not the staff of life.' It is doubtful whether the racial distinction made by Crookes still holds good. We know now that rice as well as wheat responds progressively to nitrogenous fertilisers; and rice is needed just as wheat is needed.

In Britain more than three-quarters of the nitrogen given to our soils has been 'created' by synthetic fixation. Also, for every three or four tons of synthetically-fixed nitrogen used at home, we have exported one ton so that nitrogen grabbed from out own atmosphere has journeyed forth as sulphate of ammonia to feed tea in India or rubber in Ceylon. The pattern is slowly changing in this respect, however, and synthetic fixation is ceasing to be the technocratic monopoly of highly industrialised nations. India since the war has set up her own first fixation factory. After all, some 150,000 tons of gaseous and chemically reluctant nitrogen press down upon every acre of the earth's surface.

Currently there are two arguments concerning our utilisation of the fixing process. One was recently raised in a distinguished contemporary's leader (*Chemistry and Industry*, 1953, 977). We have been reminded that the energy-equivalent of five tons of coal is needed to fix one ton of nitrogen. The air's nitrogen may be inexhaustible and everywhere, but the basic reaction of synthetic fixation is $N_2 + 3H_2 = 2NH_3$ so that for every atom of N that is won from the atmosphere three atoms of H must be won from water by consuming reducing agents: $C + H_2O = CO + H_2$. We must use up three carbon atoms to win two nitrogen atoms from the air. F. C. O. Speyer has calculated that if 50,000,000 tons of fertiliser nitrogen are needed to feed the world's likely population at the end of this century, an annual consumption of 250,000 000 tons of coal will be required. Food, then, equals fuel, or *vice versa*, and we are thinking badly and superficially when we regard the nitrogen supply problem as settled for all time because, with a combination of catalysts and high pressure, we can persuade atmospheric nitrogen to join up with hydrogen. We can indeed—but at a price. Disregarding the confusing effects of suspended and then recreated subsidies, there have been small falls in the prices of most fertilisers. But the price of sulphate of ammonia did not

follow this small but welcome trend. Though home-produced, it rose a little while the prices of imported potash and phosphate decreased. For coal had gone up again.

As a coal-minded country we are perhaps too ready to assume that C as the necessary reducing agent to produce H for fixation must be coal. There are sources of C that are more readily renewable than the fossilised end-point of organic matter, sources that are also more widely world-distributed. When we try to look ahead and draw up budgets for future generations, we are unable to divorce our minds from the fixed ideas of our own times. We do not know whether or even when the Coal Age will be left behind in history; but the warning view expressed in *Chemistry and Industry* that 'industry, transport, food-production, and food-processing are all in competition for a limited stock of fossil fuels and other earthy substances required by modern agriculture' may be merely looked back upon as a curiosity when the Atomic Age has taken possession. Nitrogen, anyway, is not fixed by hydrogen alone. In 1898 Crookes was not thinking in terms of hydrogenation but of oxidation, and a small fixation unit, with an electric arc as the persuasive influence, was operated in 1900 at Manchester; by 1902 the Birkeland-Eyde process had been initiated in Norway: $N_2 + O_2 = 2NO$. This different route to synthetic nitrogen compounds was based upon electric power in turn derived from water-power. The higher school and university text-books of the 'twenties devoted much more attention to the N-O process than to the Haber N-H process. By the year 2000 the world may be tapping more of the air's oxygen and not consuming nearly as much carbon for hydrogen production in the fixation industry. The nitrate route rather than the ammonia route could become universally economic.

The second argument or controversy is not perhaps as fundamental. Having combined nitrogen with hydrogen, should we not use more of it as ammonia for direct soil application? Do we need to incur the costs of further processing into sulphate of ammonia or ammonium nitrate? At unit cost, ammonia is the cheapest nitrogenous fertiliser. In the past ten years the use of ammonia as a fertiliser has made striking progress in the United States. Injection appliances have followed the plough instead of drills or broadcasting spreaders for solid fertiliser. The argument is certainly powerful—on paper. In practice, we cannot ignore the fact that liquid ammonia or strong ammonia solutions are far from easy and amiable materials for farm handling or for storage in agricultural areas. Sulphate of ammonia may be ammonia much diluted, but it is readily handleable and, above all for a material used so seasonally, can be stored in any reasonable building. Nor in a small country such as ours are factory-to-farm transport costs as serious an economic factor as they are in the United States. It seems important, too, to stress that converting ammonia into the sulphate need not—and certainly in this country at Billingham does not—draw upon free sulphur or sulphuric acid supplies. Anhydrite is used to provide the sulphate radical (see CHEMICAL AGE, 1951, **65**, 381) and it is only the recovery processes of the gas and coke industry that need to consume sulphuric acid.

British field tests with ammonia as a fertiliser are reported in the current number of the Ministry of Agriculture's journal (1953, **60**, 275). The conclusion reached—'on balance, it is doubtful whether, in existing circumstances, any change in practice can be justified in this country'—is somewhat negative, but it may be premature. The whole question seems to rest upon the costs and extra effort involved in special equipment and storage, factors which may well outweigh the more obvious economy

On the other hand, sulphate of ammonia is the predominant nitrogen source in compound fertilisers. Ammoniation is much more practicable in factories than in fields, but the present fertiliser legislation in Britain discourages the use of alkaline materials owing to their effects upon phosphate water-solubility. Here in the future perhaps is the major opportunity to use ammonia as it emerges from fixation and without further chemical garbing. A promising start in this direction, using ammoniacal liquors from the gas industry, has already been made in Scotland.

Notes & Comments

Outlook Less Certain

THE chemical industry's prospects on the other side of the Atlantic seem somewhat mixed. Fears that other chemical-consuming industries will do appreciably less business in future create an apprehensive background. US car production is likely to drop, which means less paint, less synthetic rubber, and less plastics for one of the biggest single markets. Defence purchasing is likely to be cut down and no one is certain that the ordinary home market can absorb what the government no longer demands. Perhaps the biggest fear of all is to be found in agricultural chemicals; after years of expansion, demand is showing unmistakable signs of contraction. The US farmers have less money to spend. Support-price purchases of farm produce have built US food stocks up to an embarrassing level and agriculture's economic prospects have been abruptly chilled. Stock farming is particularly depressed. Fertiliser demand may be well maintained but selective weedkiller and insecticide sales are bound to be affected. The one bright spot is the textile industry; having had its own depression while other industries have been booming, this is apparently reviving at an opportune time. Textile chemicals have a better outlook than most.

Danger Not Obvious

THE situation is insidiously rather than obviously dangerous. Rapidly rising demand has been met year after year by rapidly rising production, and the rate of investment in new plant and plant extensions has been phenomenal. But one way or another capital has had to be hired and many of the hire charges remain. They may be more difficult to meet if sales and output are reduced. For the time being the fact that profits taxation has been reduced may balance the financial equilibrium. But for that, there would be much less optimism about 1954. The last Anglo-American Productivity Council Report—'Heavy Chemicals'—revealed what is simultaneously the great strength and weakness of the US chemical industry. In all ways of measurement but one, US productivity was higher. The exception was the measure of productivity per unit of capital invested. There British productivity was the higher. An abundance of modern plant is a golden asset when the demand for goods is insatiable; unless it has been fully paid for, it can be a costly liability when the demand is dropping.

Fierce Competition Likely

ONE development is almost certain. The US industry at home will compete fiercely in the effort to keep plants at full or fairly full output. Additional competition from abroad will not be sympathetically received, the 'trade not aid' slogan notwithstanding. There will be powerful pressure for bigger tariffs wherever European chemicals secure noticeable amounts of business. Commercial liberalism thrives best in an expanding situation. Here we should be foolish to cherish any illusions about earning dollars. They are likely to be made more difficult to earn.

Zirconium & Corrosion

AS a metal in significant supply zirconium is so new that little has yet been published about its properties as a material of construction. A useful survey of zirconium's resistance to corrosion has recently been published (*Chemical Engineering*, 1953, **60,** [9] 304). Commercial zirconium, which may contain up to 2 per cent of hafnium and 0.75 per cent of iron, has remarkably high resistance to organic acids, metallic chlorides, hydrochloric acid and phosphoric acid. It offers exceptional promise as a special constructional material by displaying high resistance to just those corrosive substances that many other alloys and metals cannot withstand. Where contamination of the product or process materials is even more costly than decline in the working life of the plant, zirconium seems likely to give outstanding service to the chemical industry. Its

immunity to attack approaches that of tantalum. Also, its other properties will not handicap employment in plant construction. It has good machinability, has high strength despite lightness of weight, and in general can be mechanically handled or shaped as comfortably as titanium. This is evidenced by the fact that commercial zirconium is already available in America as sheet, strip, plate, wire, bar, rod or forgings. Some indication of zirconium's advance as an available metal is given by the recent report (*Chemical Week*, 1953, **73**, 11, 12) that the Carborundum Company's $2,500,000 plant at Akron is ahead of production schedule on zirconium production. However, as a sidelight on general availability to industry it is also reported that the Atomic Energy Commission has placed orders totalling $11,000,000 for supplies over five years. Atomic energy development may absorb much of the zirconium that is initially produced.

By-Product Iron Ore

International Nickel Company Process

THE International Nickel Company of Canada, Limited, has announced that it is undertaking the production of by-product iron ore from nickel ores in the Sudbury District of Ontario, where its mining operations are centred.

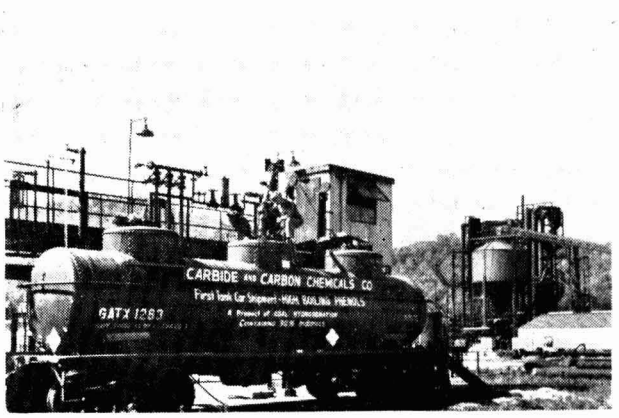
Outlining plans for the project, Mr. J. Roy Gordon, vice-president and general manager of Canadian Operations, said the company was beginning immediately the construction of a $16,000,000 plant in the Copper Cliff area as the first unit in an operation which will ultimately yield about 1,000,000 tons of high-grade iron ore a year in addition to nickel from Sudbury ores.

The new plant will supply iron ore higher in grade than any now produced in quantity in North America. Containing at least 65 per cent iron natural and less than 2 per cent silica, this ore will command a premium price for direct use in open hearth and electric furnace steel production in Canada and the United States. By comparison, ore from the famed Mesabi pits of Minnesota contains 51.5 per cent iron natural.

Initially the plant will treat 1,000 tons a day of nickel-bearing pyrrhotite removed from ore in the early stages of processing at Copper Cliff.

The recovery of iron ore as a by-product is considered one of the outstanding advances in nickel extraction metallurgy. Nickel production throughout the world, both in operating plants and in plants under construction, is based on processes in which the iron content of the ore is rejected in slag or in tailings. Ferro-nickel production, in which iron is an undesirable impurity, involves recovery of only a minor portion of the ore's iron content.

The Inco method, in addition to being the first to permit the recovery of high-grade iron ores, is of great importance in opening the way for increased recovery of other elements (including sulphur when its production is economically feasible) from the complex Sudbury ores.



The first tank car of high boiling phenols as it was shipped on 17 August, 1953, from the West Virginia coal-hydrogenation pilot plant by Carbide and Carbon Chemicals Company. The USA firm has just announced the known components of 50 per cent of this mixture: indanol-4, approximately 15 per cent; indanol-5, approximately 15 per cent; 3-methyl 5-ethyl phenol, approximately 10 per cent; n-propyl phenols (meta and para), 5 to 10 per cent

Leather Chemists' International Conference

Dr. K. H. Gustavson Elected to Presidency

THE third biennial Conference of the International Union of Leather Chemists' Societies was held in Barcelona on 13-18 September, and was attended by visitors from all the countries of Western Europe. The British Society of Leather Trades' Chemists was represented by a contingent of 40.

At a meeting of delegates to the International Union held in Barcelona University on Tuesday morning, 15 September, the Austrian Leather Chemists' Society was formally admitted to the Union, and the following officers for 1954-5 were elected:— President, Dr. K. H. Gustavson (Sweden); first vice-president, Dr. H. G. Turley (USA); second vice-president, V. M. J. Mallebay (France); co-opted members, Drs. A. Engeler (Switzerland) and W. Grassmann (W. Germany); hon. treasurer, Professor D. Burton (UK); and hon. secretary, A. Harvey (UK). It was decided to hold the 1955 Conference in Stockholm, probably during the early part of August.

On Sunday evening, 13 September, a reception of delegates and visitors was held at the Avenida Palace Hotel, when Mrs. Mercedes Paniker de Pelach, President of the Spanish Society of Leather Chemists, received some 400 participants. In a short speech, she regretted that ill-health prevented her father, Mr. R. Paniker, from being present. M. Mallebay, President of the International Union, also spoke, and expressed pleasure at seeing such a large gathering.

Well-known Names

The official opening of the Conference was performed by the Mayor of Barcelona at the Town Hall on the morning of 14 September. Speeches were made by Mrs. Paniker, the Mayor, and M. Mallebay.

Presiding at the opening scientific session in the afternoon, M. Mallebay thanked the Spanish Leather Federation and the Spanish Society of Leather Chemists for all they had done in organising the Conference. He conveyed the greetings of many who were unable to attend on account of ill-health, including Professors Meunier and McCandlish, and Mr. Loos.

He could not resist referring to many members of former conferences who had passed away, and would mention such names as Procter, Grasser, Atkin, Andreas, Scharesparelli, Lepetit and Parker, all of whom he had been privileged to know personally, and who had done so much in the field of leather chemistry.

Referring to the close liaison between the International Union and the International Council of Tanners, he said it was hoped that it would lead to fruitful results, and with a few more preliminary remarks he called upon the speakers for the session.

Three Papers

These were Dr. W. Weber, who read a paper on 'Sole Leather Quality and Water-soluble Matter', Dr. A. Engeler, on 'Resistance to Abrasion of Leather', and Dr. G. Otto, on 'Formation of Linkages between Aromatic Substances and Leather Fibres'. This last discussed the reciprocal action of simple aromatics, low-molecular weight and condensed sulphonic acids, anionic and non-ionic dyestuffs with keratin, collagen and polyamide fibres, and with water-soluble polyvinyl pyrrolidone.

The conclusion was drawn that the simplest kind of linkage is an attraction between dipoles. The peptide group has a dipolar nature, and in the aromatic nuclei dipoles of corresponding intensity of electrostatic field are easily induced. Besides these dipole linkages which can generally be assumed to be present, hydrogen bridges are also often formed. Both these linkages are strongly influenced (often intensified, but also often weakened) by electrovalencies present.

The play of these forces, between compounds with a different number of aromatic nuclei on the one hand, and the protein fibre on the other, results in very different kinds of effects which are of industrial importance. These include the uptake of sulphonic acids, which are non-swelling but at the same time have a hydrotropic effect, tannage with synthetic and natural tannins, and dyeing with dyestuffs which are adsorbed by the leather surface.

When the conference resumed on the afternoon of Tuesday, 14 September, with Mrs. Paniker de Pelach in the chair, Mr.

J. R. Blockley introduced a discussion on 'The Physical Merits of Leather'. After expressing pleasure at the presence of Dr. E. C. Snow, secretary of the International Council of Tanners, he read a statement of authority on the merits of leather based on scientific data, which had been prepared at the request of the ICT.

After this statement and matters arising from it had been discussed by representatives of various countries, papers were read by Professor Sagoschen on 'International Training of Leather Technologists', and by Dr. W. Grassmann on 'Elastic Properties and Fibre Structure of Leather'.

Outing to Montserrat

The whole of Wednesday was devoted to a trip to Igualada and Montserrat, including a visit to the new building of the Spanish Tanning School.

In the morning session of Thursday, 17 September, when the chair was taken by Dr. K. H. Gustavson, papers were presented by P. Chambard and Miss R. Lasserre on 'Study of Silica Tannage', by F. Pothier on 'Influence of Temperature on Combination of Collagen and Vegetable Tannins', by Ch. Faure on 'Fast Colours for Glove Leathers', and by K. H. Gustavson on 'Study of Vegetable Tannage with Modified Collagens and Polyamides.'

Dr. Gustavson had shown that polyamide possesses marked affinity for vegetable tannins, binding them irreversibly. The fixation of mimosa tannins by polyamide is dependent on the *p*H of the system in the range *p*H 2-8. Practically no tannin fixation occurs at final *p*H values greater than 8. The same kind of curve is shown by mimosa tannins in reactions with collagen if its swelling is prevented by salt addition. The data indicate that the peptide links are the main binding sites of collagen for vegetable tannins of the type of the mimosa tannins and that the phenolic groups are the reactive sites.

Gallotannic acid, which carries a fairly strong acidic group, does not show this *p*H dependence. Other findings also indicate that in the fixation of gallotannic acid by collagen, ionic protein groups are involved, as well as the —CO.NH— groups which are responsible for the main binding of the gallotannins.

Papers read at the afternoon session were 'The Iso-electric Point of Gelatin' by A. Staib, 'Primitive Leathers' by A. Gansser, 'Disc Chromatography and Qualitative Tannin Analysis' by A. Jamet, 'Microscopical Study of Salt Stains' by A. Kuntzel, and 'A Comparative Study of Tannin Analysis' by A. Torner.

On Friday, 18 September, the papers presented in the morning session included 'The Evaluation and Control of Leather Finishes' by J. S. Mudd, 'Stability Constants and Probable Structure of the Basic Chromium Sulphates' by L. M. Hill, and 'The Cross-linking Action of Glyoxal on Collagen' by G. M. Sleichter and R. M. Lollar.

By means of a mercury-loaded tester the stress-strain characteristics of collagen fibres can be measured. Results show that the tensile strength and shrinkage temperature increase and then level off at a maximum as the amount of glyoxal given increases. From data obtained the molecular weight of collagen between cross-links can be calculated. There is a drastic decrease in molecular weight and then a levelling off at a minimum as the amount of glyoxal given increases.

Further, the reaction with glyoxal increases the modulus of elasticity of the shrunken collagen. These data indicate that cross-linking plays a significant role in the action of glyoxal on collagen.

The final paper of the morning session was 'The Accessibility of the Cationic Groups of Collagen to large Anions of Polyacids,' by A. Larsson and K. H. Gustavson.

Complete Inactivation

In the irreversible fixation of polyacids with molecular weights of the order of a few thousand, such as the highmolecular fraction of lignosulphonic acids by collagen (hide powder), measurements of the amounts of protons and anions removed by the protein indicate complete inactivation of the ionic protein groups in the *p*H range 1.5-2. However, this mode of estimation only proves the complete inactivation of the carboxyl ions of collagen. Also, the absence of fixation of protons (0.1 N HCl) by the inactivated collagen is only an indication of the complete discharge of the carboxyl ions of collagen.

The degree of irreversible inactivation of the cationic protein groups by the polyvalent anions cannot be estimated by these methods. Lignosulphonic acids of average

molecular weights 5,000-6,000, containing 10-12 sulphonic acid groups in the anion, show stoichiometric binding of the proton as well as the anion by collagen.

In order to evaluate the number of cationic protein groups of collagen irreversibly inactivated by the anions of the acids mentioned, the differences in the heats of reaction of collagen with these acids and hydrochloric acid have been determined. From the titration curves the values of ΔH in k.cal. per mole are obtained by means of Clapeyron's equation. The $-\Delta H$ values are: for hydrochloric acid 2; and for lignosulphonic acids 6-7. The values indicate that about half of the cationic groups of collagen are irreversibly inactivated by the fixed anion of lignosulphonic acid, since complete discharge of the cationic groups of collagen will require $-\Delta H$ values of the order of 12-14 k.cal. per mole.

Same Order of Magnitude

From investigations of the reaction of lignosulphonic acid with methylated collagen containing 95 per cent of its carboxyl groups esterified and 0.8 meq. protein-bound HCl per g. collagen, it is found that for each equivalent of the lignosulphonic anion fixed by the esterified collagen, 0.5 equivalents of Cl-ions, held by the cationic protein groups, are released (anion exchange). No demethylation takes place at final *p*H values of 1.5-2. Since the maximum binding capacity of collagen for lignosulphonic acid was attained, it is indicated that only about one half of the cationic groups of collagen are inactivated; the other half of these groups possibly being electrostatically compensated by some long-range effect of the electronegative sites in the large anion of the fixed sulpho acid. Hence the two independent methods give results of the same order of magnitude.

The findings obtained in the study of the reaction of lignosulphonic acid with collagen prove the governing importance of the degree of affinity of the polyvalent anion for the cationic groups of collagen, combining irreversibly with the same, for reactions of this type. Further, the importance of the steric factor in such systems is evident.

In the afternoon the general meeting of the Union was held, followed by papers on 'Sumach' by Sr. A. Yague, 'Hydrolysis as the Cause of Loose Grain' by P. Bocciardo and 'The Action of Large Ions on Collagen and Gelatin' by K. G. S. Pankhurst.

Large ions such as detergent or dyestuff ions may be adsorbed to proteins by a variety of mechanisms, e.g. by Coulombic forces, by dipole association or by Van der Waals forces. Under acid or alkaline conditions, in the absence of inorganic electrolyte, ions of opposite charge may be bound exclusively to the charged groups of the polar side chains of the protein molecule. Indeed, both detergents and dyestuffs have been used for the determination of these groups.

Under isoelectric conditions, particularly in the presence of inorganic salts, much larger quantities may be adsorbed, most probably to the keto-imide 'backbone' groups by an ion-dipole association. The amount adsorbed in this way is critically dependent on the size of the adsorbing ion, since, the larger its head group, the more difficult it is for it to approach sufficiently near to the peptide group for the ion-dipole association to be stable.

After a single layer of ions have been adsorbed, further amounts may be bound by secondary (Van der Waals) forces. Such adsorption may affect the physical characteristics of the protein in many ways, e.g. the solubility of a normally soluble protein such as gelatin is first decreased and then increased as more detergent is adsorbed. The shrinkage temperature of collagen may be drastically reduced by the adsorbed ions.

Final Stages

The final paper of the session was by W. Clerck on 'Recent Developments in Low Frequencies.' After reports had been read from the various commissions, closing speeches of thanks were made by M. Mallebay and Dr. Gustavson, supported by G. H. W. Humphreys, Dr. Sagoschen, Dr. Grassmann and Dr. Gansser.

The closing banquet was held at 'El Cortijo' resturant; some 350 people attended, and during the evening and early morning there was dancing and a cabaret.

Melchett Lecture

The Institute of Fuel's Melchett Lecture for 1953, 'The Domestic Appliance Industry and Fuel Usage,' by Dr. Harold Hartley, C.B.E., D.Sc. (chairman, Radiation Ltd.) will be delivered at 5.30 p.m. on Wednesday, 7 October, in the Lecture Hall of the Institution of Mechanical Engineers, Storey's Gate, St. James's Park, S.W.1.

World Petrol Figures

1952 Production Showed Increases

WORLD production of crude petroleum in 1952 totalled 4,500,000,000 barrels, an average of 12,300,000 barrels a day, according to the Bureau of Mines, United States Department of the Interior. This was an increase of 5 per cent over the 1951 total, gains occurring in all the major producing areas. Despite the slump in Iran, production in the Middle East rose by 8 per cent to 779,000,000 barrels. Output from Venezuela went up 6.1 per cent to 660,000,000 barrels and USA production increased 2 per cent.

Completion of the 556 miles crude petroleum pipe line from the Kirkuk field in Iraq to Banias, Syria, was a feature of 1952 construction developments in the Middle East, and the Kirkuk production was double the 1951 output. The Ain Zalah field in northern Iraq, operated by the Mosul Petroleum Company, began commercial operations in 1952, following completion of the 135-mile line connecting that field with the IPC main line system to the Mediterranean.

Production in Indonesia (including New Guinea) in 1952 totalled 4,000,000 barrels, an increase of 12.3 per cent over the 1951 figure, while the USSR is estimated to have increased production by 12.7 per cent compared with the previous year.

Imports of crude petroleum into Western Europe in 1952 totalled 511,000,000 barrels, an increase of 26.1 per cent over the 1951 total. Of the principal importing countries, Italy showed the largest increase with a gain of 37 per cent. The United Kingdom came next with an increase of 33 per cent. About 94 per cent of Western Europe's imports came from the Middle East, compared with 89 per cent in 1951.

Demineralisation of Salt Water

THE Press report of the findings of OEEC working party, published in our issue for 12 September, discusses the merits of the principal processes for the demineralisation of salt water studied by a group of experts.

We have subsequently been advised by DSIR that the third section, headed 'Vapour Pressure Distillation', refers in fact to the novel method under development by Von Platen (based on distillation at the critical pressure) and not to the orthodox method of 'Vapour compression distillation,' which suffers none of the aggressive corrosion effects referred to or the necessity for the use of high cost materials of construction.

Further, when comparing the relative production costs of vapour compression distillation and electrodialysis, it should be stressed that costs for vapour compression distillation are on a production basis while those for electrodialysis are forecast from small scale pilot plant experiments that may require a period of some two or three years for development to a commercial size unit. For the demineralisation of waters of high salt content (sea water), vapour compression distillation undoubtedly offers the lowest production costs, particularly if the use of boiler fuel oil is considered as a replacement for high grade diesel oil.

France to Produce 'Terylene'

NEGOTIATIONS have been concluded between Imperial Chemical Industries Limited and Societe Rhodiaceta of Lyons, the French manufacturers of acetate rayon and of nylon, whereby Rhodiaceta will, under licence from I.C.I., manufacture and sell in France the polyester fibre, known in this country as 'Terylene'. This announcement follows on the news published last month that 'Terylene' is to be produced in Italy under licence from I.C.I., and is a further illustration of the world-wide interest in Britain's new synthetic fibre.

A.I.Ch.E. National Meeting

NEARLY 1,000 chemical engineers, from all parts of America, met in San Francisco for a national meeting of the American Institute of Chemical Engineers from 13-16 September. The technical sessions began with a symposium on 'Economic Evaluation of Chemical Projects,' presided over by R. P. Kite, manager of the Development Department, the Dorr Company, Stamford, Connecticut. In addition to four general sessions, there were symposia on mixing, chemical engineering fundamentals (four sessions), and ion exchange (two sessions). The meeting was sponsored by the Northern California Section of the A.I.Ch.E. and George C. Gester, Jr., California Research Corporation, Richmond, and R. I. Stirton, Oronite Chemical Company, San Francisco, were general co-chairmen of the meeting.

Recent Advances in Distillation—Part II*

by G. A. DUMMETT, M.A., A.M.I.Chem.E., & P. V. CLIFTON, M.A., D.Phil., A.R.I.C.†

IN general, the character of problems presented to distillation engineers has changed appreciably in the last few years and, with the exception of certain petroleum operations, one is seldom required to consider the isolation of distillates with wide boiling ranges. More often than not, pure products (99.5 per cent or better) are required and it is frequently required to make separations between substances which boil only a few degrees apart. For example, the recent shortage of sulphuric acid stimulated fresh efforts to separate the classical inseparable mixture of benzene and thiophene, and this is now considered possible by distillation in a column or series of columns containing very many plates.[35] The production of such materials as pure benzene and toluene, pure phenols and cresols and naphthalene, continuously from crude materials, has been perfected in the period under review.

Easier Separation

The ease of separation or relative volatility of two components or chemical species may often be increased by the addition of a third component, which imposes separation, depending more on chemical type than on boiling point alone. Depending on whether this component distils over in the top product or is removed at the base of the column as though it were an extractive solvent, the procedure is usually known as azeotropic or extractive distillation respectively. An excellent comparison of the two processes has been made by Benedict and Rubin,[36] and interesting considerations of the selection of 'separating agents' have been published by Ellis and Garner[3] and by Colburn and Schoenborn.[37]

Of these two processes, azeotropic distillation has received, in the past, rather more attention than the basically similar extractive process. The use of benzene or a mixed hydrocarbon entrainer in the production of anhydrous alcohol by the Melle processes is a classical example. More recently, benzene has been used with success to dehydrate crude wet pyridines, which themselves form binary azeotropes with water and, in a recent patent claim,[38] crude coal tar itself is conveniently dehydrated by entraining the water with a light hydrocarbon fraction.

Feldman and Orchin[39] have recently published an interesting paper on the application of the azeotropic method to the separation of α- and β-methyl naphthalenes, which includes a most interesting analysis of the variation of azeotropic composition with absolute pressure. However, although it is possible, with the assistance of one of the extensive tables of azeotropes[40] to devise an infinity of separations on paper, there always remains the necessity to recover the entrainer and to separate it from the product. Unless this can be done by some simple procedure, such as decantation, azeotropic distillation is rarely likely to be a workable proposition.

It is possible that the large scale expansion of the petrochemicals industry and the consequent increased availability of a wide range of solvents may stimulate still more interest in extractive distillation. Solvents of truly remarkable selectivity are appearing on the market which offer attractive possibilities of liquid/liquid extraction and its close relative, extractive distillation.

One of the first applications of extractive distillation and one of the most important was the isolation of nitration toluene from petroleum by extractive distillation with phenol, which was applied on a huge scale during the war (Fig. 5). The process has been reported both from a theoretical and practical standpoint in a brilliant series of papers.[41,42,43]

It is not generally realised that water itself can form an excellent extractive distillation solvent. This has recently found application in the alcohol industry, where water is fed to the head of a purifying column in such amount as to wash all the ethyl alcohol down the column and to maintain throughout it a low alcohol concentration. This permits all those impurities—higher alcohols, esters and the like—of limited solubility in water, to be distilled over the head

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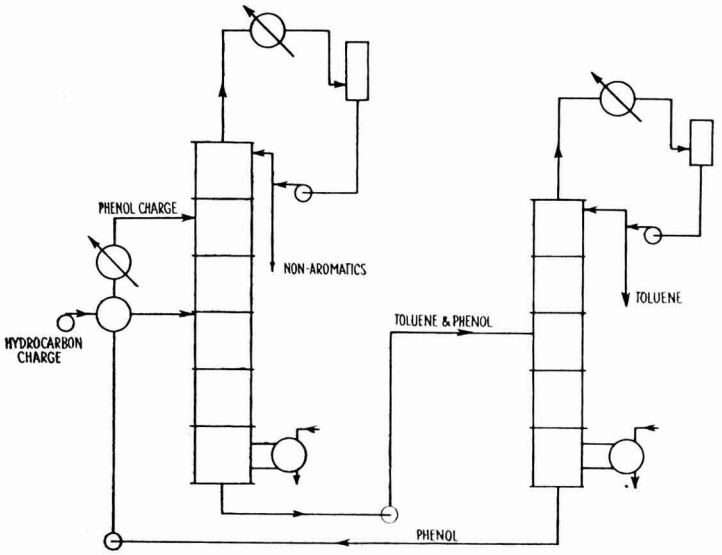

Fig. 5. Extractive distillation of toluene with phenol

of the column in concentrated form, so producing a high yield of well-purified spirit at a steam consumption but little in excess of that required for the production of the raw spirit.

Several variants of this process are in production, of which the best known is the 'Allospase' process of the Usines de Melle[44] (Fig. 6).

It is not necessary for a volatile added component to form an azeotrope with the other components distilled at the head of the column; it is also possible to combine this with extractive distillation. An interesting example is a process used on a large scale for the isolation of pure toluene in high yield from low gravity crude toluoles.[45] A satisfactorily sharp separation between non-aromatic hydrocarbons and toluene was obtained by the use of a mixed

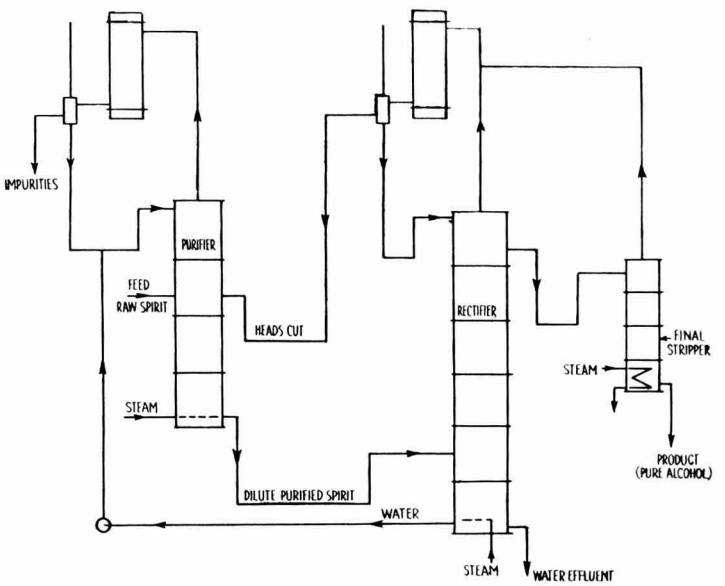

Fig. 6. Allospase process

entrainer containing acetone, methanol and water.

The process is interesting in that of all the possible azeotropes which this mixture could have produced, the overhead product from the main column contained only non-aromatics with boiling points up to 15° higher than that of toluene and acetone, but without the presence of any constant boiling mixture. The effluent from the column contained toluene and aqueous methanol, the latter being decanted off and used to extract acetone from the overhead product, so reconstituting the entrainer. (Fig. 7.) The aqueous methanol here acts as a kind of extractive distillation solvent, although the actual solubility of toluene in it is low.

It is instructive to compare this process with that using true azeotropic distillation with methanol which has also been applied on a large scale and has been reported on by Chadder and Spiers.[46] Methanol is not so selective in its effect as acetone and, in consequence, the steam consumption required is greater. The difficulties in the methanol process are revealed by an analysis in both fundamental and experimental terms by Benedict, Johnson, Solomon and Rubin.[47]

Since the end of the war, the steady increase in the cost of fuel has focused attention more than ever on the costs of distillation services, the main items of which are steam and water. It is not proposed to elaborate on the low thermodynamic efficiency of the distillation process, nor to dwell on the various general methods of improving it, for this has been dealt with in a recent paper by Freshwater.[48]

Although the transfer of heat is generally treated as a separate unit operation, most efficient distillation plants depend on a high degree of heat exchange and, in considering recent advances in distillation, thermal economies are thereby implied.

The evaporative condenser,[49] as well as achieving in some cases substantial thermal economy, has the advantage over conventional water cooled units that the evaporating fluid is clean condensate. Thus, cleanliness of at least one heat exchange surface is assured. This makes for the maintenance of high heat transfer coefficients, cuts out the necessity for frequent descaling and reduces corrosion.

The need for frequent tube cleaning can also be avoided and good condensing coefficients maintained over long periods in stan-

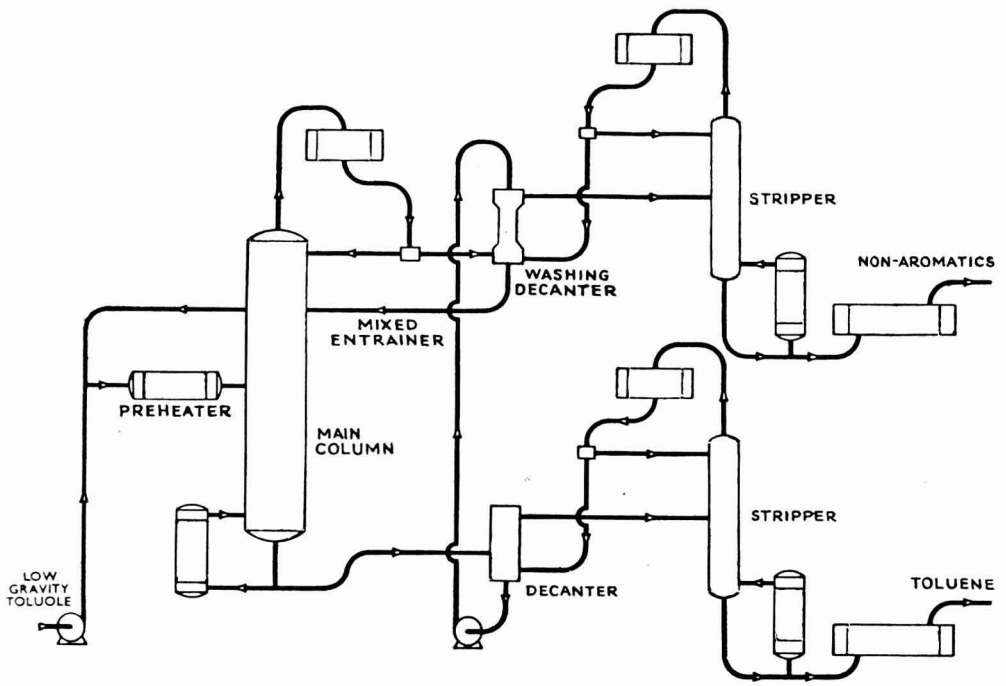

Fig. 7. 'Mixed entrainer' process for separating toluene from non-aromatics

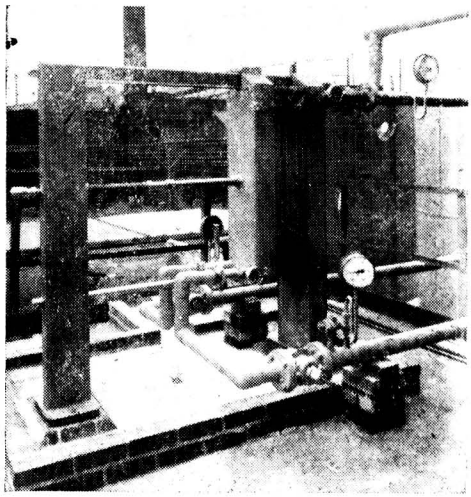

Fig. 8. Plate type heat exchanger installation

dard water cooled units by re-circulating good quality water—steam condensate for preference—cooling it by heat exchange against whatever local supply is available. This is especially advantageous where the normal supply is very dirty or highly corrosive. The need for cleaning such a heat exchanger obviously will arise from time to time, and it is of importance that those surfaces which are in contact with dirty water should be easily accessible and rapidly cleaned. For this type of duty, the plate heat exchanger is particularly suitable (Fig. 8).

For many years, this type of exchanger has been standard equipment for spent wash/alcohol heat interchange where its efficiency, coupled with its accessibility for cleaning or inspection and its compactness, have been of paramount importance. The application of plate machines to chemical process work generally is expanding, however, consequent on improvements in the elastometric materials which are needed for gaskets. Recent trials with this type of heat exchanger, working with ammonia liquor feed against stripped effluent, have produced notable results. An example of such a machine is shown (Fig. 9) and an interesting comparison may be made between the conventional ammonia liquor exchanger on the left and the latest type on the right.

Low temperature gas fractionation is a specialised technique in which heat exchange and conservation is of fundamental importance. Very considerable advances have been made in the production of oxygen from air on a large as well as on a small scale. Modern oxygen production techniques have been reviewed by Schuftan.[50] The theory of air separation has been surveyed by Ruhemann,[51] who himself has contributed as much as anyone to our knowledge in this field.

Even more striking progress has, however, been made in other gas separations. The production of argon, discussed by Axon, Pearce and Huhemann[52] is now a commonplace. Brilliant application of gas separation techniques has led to remarkable achievements as diverse as the isolation of hydrogen for ammonia production from coke oven gas at Flixboro described by Napier;[53] the separation of ethylene from coke oven gas at Corby;[54] and the separation of cracked petroleum gases at Partington. This last plant propounds interesting problems of instrumentation which are discussed by Ruhemann.[55]

Finally, until recently it could be said that distillation was ill-served by textbooks. While a really good text covering fractionating processes has not yet been produced and is not likely to be for some time because of the rapid changes in this field, the funda-

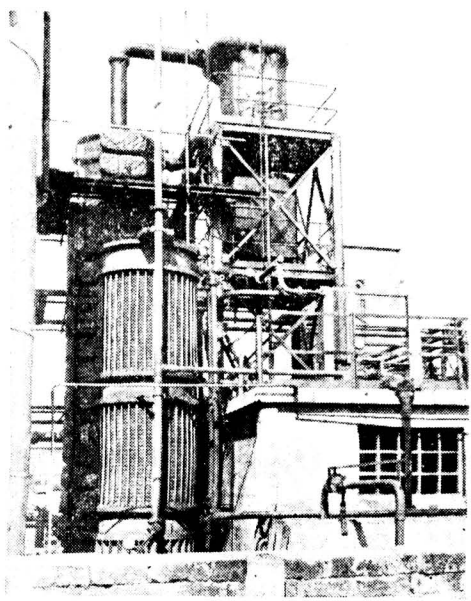

Fig. 9. Application of plate type heat exchanger to heat recovery in ammonia liquor concentration

mentals of the theory and practice of distillation and of fractionating plant design have been well dealt with in three recent texts by Kirchmann,[56] Rose,[57] and Robinson and Gilliland.[58]

Acknowledgments

The authors' thanks are due to the directors of the A.P.V. Company, Ltd., for permission to present this paper, and also to their colleagues for their help in its preparation.

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Gelatine & Animal Glues

Improvement in Jelly Strength Testing

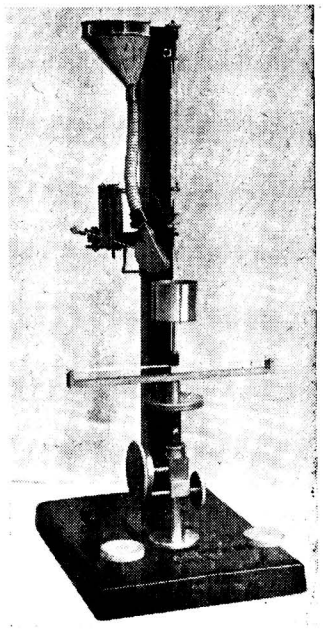
THREE improvements in the standard methods of jelly strength testing of gelatine and animal glue for commercial grading have resulted from recent investigations by the British Gelatine and Glue Research Association.

Both British Standard No. 647-1938 (Glues) and B.S. No. 757-1944 (Gelatine) are based on the use of the Bloom gelometer to measure the load required to push a plunger of 12.7 mm. dia. 4 mm. into a jelly prepared and matured under standardised conditions.

The latest improvements in the standard methods of testing are as follows:—

(i) The radius of the edge of the gelometer plunger must not depart from the specification figure of 1/64 in. Errors due to incorrectly made plungers have been observed to exceed 10g. Bloom.

(ii) A device called the 'Dummy Bloom' has been developed which uses the elastic behaviour of spring steel to standardise the performance of Bloom Gelometers. By means of it a continuous check on errors arising from the instrument is secured. This device is being manufactured by Griffin & Tatlock Ltd., Kemble Street, Kingsway.



The dummy device set up

(iii) The British Gelatine and Glue Research Association has standardised two gelatines (184 and 102g. Bloom at 6⅔ per cent concentration) and one glue (85g. Bloom at 12½ per cent concentration) for use as primary standards of jelly strength. These may be used to check the preparation and maturing of jellies, and also as an overall test of the Bloom method. These standards are available from the Association's Laboratories at 2a Dalmeny Avenue, Holloway, London, N.7.

Discrepancies in jelly strength testing can be eliminated by attention to these points.

The work has been carried out by Mr. D. Fysh, who is in charge of the Technical Laboratory of the Association, and Mr. A. G. Ward, Director of Research, assisted by Mr. D. J. Goodwin and Miss J. W. Eastoe.

Italian Sulphur Industry Crisis

OUR OWN CORRESPONDENT'S REPORT

THE Italian sulphur industry is at the moment hit by the gravest crisis in its history, reports our correspondent. After two years of normal sales a large stock, amounting to about 150,000 metric tons, has been built up again and will undoubtedly increase as no demand comes from foreign countries.

Up to the end of the first six months of 1952 the industrialists had been spurred to larger and larger outputs, since the official associations had stated that the world's deficit of this product exceeded 1,000,000 metric tons and that the American output was decreasing. To-day's output exceeds consumption and this situation will probably continue until 1955.

The crisis is particularly grave for the Italian industrialists who produce sulphur at higher prices than the American and European competitors.

After the end of the war, Italian industrialists began reconstruction without any assistance from the State, but after overcoming many obstacles they were not requited by sufficient demand for the product. Despite an output largely inferior to the pre-war figures, a big stock was rapidly built up (more than 100,000 metric tons in 1949).

The insufficient sales brought about the request and concession of a minimum price guaranteed by the State; such a guarantee was unfortunately granted only on the sold and delivered product. The Korean war and the development of several sulphur-needing industries gave the Italian industrialists good hopes of remunerative prices and induced them to renounce the guarantee of the minimum price; the mineowners asked only for loans on acceptable terms in order to modernise their installations and mechanise the services.

Bureaucratic difficulties delayed the intervention of the State, and it was not until 12 August 1951 that a law was passed approving a loan of 9,000,000 lire to the industry. The technical committee for the study of the projected improvements completed its examination in July 1952, but further regulations requiring total guarantee of the loan meant in the end that only a few industrialists were able to obtain the needed sums. Even in this last case the work, which should have been carried out during the full-price period, is to be executed during a grave crisis.

The Italian sulphur industry must not be allowed to die, says our correspondent, for social economic and patriotic reasons and also in order not to deprive Europe of this important product. It is essential to guarantee a minimum price, operating not only on the sold and delivered sulphur but also on the product deposited in the warehouses.

Microchemistry Course

COMMENCING 16 January, 1954, a course of 12 lectures and appropriate practical work will be held on Saturday mornings at the Norwood Technical College, London, S.E.27, from 9.15 a.m. to 12.30 p.m. This course is designed to survey the principal branches of chemistry in which small-scale methods have been successfully applied.

Lectures, illustrated by demonstrations, will deal with the following topics:—

Scope, aims and achievements of small-scale techniques. Design and construction of simple apparatus. Organic and inorganic preparations on a reduced scale. Simple chemical microscopy. Inorganic qualitative analysis. Volumetric and gravimetric analysis on a reduced scale. Organic qualitive and quantitative analysis. Physiochemical methods of analysis. Microtechniques for the determination of molecular weight, etc.

In the main, apparatus either easily constructed or normally at hand will be used, as the course is of an essentially practical nature.

Application forms for admittance to the course may be obtained from the Secretary of the College. The fee for the course is £1.

Asbestos Workers' Pay Rise

Three thousand workers in the asbestos manufacturing industry will receive wage increases this week in respect of their claim made last May. Men in the textile section will get 2d. an hour more and women 1½d. an hour. On the non-textile side adults will get an extra penny an hour.

Four Points for Chemical Engineers

Improvement of Productivity in Chemical Industry

DURING the Chemical Engineering Conference at Olympia, the afternoon of Wednesday, 9 September, was devoted to a discussion of the recently published reports by the OEEC on 'Chemical Apparatus in the USA' and by the British Productivity Council on 'Heavy Chemicals.' We have already published a report of the comments made by Sir Harold Hartley in opening the discussion (THE CHEMICAL AGE, **69**, 609); the other principal speaker was Mr. J. Grange Moore, leader of the team which produced the latter report, who said:

As you know, the British heavy chemical industry sent its Productivity Team to the USA in March last year. The team was 17 strong—management, technical specialists, shop floor and union interests were represented. In six weeks we toured heavy chemical factories situated as far south as Texas and as far west as Nevada; we saw old and new, large and small, good and not so good. Our report, published in January of this year, was unanimous. It listed no less than 20 major recommendations. We are convinced that if these are implemented, the productive efficiency of our own heavy chemical industry, good though it may now be compared with that of some other British industries, can and will be very substantially increased.

Most Obvious Interests

You are probably expecting me to touch this afternoon on what our report has to say about chemical engineering. Indeed, when I was preparing my notes for this short talk I asked Dr. Hoblyn to mark those parts of the report which obviously concerned the chemical engineer most closely, and this he very kindly did. They deal with the layout, design and erection of plant, with instrumentation and automatic control, with simplification and standardisation, and with the training and employment of chemical engineers. In a word, they are precisely those parts of the report which would be read by any chemical engineer who was, as most of us are, sore pressed for time, yet anxious to keep up to date with his subject.

But let us be logical. Let us in these precious few minutes this afternoon deliberately put aside what can so easily, and probably has been, read. Let us consider instead four matters in the report which perhaps are more likely to be missed although, as I shall now try to show, they concern the chemical engineer profoundly.

Realistic Costing

We were very impressed, on our tour, by the realistic and practical attitude towards cost information which was so widespread in American chemical factories. For example, both process and maintenance foremen, and indeed many of the men, knew the costs of the things under their control and governed their actions accordingly. Junior management had clear-cut instructions to get their operating costs down, and when they had succeeded they were sometimes congratulated, sometimes promoted, but still were told—'Now get them lower.' Frequently the men running the plants were chemical engineers, and it was common to find a chemical engineer on each shift, perhaps with only half a dozen process workers under him, but he was there for the specific purpose of finding out how to get maximum production from his plant at minimum cost.

In Britain too many of us are content to regard cost sheets as secret documents which, provided the figures they contain are accurate to several decimal places and show no major increase which cannot readily be explained, are to be kept locked away from the prying eye of man. Indeed, I believe that some works accountants regard their task as finished when they have produced these cost sheets, not realising that a cost sheet itself is worthless and only takes on value in proportion to the use which their management at all levels makes of it.

It was very interesting to find in one American factory that a chemical engineer was employed full time by the works manager to translate the accountant's cost sheets into technical memoranda of cause and effect, and these were widely circulated and studied eagerly by the process staff as being of real assistance in the major objective of reducing costs. Those factories who were using standard costing rather than

historical costing were emphatic that the change had resulted in a much closer control of their process costs, though we were surprised to find that the use of standard costing was only a little more general than it is in Britain.

Minimum Consumption

You may by now be wondering—what has this close study of operating costs to do with the chemical engineer? I think that the question really answers itself, but may I put it this way? Our job, whether we are chemists or engineers, chemical engineers, accountants or, in fact, in any supervisory position in industry is to see that our actions result in the provision of the goods and services needed by the community with the minimum consumption of real resources; and the common yardstick, imperfect though it is, by which we may assess the value of our contribution, is undoubtedly that of cost.

On the capital side you know, of course, that many American firms insist on the fullest possible planning of construction before one dollar is spent on materials, and they do this in order to ensure that capital, once committed, is made to earn a return as quickly as possible. I think this is a very important matter and no doubt you join me in feeling that we in Britain could pay more attention to it, despite the many problems which beset us.

There is reason to believe, too, from the capital investment figures in our report, that the average technical graudate in the British heavy chemical industry is at present supervising the erection, and indeed the operation, of from one and one-half to two times the physical amount of plant and equipment for which his American counterpart is held responsible, and in Britain he certainly has, in addition, three times the number of men to supervise. Perhaps, therefore, it is not surprising that we in Britain often make less use than we should of our cost information, for many of us have so little time to do all that we know should be done.

May I turn now to another subject which gave rise to at least two recommendations in our report—work study. Some of you will perhaps know a good deal about this, others perhaps very little. I am glad to be able to tell you that our recommendations have been energetically taken up by the Association of British Chemical Manufacturers, who have organised a two-day conference on work study to take place at Buxton early in October. This conference is to be attended by over 500 senior representatives of the heavy chemical industry, and I am confident that it will lead to a better appreciation of the vital part which these techniques—method study and work measurement—can play in our industry. If this lead by the ABCM is actively followed up by the individual companies, we shall be well ahead of the American chemical industry in this very important approach to increased productive efficiency.

Why do I say very important? May I put it this way? You probably know—and indeed it is fully discussed in our report—that the American heavy chemical industry has a far higher percentage than we have of modern plant, incorporating many recent advances in chemical engineering knowledge. Since our return from the States my information is that this trend is accelerating. Despite the very vast expenditure which is being undertaken in the British chemical industry, the American has a three times greater capital investment per employee than we have here at home. I need not emphasise the significance of these figures to an audience such as this.

Now capital for expansion and modernisation must, of course, ultimately come from the so-called profits of industry, and so our most pressing task today is to increase the productive efficiency of our existing resources. One of the most powerful ways of doing this is to make the fullest possible use of work study, applying it to what we have now, and then, when we have by its use accumulated some savings, applying work study to our proposals for spending those savings, to ensure that we get from them the greatest possible productive efficiency.

Importance of Work Study

How can work study help the chemical engineer? Briefly, its use at the layout and design stage will almost certainly reduce the area required for a given output, with all that means in avoidance of line losses and in reduced overheads. Frequently it can eliminate a lot of materials handling, and should therefore always precede any capital investment in mechanical handling equipment. Its use will lead to the best grouping of operating controls and to the most

economic manning of the plant, and it is, of course, essential to any proper system of scheduled and planned maintenance.

These are but a few examples of the importance of work study, and I would earnestly counsel those who are not familiar with these techniques to repair this omission as speedily as may be. There will be an excellent opportunity of reading of the application of work study in the heavy chemical industry when the proceedings of the Buxton Conference are published by the ABCM later this year.

May I now turn to my third point. You will know that the American is generally less secretive about many technical matters than we are. I believe this is because he has found that giving information to his competitors not only results in a valuable interchange of ideas by which he can check up on his own progress, but acts also as a constant spur to himself to keep ahead. We were impressed, for instance, by the thoroughness with which the American Manufacturing Chemists' Association collected and published technical figures of capacity, output and performance, etc., for a wide variety of chemical manufactures.

Technical Data Needed

The British heavy chemical industry has just nothing to compare with these publications, and as a result we are in a poor position to judge our own technical progress relative to that of our competitors at home and overseas. I am hopeful that we may see in the next few years an attempt to make much more technical information available, and I am sure that, without any sacrifice of essential commercial security, it will be possible for the weaker firms to benefit from the knowledge of the stronger by this means. It is in such work as this that the various technical and trade orianisations can play a most important part in raising the standard of productive efficiency of our industry.

Frequently on our tour of the American chemical factories we saw little that was new to us, but we saw far more use being made of the best. I believe that if the level of productive efficiency of the least efficient British chemical factories could be raised to that of the best, we should find ourselves level pegging with the Americans. And it is through interchange of technical information—of what we already know at home—that this can be done.

Lastly, a word on technical strength. Sir Harold Hartley in his talk stressed repeatedly the necessity of increasing the numbers of chemical engineers available in this country. Our team saw clearly that nearly every recommendation made in their report required, for its implementation, one or other type of technical graduate and therefore, as our prime and overriding recommendation, we called for an immediate increase in technical graduate strength throughout the heavy chemical industry. In this we did not confine ourselves to chemical engineers, for we believe, and I think rightly, that every type of technical training has its appropriate and essential part to play.

Ratio of Technical Strength

In America, as you know, we found in the heavy chemical industry that the ratio of technical strength to payroll strength was 1:6, whereas in Britain it is 1:16. I do not blame our universities and technical colleges for this, for I am sure that if, in the past, industry had called loud and long for technical men, they would by now have been forthcoming.

Why didn't we? or rather should I say, why didn't we all? for some of us certainly did. Personally I am coming to the conclusion, with which you may entirely disagree, that we were afraid. And perhaps many of us still are afraid. Afraid of what? Of overstaffing?—but have you yet found a chemical factory in which an additional engineer or chemist or chemical engineer could not save at least twice his own salary? Of the cost?—but is there any more expensive way of running a factory than by denying it adequate technical leadership? Could it rather be that, perhaps instinctively, we are afraid, just as the humblest shop floor worker is sometimes afraid, of change, of increased responsibility, of 'being shown up', yes and even—remote though it may seem—of losing our jobs?

I hope it is fear, for I am not aware that we in Britain lack courage, when we know where the enemy lies. And if there is one use for courage in British industry today it is in refusing to be denied adequate technical strength, so that the undoubted genius of our scientists, and the pride and skill of our craftsmen, may be directed with all speed to the provision of the goods and services which it is industry's prime duty to provide.

To Make 'Dollar' Insecticides

New £1,000,000 Plant Planned

SCHEDULED for immediate construction and for completion by mid-1955, a new plant at Shell's Pernis (Rotterdam) refinery in Holland will make available for world-wide distribution two new insecticides, aldrin and dieldrin, which have already had international success.

With production hitherto confined to the USA, the use of these products in many countries has been limited because of currency considerations. However, quite large quantities have been made available in certain countries through the US Government aid programmes, particularly for locust control and public health applications. The plant to be erected in Holland, at an estimated cost of more than £1,000,000, will make these materials more readily available throughout the world. In view of the importance of these two products in agriculture and public health, plans have been laid to manufacture them in such quantities as will satisfy not only Shell's own requirements but also the needs of other insecticide manufacturers wishing to use aldrin and dieldrin as the base material for their own products.

Worldwide Development

A comprehensive development programme has been carried out with aldrin and dieldrin on a worldwide basis and has confirmed the unique value of these materials for the control of soil insects, cotton pests, locusts, ants and many other insects. In particular, the extreme potency and long residual action of dieldrin make this compound invaluable for public health work. Unlike other insecticides, it will control both the Anopheline and Culicene mosquitoes which are respectively the carriers of malaria and filariasis. Their great biological activity makes it possible to use these insecticides at application rates which are a mere fraction of those needed for other insecticides, such as DDT and BHC.

Aldrin attracted worldwide attention in 1951 when the Iranian Government appealed for help in combating its worst locust plague in 80 years. Under the TCA (now Mutual Security Administration) programme, 13 tons of aldrin were flown to Iran and applied at the recommended strength of only 2 oz. per acre. Within 24 hours 98 per cent of the insects were killed, the plague checked and the threat of famine averted.

In the 1952 locust campaigns in Pakistan and Iraq, aldrin was used both aerially as a spray and as the toxic component in ground bait and proved cheaper and more effective than any other insecticide. More recently this summer dieldrin was responsible for saving a $75,000,000 rice crop in California, from the depredation of rice leafminer, during the biggest infestation in the area since 1922. The insect had already damaged 50,000 acres of rice when the experts were called in. Within a few days more than half the Californian rice acreage had been sprayed with dieldrin, selected after on-the-spot trials as being the most effective destroyer of this pest, and the wealthy crop was saved at a cost of as little as $3.50 (£1 5s.) an acre.

The terms 'aldrin' and 'dieldrin' were coined from the well-known chemical synthesis, the Diels-Alder reaction used in their manufacture.

Aldrin contains not less than 95 per cent of 1,2,3,4,10,10 - hexachloro - 1,4,4a,4,8,8a-hexahydro-1,4,5,8-dimethanonaphthalene, together with 5 per cent or less of related chlorinated hydrocarbons. Dieldrin contains not less than 85 per cent of 1,2,3,4,10,10 - hexachloro-6,7-epoxyl - 1,4,4a,5,6,7,8,8a-octahydro-1,4,5,8-dimethanonaphthalene, together with 15 per cent or less of related compounds.

Catalyst Factory

The first factory on the European continent to produce catalysts for cracking oil was officially opened recently in the Netherlands. The plant, which started production ahead of schedule last January, has an output of 5,000 to 6,000 tons a year, and the company plans to double it next year. It is expected that 90 per cent of the output will be exported. Contracts for the sale of the whole first ten years' production have been concluded with Royal Dutch and Standard Oil for their refineries in Holland, France, Belgium and Germany.

Safety Requirements of Floors

Attention to Details Can Prevent Accidents

IT is undeniable that the condition of the floor may have an important effect on the occurrence of accidents in a chemical works. A slippery floor is a constant hazard to workers and accidents may also be caused by uneven wear, pot-holing, indentation, splintering of surfaces, cracking or lifting of the floor, bad design of steps or ramps, and the use of materials which may lead to fire or explosions.

Attention to the prevention of accidents associated with floors should begin at the design stage of the building and its equipment. Suitable layout may avoid heavy concentration of foot and trolley traffic which might cause excessive wear. In designing a works or factory the floor levels should be so planned as to avoid the need for steps where heavy flows of foot or trolley traffic occur. A single step is often a source of danger. Where varying floor levels are unavoidable ramps may be preferable to steps, but on trolley routes the slope is important and should not be so steep that the momentum of the trolley might create a hazard.

In selecting a floor finish the essential qualities to be considered include resistance to wear, impact and dampness, and freedom from slipperiness, cracking and lifting. In many works freedom from the deleterious effects of certain chemicals may be important, or it may be necessary for a floor to be 'non-sparking' or for some rooms to be electrically conductive. Wear is bound to occur in varying degrees with every type of floor, but it is important that it should occur evenly without the development of holes, badly worn patches, dusting, chipping, splintering or ridge formations. Besides constituting hazards to the users of the floors, these defects make it difficult to keep the surface clean.

Fatigue a Danger

The comfort and well-being of workers also call for careful consideration when selecting floors, since proneness to accident is unquestionably influenced by discomfort and fatigue.

For several years the materials used for floor surfaces have been under investigation by the Building Research Station of the Department of Scientific and Industrial Research, and this study has yielded a considerable amount of fundamental data, much of which has an important bearing on the problem of accident prevention. Recommendations regarding the types and qualities of floor finish suitable under various industrial conditions occurring in practice, are contained in *National Building Studies Special Report No.* 11 (*Floor Finishes for Industrial Buildings*), by G. E. Bessey, M.Sc., F.R.I.C. This report contains a wealth of information which is directly applicable to the chemical industry, although certain special problems peculiar to the industry are excluded from its scope.

British Standards

A number of British standards relating to particular types of floor finishes are also available for consultation. A series of British Codes of Practice dealing with the properties and performances of various floor finishes, methods of laying and limitations on their use, is in course of preparation, and some have been published as drafts for comment.

No floor can be ideal for all requirements. For example, women workers may be employed at the receiving end of a conveyor belt feeding on to heavy trollies which are pushed away. This situation requires a floor suitable for the comfort of the women workers, but which must also be capable of withstanding heavy trolleys. Only by the installation of two different floor finishes could such conflicting requirements be satisfied. Sometimes there may be one overriding requirement which limits the range of choice, such as the acid-resistant qualities which are often essential in the floors of chemical factories. Frequently it is necessary to compromise by choosing a floor capable of giving a reasonable standard of overall performance.

Of the utmost importance to personal safety is freedom from slipperiness. A floor should be non-slippery under all conditions of use, whether clean or dirty, wet or dry, new or worn, and also when materials from factory processes are spilt. In this connec-

tion it is noteworthy that the most dangerous hazards are often presented by a sudden change from a non-slippery surface to a slippery floor or patch. Slipperiness may be reduced by surface roughening or by the formation of grooves, ribs, corrugations or embossments in the manufacture or in the laying of the material. The introduction of abrasives such as carborundum or alundum in the finish is frequently adopted for concrete floors and stair treads.

Spillage Hazard

Hazards may be presented by the spillage or splashing of liquids over the floor. The presence of a liquid such as oil may make the floor slippery, or spillage of certain chemicals may result in deterioration of the surface. Both conditions are a potential source of accidents. The best approach to this problem is to design the machinery and its layout so that liquids are prevented from reaching the floor. The risk of damage to the floor may often be greatly reduced by placing drip-traps, or preferably catch-pots and gulleys, where it is liable to occur. Should this not be feasible it may be possible by suitable design to limit the area of floor which is affected.

This hazard may also be reduced by suitable construction of the floor finish. For example, the floor finish might be designed in a double layer, the upper layer being an iron or steel open grid through which the fluid may drip. In a chemical works the potential danger to personal safety, as well as the cost of maintaining the floor in a good condition, may be reduced by frequent or continuous washing and by designing the floor finish with adequate falls for drainage purposes. Slopes up to 1 in 40 are used in the chemical industry.

Particular care should be taken to use a finish which has good non-slip characteristics in positions where any liquid inducing slipperiness is likely to be spilt or splashed on the floor.

Fire resistance is, of course, an important requirement where highly inflammable materials such as celluloid are handled, and in some circumstances a fire-resistant floor may be a statutory requirement. Where inflammable liquids are liable to be spilt, the fire risks will obviously be greater with floors of absorbent or combustible materials, such as timber or asphalt, than with inert dense materials such as concrete or tiles. In factories or stores where sparks caused by friction on a floor surface may cause fire or explosion, it is necessary to use non-sparking finishes, such as rubber, special non-sparking asphalts, or special magnesium oxychloride compositions. In order to avoid the risk of sparking, it may also be desirable in some instances to use a floor which conducts electricity and so prevents the accumulation of static charges. Special types of concrete floors with metal aggregates or of rubber with graphite fillers are suitable for this purpose.

There are as yet no accepted standards by which the floor properties affecting physical comfort may be gauged, but workers are physically affected by foot comfort, which depends on the resilience and thermal conductivity of the floor. In general, a fairly soft non-conductive surface is less tiring for standing workers than a hard conductive surface.

A high resistance to wear is given by steel or cast iron plates, tiles or grids. Other good wear-resistant materials include granolithic concrete and pre-cast tiles, hard ceramic tiles, etc. For floors where neither impact nor the more severe type of abrasion occurs, finishes which should be sufficiently wear-resistant include rubber, heavy duty magnesite, bitumen, cement, latex cement, wood block, asphalt, pitch, clay and concrete tiles.

Limitations of Timber

Timber is still among the best materials for many conditions. If appropriate varieties are used, good resistance to wear and to the action of water, oils and fats, and neutral salts can be obtained. Most timbers, however, are affected by appreciable concentrations of acids or alkalies, which cause pick-up of the grain and gradual softening. Timber is unsuitable for continuously moist conditions (which may lead to rot), for alternating wet and dry conditions (which may cause warping and lifting), and for exposure to acids and alkalies. In some conditions timber tends to absorb oil and grease and thus become dirty and slippery.

The behaviour of a floor finish under any given conditions depends not only on the type of finish, but also on the quality of the materials and workmanship. It is thus essential not only to select a suitable type of flooring for the particular purpose and to specify the quality of the materials to be

used, but also to ensure that the finish is carefully laid by suitably skilled labour.

It should also be remembered that the behaviour of the floor finish depends upon the suitability of the structural floor and, in the case of ground floors, upon the sub-floor or foundations. Floor movement resulting from settlement of the major structural elements of the building or shrinkage of the soil under the floor is, of course, a problem on which the advice of an architect or engineer should be sought. Deflection or floor movement with consequent damage may also occur, however, if the design load of the floor is exceeded by the installation of new machinery, by storage of an excessive weight of goods on the floor, or by the manner in which the superimposed load is distributed on the floor.

Face Protection

THE new 'Panorama' face shield, moulded in one piece from 1/16 in. Perspex acrylic sheet, has been designed as a light and comfortable form of face protection for the chemical industry.

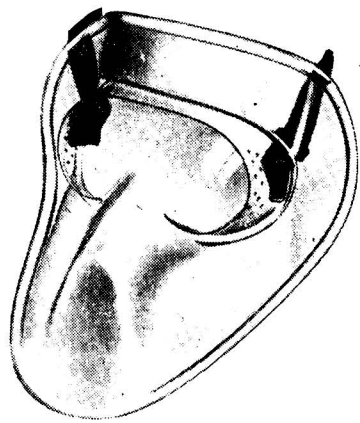
The face shield incorporates the 'Panorama' goggle in the eye piece, and small ventilation holes at the side of the goggle portion allow a full flow of air to penetrate to the eyes, thereby avoiding misting and fogging.

An important feature of the shield is the absence of clumsy head harness, and the total weight of the face shield is only 3½ oz., making it the lightest weight model produced. A ¾ in. elastic band is sufficient to hold the shield in place.

Encyclopædia of Safety

ONE of the significant developments in industry in recent years has been the growing awareness of factory managements of the importance of health and welfare in industry. The wise employer is anxious not merely to comply with minimum standards laid down in the Factories Act and Regulations, but rather to establish conditions of comfort and safety for his employees which will result in the best work. There are few books giving comprehensive information on this subject, and a newly published 'Factory Health, Safety & Welfare Encyclopædia', by C. Conway Plumbe, formerly HM Superintending Inspector of Factories, should prove of great value to the busy works manager, personnel officer, or safety officer. The sentiment which throughout has moved the author is found in essence in one sentence: 'being engaged at a factory should never become a reason for smothering one's normal human faculties'. Mr. Plumbe's particular interest is certainly industrial psychology, as his section on 'Colour' shows, but the whole book is a good guide to sensible industrial practice, which can offer workers 'a real sense of personal dignity in work and a way of life worth while for the community'.

'Factory Health, Safety & Welfare Encyclopædia.' By C. Conway Plumbe. National Trade Press Ltd., London. 1953. Pp. 328. 30s.



'Panorama' face shield

Oil Refinery Progress

During a recent Press visit to the Vacuum Oil Company's new refinery at Coryton, Essex, it was stated that progress has reached an advanced stage and it is hoped to complete all the major work before the end of the year.

New Selective Weedkiller

A new and more concentrated form of the hormone weedkiller Methoxone, called Agroxone 4, is to be marketed by Plant Protection Ltd., next spring. It will contain 90 per cent active weedkilling agents as against 60 per cent in all previous weedkillers based on the same chemical formula.

Powdered Hydroxyethylcellulose

A NEW, easy-to-use powder form of 'Cellosize' hydroxyethylcellulose is now commercially available from new plant facilities at Niagara Falls, New York, according to an announcement by Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation.

This white, water-soluble, free-flowing powder is useful as a thickener, stabiliser, dispersant, and binder. It is being offered in two viscosity types—Cellosize WPHS (viscosity of a 5 per cent solution is approximately 7,000 cps. at 20°), and Cellosize WPHS-Low (viscosity of a 5 per cent solution is approximately 100 cps. at 20°). Both types contain a minimum of 60 per cent hydroxyethylcellulose and have a maximum salt content (sodium phosphates) of 35 per cent.

Cellosize WPHS has already proved of value as a thickener and stabiliser for resin emulsions, as a laundry size, and as a thickener for cosmetic lotions and water-base inks. It is being used as an additive in urea-formaldehyde textile finishes to improve the 'handle' of the fabric, as an additive in dressings for rubber products to give a glossy finish, as a constituent of non-staining wall-paper adhesives, and as a leather pasting adhesive.

Cellosize WPHS is also suggested as a soil suspending agent and thickener for detergents, as a pigment dispersant, as an adhesive, and as a general purpose thickener. For most of these uses the salt content of the new powder form has the advantage of making the hydroxyethylcellulose easier to dissolve in water. In many preparations the presence of the phosphate salts may be beneficial because of their detergent and dispersant properties.

Industrial Clothing

AS much as the sailor, soldier and airman must be dressed for the parts played in Service life, so it is becoming increasingly recognised that industrial workers must be provided with the right kind of protective garments and the correct distinctive clothing for whatever job they do. 'Uniforms and Industrial Clothing Catalogue,' a new annual publication, deals comprehensively with the complete range of Service uniforms, general uniform wear, and industrial clothing. It caters for those responsible for the purchase of all types of uniforms, overalls, protective wear, footwear, facewear, headwear, gloves, textiles and accessories. With the help of the fully illustrated Buyer's Guide, purchasing and indent agents can locate suppliers of almost any type of clothing equipment required. The articles in 'Uniforms and Industrial Clothing Catalogue' present much practical information on how to make the right kind of purchases, quality points to look for, garment storage methods and information on the latest cloth and clothing tests carried out by Service and industrial experts. There is also a simple guide to all the legal requirements for protective clothing and a list of testing laboratories which carry out examinations on cloth and clothing of all descriptions. The annual is published by the United Trade Press Ltd., 10s. per year.

Phosphating Conference

DELEGATES from Great Britain, the United States, France, and Western Germany, including the world's acknowledged experts in the industrial phosphating field, met recently at the Pyrene Company, Ltd., Great West Road, Brentford, Middlesex, for an exchange of technical information and to discuss future developments of the internationally known and used 'Bonderizing,' 'Parkerizing,' and 'Parco-Lubrizing' range of industrial phosphating processes.

The conference, the first of its kind ever to be held, was conducted under the chairmanship of Mr. W. E. Wright, a leading authority in this country on the application of phosphate coatings, and a director of the Pyrene Company, Limited, who also headed the British delegation. Leaders of the visiting delegations were: The United States—Mr. R. W. Englehart (Parker Rust Proof Company); France—M. Dété (Societe Continentale Parker); and Germany—Dr. Wilhelm Overath (Metallgesellschaft AG). The meetings lasted three days.

A special feature of the conference was the attention paid to research in the phosphating field, all four participating countries taking an active part. Delegates described the investigations current in their own research laboratories and pooled their experience regarding inquiries now being undertaken in many directions in the solution of important production problems.

Indian Newsletter

FROM OUR OWN CORRESPONDENT

FOUNDATIONS were laid on 6 September for a new factory of The Heavy Chemicals Ltd., at Milavittan, near Tuticorin, South India. The factory is the first of its kind in India to manufacture high test hypochlorite in addition to caustic soda, titanium tetrachloride, titanium dioxide and ferric chloride. The Heavy Chemicals Ltd. was formed in 1951 with the object of manufacturing caustic soda and utilising by-product chlorine for making a line of chemicals in two stages. During the first stage, the factory envisages electrolytic production of five tons of caustic soda per day and utilisation of the chlorine output for the manufacture of high test hypochlorite. In the second stage, production of caustic will be stepped up to 10 tons per day and the surplus chlorine will be utilised to process ilmenite sand. It may be remarked that India now produces about 11,000 tons of caustic soda per year and the Five Year Plan for India hopes to raise the production to 33,000 tons by 1956. High priority has been given to fostering chlorine industries in the country.

The raw materials required for the factory are readily available in the locality. Tuticorin is a big producer of sea salt and cheap and continued supplies are assured. The beach sands contain ilmenite, which will be processed. The power requirements will be met from the Papanasam hydroelectric grid. The factory will be erected on a 20-acre site and an adjoining 50-acre land is proposed to be developed into a model township. The plant for the factory has been supplied by Messrs. Krebs-De Roll, of Switzerland, who, with the directors of the company, have invested a capital of Rs.3,500,000 (£262,500), while another Rs.1,500,000 (£112,500) has been issued for public subscription. When the factory goes into production, it will meet the caustic soda demand, especially of South India, and will also produce valuable by-products.

* * *

Details regarding the new steel plant to be set up in India have been announced in the House of the People by the Minister for Production, Government of India. An agreement has been signed between the Government of India and two German firms, Krupps and Demag. The agreement provides for technical and financial co-operation of the two firms in erecting a new steel plant with an initial capacity of 500,000 tons of ingots per year and capable of stepping up to 1,000,000 tons a year. A private limited company with representation for Government and the firms will be registered shortly, to own and operate the new steel plant. The Government nominee will be the managing director of the company. The German firms will provide the technical experts and Indian nationals will receive progressive specialised training for manning the plant.

The capital cost of the project is estimated to be about Rs.712,000,000 (£53,400,000). Of this, the Government of India will provide about Rs.420,000,000 (£31,500,000), the German firms contributing Rs.95,000,000 (£7,100,000). The Government of India propose to apply to the International Bank of Development and Reconstruction for a loan of Rs.200,000,000 (£15,000,000). The German combine will be appointed technical consultants and will receive a fixed fee of Rs.21,000,000, and no royalties are payable. The agreement is for a period of 10 years with option to either party to continue the association for a further period of 10 years. The constitution of the company and the location of the new steel plant will be decided by a team of German experts who will come to India shortly. Tenders for plant and supplies will be called for from UK, USA, and other countries, and quality, prices and deliveries will be the determining factors in selecting suppliers.

Even after setting up the new steel plant, the Government feel that, in view of the rapid industrialisation of the country, there still exists the need for another steel plant. In this context, it is pertinent to point out that the Government of India have virtually agreed to advance a loan of Rs.100,000,000 (£7,500,000) to the Tata Iron & Steel Company, according to their latest annual report. The company will draw on the loan very shortly and will utilise the loan for the expansion and modernisation of the plant at Jamshedpur. While every effort is being made to step up production of iron and steel

in India, it is regrettable that labour at the Indian Iron & Steel Works Ltd., Burnpur, should resort to a continued slow-down strike which resulted in a lock-out. In the State-owned Mysore Iron & Steel Works at Bhadravati, labour troubles were apprehended. In both cases the Government took prompt measures which improved the situation and production is expected to reach normal shortly.

* * *

The export of manganese and iron ores has been ordered by the Ministry of Commerce and Industry to be restricted from the ports of Calcutta and Madras from 15 October, 1953. While exports of these ores will be unrestricted from other ports like Bombay, the exports from Madras and Calcutta will be allowed only 25 per cent of their highest exports in the past three years. The order has been resented in trade circles, especially in view of commitments with foreign firms and the fact that Madras and Calcutta account for 47 and 17 per cent of total manganese ore exports from India. It may be pointed out here that India exported a total of 1,364,931 tons of manganese ore to all destinations in 1952-53 (April to March), of which 136,584 tons went to UK. It is likely that because of restrictions exports may fall and buyers abroad may find difficulties and delays in supplies.

The mineral policy of the Government of India may be changed in future in view of a decision taken by the Mineral Advisory Board to encourage exports of minerals in semi-processed or processed forms. It is too early to say how this decision may be implemented. Meanwhile the activities of the Geological Survey of India are on the increase. Limestone deposits to the tune of 3,000,000,000 tons suitable for the manufacture of cement have been found in Kurnool District (South India). Location of iron ore in Kistna District and adjoining tracts of South India has led to brisk activity in the area; mining leases have been obtained and it is learnt that the ore will be exported from Masulipatam port on the East Coast.

The UK Government, under the technical co-operation scheme of the Colombo Plan, have provided the Indian Institute of Technology at Kharagpur with tool rooms equipped with some of the finest and most modern machine tools. These had been given highest priority in British factories and had been supplied in a year, although they would normally have taken four years. The equipment cost Rs.470,000 (£35,250). The acting British High Commissioner, in declaring the tool rooms open, said these would hasten the pace of technological education in India.

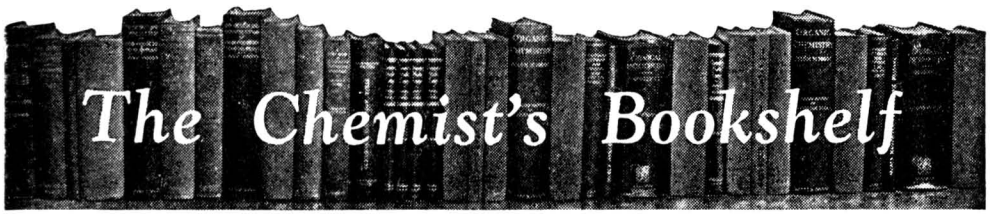
The Tata Iron & Steel Company have donated Rs.600,000 (£45,000) to the Bihar Institute of Technology, Rs.400,000 (£30,000) to the Arts and Science College at Chibassa and Rs.300,000 (£22,500) for the starting of the Orissa Polytechnic Institute at Hirakud, for fostering technological education in the country.

Transhipment Licensing Control

The Board of Trade announces that the 'Transhipment' Open General Licence dated 15 October, 1951, has been amended as from 15 October next, to control certain further goods of strategic importance and to release from control fats and oils, oil-bearing seeds and nuts. The goods now brought under control—as listed in the amendment obtainable from H.M. Stationery Office—may not be transhipped without individual licences, other than to the Commonwealth (except Hong Kong), the United States of America and the Irish Republic. Applications for individual transhipment licences should be submitted to the Export Licensing Branch, Board of Trade, Atlantic House, Holborn Viaduct, London, E.C.1.

New Spinning Oil

THE new Mule Spinning (Health) Special Regulations, 1953, are due to come into force early next year and to meet their requirements for a 'white hydrocarbon oil of petroleum origin which has been drastically refined with sulphuric acid and conforms to the specified colour and viscosity.' Manchester Oil Refinery Ltd., announce the production of a new White Mule Spindle Oil. This oil is completely mineral in origin and has a viscosity of between sixteen and twenty-one centistokes at 140°F. and a Saybolt Chronometer colour of +30. The well-known work of Dr. C. C. Twort indicates that these rigid standards mean complete biological inactivity and to meet them this new oil has been subjected to severe treatment during refining.



PROGRESS IN ORGANIC CHEMISTRY. Vol. 2. Edited by J. W. Cook. Butterworths Scientific Publications, London. 1953. Pp. 212. 42s.

Is there a permanent place for an annual book reviewing organic chemistry, when in addition to the large number of reviews published in the trade magazines, there already exist several review publications such as 'Chemical Reviews,' 'Quarterly Reviews' and 'Annual Reports on Pure and Applied Chemistry'? The favourable reception afforded to the first volume of the series suggests that there is, and with one slight reservation the present reviewer is in agreement with this view. The articles which appear in both volumes are not claimed to be comprehensive, but are rather in the nature of a description of selected topics, the section being in all cases made by a recognised authority in the field under review. This lack of completeness need not be considered as a disadvantage, for it is possible for almost any research student to make an exhaustive examination of the literature and produce a complete survey. Nevertheless, when the writer is an authority, we should demand more from him than a brief description of published work in his selected topics. We should, in fact, demand a critical survey.

The review which fits these requirements most perfectly is 'The Relationship of Natural Steroids to Carcinogenic Aromatic Compounds' by H. H. Inhoffen. There is not only a stimulating account of the detection of carcinogenic activity in polycyclic hydrocarbons, but also a delineation of the gaps in our knowledge, and suggestions for future action. The similarities in structure between steroids and the polycyclic hydrocarbons are discussed and the theories of the origins of carcinogenic activity examined critically. This review should do more than acquaint the student or research worker with the present position of chemical carcinogenesis, it should stimulate fresh work in this most vital of investigations.

The task of F. S. Spring in reviewing the 'Partial Synthesis of Cortisone and Related Compounds from Accessible Steroids' was slightly more difficult, and there seemed to be no attempt to assess the value of the many alternative routes, possibly because of the recent character of most of the work. In the confused state of mind induced by their variety and ingenuity it seemed significant that in a recent announcement of a projected British manufacture of cortisone, the starting material chosen should be the original one, desoxy-cholic acid. There was no mention of the total synthesis, which must have some reaction upon these attempts at partial synthesis.

The first article by M. J. S. Dewar, entitled 'Some Recent Developments in Theoretical Organic Chemistry,' is one of the clearest expositions of the applications of quantum theory to the theoretical problems of organic chemistry.

The review of 'Organic Fluorine Compounds' by M. Stacey, gives in addition to the discussions of laboratory procedures, many of the manufacturing processes for this new and important class of compounds. The applications and uses of many are also mentioned.

The least satisfactory article in the book, is 'Some Recent Developments in Pyridine Chemistry' by J. P. Wibaut. Although it is some years since the chemistry of the pyridine nucleus was adequately reviewed, the present text is not confined to the large amount of work carried out in the intervening years, but is an arbitrary selection from papers published during the last 30 years. Thus, while the synthesis of the pyridine nucleus from aliphatic compounds is discussed, the reverse procedure of the ring opening to produce such compounds as the derivatives of glutaconic aldehyde is not mentioned. Similarly there is a reference to sulphapyridine, but none of *iso*-nicotinic acid hydrazide.—J.R.M.

ORGANIC CHEMISTRY.—An Advanced Treatise. By Henry Gilman. New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. 1953. Volume III, pp. 580 + xxxviii. Volume IV, pp. 661 + xxxviii. 70s. each.

The first two volumes of this work were issued in 1938, and were subsequently revised in the second edition of 1943, but Volumes III and IV comprise entirely new material and have not previously been published. The general idea behind the initiation of this series was to provide a general treatise of organic chemistry suitable for instruction at graduate level in which attention was focused upon new developments.

Six main subjects are dealt with in each of the present two volumes, and some details of these topics are given below as the general title of the treatise is scarcely indicative of its wide scope and importance.

Volume III:

The Study of Organic Reaction Mechanisms (122 pp.) by Paul D. Bartlett discusses the general way in which reaction mechanisms can be classified broadly into free radical mechanisms, ionic mechanisms and molecular mechanisms, and considers in some detail the mechanisms of a large number of organic reactions.

Applications of Infra-red and Ultra-violet Spectra to Organic Chemistry (56 pp.) by Foil A. Miller deals primarily with the use of infra-red and ultra-violet spectra in determining the structure of organic molecules.

Lipids (65 pp.) by J. C. Cowan and H. E. Carter is a useful account of the esters of the higher fatty acids and related compounds which are characterised by solubility in organic solvents, and by insolubility in water. Fats, phospholipids, inositol lipids and sphingolipids are discussed.

Organic Dyes (149 pp.) by H. W. Grimmel provides an extensive and valuable survey of the chemistry of organic colouring matters, but excludes (owing to limitations of space) intermediates.

Some Aspects of Chemotherapy (141 pp.) by H. R. Ing deals primarily with the chemotherapy of bacterial infections, malaria and of diseases caused by trypanosomes. Various types of chemotherapeutic agents are discussed, including arsenical drugs, cinchona alkaloids, acridine derivatives and sulphonamides.

Antibiotics (48 pp.) by Lee C. Cheney provides a compact account of the chemistry of benzylpenicillin and similar related compounds, streptomycin, aureomycin and terramycin, and includes a valuable table giving details of over 70 less well-known antibiotics.

Volume IV:

The Terpenes (142 pp.) by Richard H. Eastman and Carl R. Noller presents an extensive description of the acyclic, monocyclic and bicyclic terpenes, the sesquiterpenes, diterpenes, triterpenes, tetraterpenes, and polyterpenes (e.g., rubber).

Heterocyclic Chemistry (178 pp.) by Richard H. Wiley deals with a group of compounds which are widespread in nature as alkaloids, vitamins, pigments, etc., and which often play a vital role in biological processes. The synthesis and reactions of the well-known heterocyclic rings are also described.

Starch (50 pp.) by W. Z. Hassid is an interesting and valuable account of the chemistry of this important polysaccharide.

Chemistry of Explosives (50 pp.) by George F. Wright is mainly concerned with the chemistry of explosives developed (or released from security restrictions on publication) since 1945.

Reactions of Organic Gases under Pressure (119 pp.) by W. E. Hanford and D. E. Sargent deals with reactions involving organic compounds and substances other than hydrogen that are normally gaseous under standard conditions. Hydrogenation was dealt with in Volume I. Subjects considered in this volume include the reactions of gaseous saturated hydrocarbons under pressure, the polymerisation of ethylene, propene and butene, and the reactions of acetylene under pressure.

Oxidation Processes (126 pp.) by William A. Waters describes reactions involving the use as oxidising agents of diacyl peroxides, hydrogen peroxide and peracids, ozone, osmium tetroxide, lead tetraacetate, periodic acid, chromic acid and chromyl chloride, potassium permanganate and selenium dioxide.

A useful feature is that each volume is provided with a complete index to the two volumes, which should facilitate reference. For the chemical student commencing research in these particular fields, or as refresher reading for more advanced workers these two volumes would seem to serve an admirable purpose.—G.S.E.

HOME

I.C.I. Oil Prospecting

It has been announced that a petroleum prospecting licence covering an area of 142 sq miles in the North Riding and Durham has been granted to I.C.I. by the Minister of Fuel and Power. The area includes parts of West Hartlepool and Darlington.

George E. Davis Memorial Lecture

A memorial lecture on the life of George E. Davis, 'the father of chemical engineering', will be given by Mr. Norman Swindin, of Nordac Limited, in the Reynolds Hall, College of Technology, Manchester, on Saturday, 10 October, at 3 p.m. The lecture is being given under the auspices of the North Western Branch, Institution of Chemical Engineers, and the Chemical Engineering Group and the Manchester Section of the Society of Chemical Industry, and will be followed by a Memorial Dinner at the Queen's Hotel.

Progress in Titanium

Dr. Maurice Cook, joint managing director, Metals Division, Imperial Chemical Industries, Ltd., Witton, speaking at the recent Institute of Metals conference at Southport, said that titanium had been known for 150 years, but only in the last few years had it been produced on an industrial basis. In the last six or seven years, millions of pounds had been spent on research. Never before in so short a time had there been so much activity directed on one single industrial metal.

Phthalate Price Amendments

British Industrial Solvents inform us that an error was made in the Press notice they issued concerning reductions in the main 'Bisol' phthalate plasticisers (see THE CHEMICAL AGE, p. 614, 19 September). The following is the corrected schedule of current prices per lb: Bisoflex 81 (DOP), 2s. 8¼d.; Bisoflex 791, 2s. 1¼d.; Bisoflex 91, 2s. 3¾d.; Dibutyl phthalate, 2s. 0¼d.; Di-*iso*butyl phthalate, 1s. 9¾d.; Diethyl phthalate, 1s. 10½d.; Dimethyl phthalate, 1s. 7½d. All prices are for 5-ton lots, delivered carriage paid UK, in returnable packages.

Leakage of Acid

A leakage of acid into the street and down the gutters, from a vat on the premises of W. Canning & Company, Palmer Street, Small Heath, Birmingham, last week, was attributed to a faulty tap. The acid was flushed away by the fire brigade and no damage or injury was caused.

Coal Board Profit

An estimated surplus of £808,187 for the second quarter of the year is announced by the National Coal Board. The estimated surplus for the first quarter was £541,133. In the second quarter—as in the first—only four divisions of the Board showed a profit —North Eastern, East Midlands, West Midlands and South Eastern.

To Fight the Red Spider

A new insecticide to combat the red spider, one of the worst pests on fruit farms, has been perfected by Boots Pure Drug Company, Ltd., of Nottingham, after five years' research during which more than 500 compounds were experimented with. The successful one, 'Chlorocide', will be on the market in the New Year. It will have a good export trade as the red spider is a big problem for tea planters in India and Ceylon, and also for fruit growers in the United States.

The End of *British Abstracts*

When the publication of abstracts was recommenced early this year by the Bureau of Abstracts, a grant had been made by HM Government to secure the preparation of the 1953 issues of *British Abstracts* and the outstanding indexes. This grant was made pending the completion of other negotiations by which it was hoped to put the Bureau on a more satisfactory financial basis. Unfortunately these negotiations have failed, and after full consideration the Continuing Committee has been reluctantly compelled to make the decision that *British Abstracts* as such must be discontinued after the December 1953 issues. However, some of the scientific societies are considering the possibility of arranging for the continued production of certain sections of *British Abstracts* in 1954.

• OVERSEAS •

Promising Discovery

Yet another promising uranium field has been discovered in the Northern Territory of Australia. The new find is near Katherine, about 220 miles south of Darwin. Early indications suggest that it might be as potentially important as Coronation Hill, which is 40 miles east of Pine Creek, between Katherine and Darwin.

New Rubber Product

Claimed to be tougher than leather and cheaper to make, a new rubber product, known as cyclised rubber, is being developed in Malaya. Footwear manufacturers in the United States of America and Great Britain have been sent samples by H. & C. Latex and the Rubber Research Institute, Kuala Lumpur, and asked for their opinions.

Powdered Silk

By use of a new patented process, a Japanese firm has commenced the production of a powdered silk which, it is said, can be blended into face powders and other types of cosmetics. The atomised silk powder is white with the lustre of silk, is 90 per cent silk protein, has a moisture content of 9 per cent and an ash content of one-half of one per cent. It is said to have a specific gravity of 0.204 and will pass through a 250-300 mesh.

Paper Industry in Norway

King Haakon of Norway laid the foundation stone of a new building in Oslo to be used by the Norwegian Paper Industry's Research Institute. As part of the ceremony the King received a book giving the history of the paper industry; the raw material came entirely from a fir tree on the King's own estate outside Oslo. Another copy of the book was laid with the foundation stone. According to this book the Norwegian paper industry today comprises 90 factories with an annual production of 700,000 tons of woodpulp, 550,000 tons of sulphite cellulose, 100,000 tons of sulphate cellulose, 550,000 tons of paper, cardboard, etc., and 100,000 tons of wallboard. The new institute, which is expected to be completed in about a year's time, is financed to a great extent by funds raised from the export of paper.

Mining Rights Leased

Decrees have been signed authorising the transfer of 2,832,000 sq. metres of Chilean state-owned nitrate land in the Province of Antofagasta to the following companies: the Anglo Lautaro Nitrate Co., Ltd., and the Cia. Salitrera de Tarapaca y Antofagasta.

Battelle Research Building

The Battelle Institute of Colombus, Ohio, is erecting at an estimated cost of $1,500,000 a new building for chemical research. The Institute employs a staff of more than 2,000. The new building includes provision for space for pilot plants used in chemical engineering research.

Gala Celebration

To celebrate its 25th anniversary, a gala celebration is being planned by the Association of Consulting Chemists and Chemical Engineers, Inc. This will take place on Tuesday, 27 October, at 6 p.m. at the Belmont Plaza Hotel, New York City. The programme includes a banquet and dance and guests are welcome. Reservations must be received before 15 October.

Norway Short of Cement

Shortage of cement is seriously hampering building operations in North Norway. Much cement is required for the Norwegian Government's defence programme, and to meet this demand 110,000 tons of cement are being imported from Finland, Germany, and Poland. Norway's own cement production is now over 700,000 tons a year, or about twice as much as before the war, but all of this is being absorbed by Norway's home-building programme.

Rumanian Lamp Black

The recent opening of two large plants for the processing of natural gas in Rumania is reported to have placed the Rumanian chemical industry in a position to enter the world market as a large supplier of lamp black. Rumanian natural gas resources are the second largest in Europe. The new plants are said to be almost completely automatic and are equipped with the latest Rumanian and and Russian machinery. They are now producing R.300 and R.250 furnace black.

• PERSONAL •

MR. B. G. ROSS has joined the board of Industrial Soaps Limited as sales director.

MR. JAMES GRAY and MR. D. H. REID have been elected president and vice-president respectively of the Fertiliser Manufacturers' Association, with effect from 24 September.

MR. J. W. NAPIER and MR. C. H. J. CORBETT have been elected chairman and vice-chairman respectively of the Superphosphate Manufacturers' Association, with effect from 8 September.

Eastman Chemical Products, Inc., have announced the opening of a new office in Toronto to handle sales of 'Tenite' plastics in Canada. Mr. CHARLES L. SEAY, who formerly represented the company from Rochester, New York, will be in charge of the office.

MR. H. E. JACKSON has resigned from the Aluminium Development Association Council following his retirement from the board of Imperial Chemical Industries, Ltd. (Metals Division). His place has been taken by DR. MAURICE COOK. MR. G. A. WOODRUFF resigned on retiring from J. Stone & Co., Ltd. He represented L.M.F.A. Development, Ltd., on the council and his place has been taken by MR. J. F. PAIGE, of William Mills, Ltd. MR. C. W. CUMBER, representing Richard Thomas & Baldwins, Ltd., has resigned on taking up an oversea appointment with his company; his successor has yet to be appointed.

Following the appointment of DR. MAURICE COOK to the council, he has been succeeded on the executive committee of the Association by DR. N. P. INGLIS. MR. F. G. WOOLLARD has resigned, following his retirement from the Birmid Group, and his place has been taken by MR. HAROLD GOODWIN, of Birmetals, Ltd. MR. F. R. C. SMITH has also resigned, since in his new position in the Aluminium Limited Group it was impracticable to continue representing Aluminium Laboratories, Ltd., on this committee. MR. J. H. MAYES, of Northern Aluminium Co., Ltd., has been appointed in his place.

MR. A. C. H. CAIRNS has joined the board of Joseph Crosfield & Sons Ltd., a Unilever subsidiary, as director in charge of chemical sales.

MR. V. C. ELLISON, who has been appointed an additional director of the Associated Portland Cement Manufacturers' Company, Ltd., is sales director of G. & T. Earle, Ltd., also of the Cement Marketing Company, Ltd., both members of the 'Blue Circle' Group.

MR. W. E. TETLEY, of the Grove Chemical Works, Birkenshaw, near Bradford, who has been Spenborough Council's representative on the West Riding District Councils' Association for ten years, was elected chairman of the association at its annual conference at Filey on 24 September.

MR. S. BAILEY has been appointed chairman of Industrial Soaps Limited, a subsidiary of Unilever Limited, in succession to MR. J. ARNOLD FOX, whose appointment as chairman of Price's (Bromborough) Limited, also a subsidiary of Unilever Limited, was recently announced.

MR. ELMER H. BOBST, USA business and civic leader and international health authority, arrived in England on Monday on the Queen Mary from New York. Mr. Bobst, president of William R. Warner & Company, world-wide drug, pharmaceutical and beauty firm, is making a six-week tour of Western European countries to make a comparative study of local health conditions, to investigate research on cancer and other diseases, and to exchange information with medical and government authorities in Western Europe. For the past decade Mr. Bobst has been engaged in the United States with the fight against cancer. As National Campaign Chairman and as Honorary Chairman, he has brought the American Cancer Society from a $1,000,000 annual budget to a current budget of almost $20,000,000 per year. For the past eight years he has served on the Research Committee of the Society. He has also been a leader in sponsoring vitamin research and vitamin distribution. He was responsible for the addition of

vitamins to flour and for assuring that bread served to the US Armed Forces would contain vitamins necessary to health. Mr. Bobst's company has recently developed two new important drugs—'methium chloride' which has been effective in treating many cases of high blood pressure, and 'peritrate' for the treatment of angina pectoris. Mr. Bobst was accompanied by Mr. Matthew G. Herold (a director of Warner-Hudnut) and by Mr. Douglas Brown (vice-president of Standard Laboratories, Inc.).

At the invitation of the Instrument Society of America, MR. W. T. MARCHMENT, Controls Manager of Evershed and Vignoles, Ltd., delivered an address last week to the annual ISA Convention at Chicago. His subject was 'Electronic Control in Oil Refineries'. Mr. Marchment left this country for the USA on 10 September, and in addition to speaking at the ISA Convention, he planned to visit several oil refineries in different states before going on to Canada. His return to this country is scheduled for the end of October.

MR. W. S. WALLEY, M.Sc., A.R.I.C., who has been senior assistant to Mr. William N. Bacon, B.Sc., F.R.I.C., F.C.S., M.I.Chem. E., of Sindall and Bacon, analytical, consulting and research chemists, 42a Buckingham Palace Road, London, S.W.1, for the past 16 years, took over the business on 1 September. The firm is continuing at the same address and under the same title, and Mr. Bacon, in a letter to his clients, commends his successor's services to past and future clients with every confidence. Mr. Bacon has been well known as a consultant for over 50 years and his many clients and associates wish him a very happy retirement.

MR. E. A. WHITEHOUSE has been promoted to the position of export-import traffic manager of Mathieson Chemical Corporation, with headquarters at 31-14 Northern Boulevard, Long Island City, NY. He will continue as export traffic manager for the company's E. R. Squibb & Sons Overseas Division, a position he has held for the past nine years, in addition to assuming the responsibilities of export-import functions for the entire corporation. Mr. Whitehouse, who has been active in the export-import traffic field for 25 years, is a member of the World Trade Committee of the Commerce and Industry Association of New York.

Promotion of MR. S. COTTRELL to the position of vice-president of the Mathieson Agricultural Chemicals Division, Mathieson Chemical Corporation, with headquarters in Little Rock, Ark., USA, has been announced by MR. S. L. NEVINS, division president. He will also continue as director of operations of the division's seven plants located in Arkansas, Arizona, Texas, North Carolina and Pennsylvania, a post which he has held for the past year.

Mr. Cottrell joined Mathieson in 1949 as operations manager of the Mathieson Hydrocarbon Chemicals Corporation. He was previously associated with American Potash and Chemical Corporation and Monsanto Chemical Company in executive capacities.

Obituary

MRS. C. E. HUGHES, whose death occurred at Northiam on Sunday, was the elder daughter of the late Sir John Williams Benn, Bt., and the widow of Mr. C. E. Hughes, for many years art director of Benn Brothers Ltd. She was one of the founders of the Women's Land Army in the 1914-18 war, and became chief recruiting officer and editor of 'The Landswoman'. She leaves a son, Mr. K. E. Hughes, who is a managing director of Messrs. Benn, and a daughter.

Presentation of Prize

At the annual dinner of the Institute of Metal Finishing at Charing Cross Hotel on 13 October, the Westinghouse Brake & Signal Company, Ltd., Prize for the 1952/53 session will be presented to Messrs. A. E. Davies, R. M. Angles and J. W. Cuthbertson for their joint paper on 'Complex Fluorides for the Deposition of Tin & Tin Alloys'.

It is announced that Mr. E. P. Bridson has been appointed London and Home Counties representative for Finney Presses Ltd., and that an office has been opened at 5 New Bridge Street, London, E.C.4. (Tel. City 4815).

Publications & Announcements

THE September issue of *Tin and Its Uses, No. 29,* contains a well-illustrated article on the work of the Corrosion Laboratories at the Tin Research Institute and explains how test methods are devised to simulate practical conditions.

A recent patent application covers the addition of organotin compounds to enamels of the chlorinated rubber type; enamels with this addition have enormously longer life. The same organotin compounds are the preferred stabilisers for polyvinyl chloride type plastics against deterioration during compounding and processing and during service. An article discusses their value in extruded PVC pipes, which are now making great headway in the food and chemical engineering industries and also for domestic water services in some places.

Tin-zinc alloy electroplate, a novelty ten years ago, is now a well established protection for steel surfaces, especially in radio and aircraft equipment for the fighting services. An example of how intricate soldering operations can be mechanised is given in an illustrated article on the soldering of car thermostat bellows.

Tin and Its Uses is issued by the Tin Research Institute, Fraser Road, Greenford, Middlesex, England (PERivale 4254-6) and is also available free of charge from all the Institute's overseas offices.

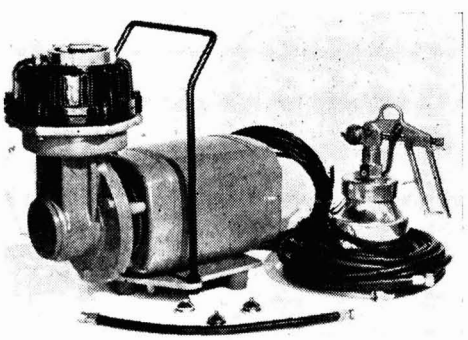
* * *

ONE of the most widely used plastics, both for industrial and domestic purposes, is polythene. The Telegraph Construction & Maintenance Co., Ltd., one of the pioneers in its commercial development, have evolved a range of materials having a polythene base, and marketed under the trade name of 'Telcothene.' 'Telcothene' does not contain toxic fillers, and its translucence and resistance to fracture at low temperature are important factors. A new publication, 'Telcon Plastics, Their End Uses and Characteristics,' has been received, devoted mainly to Telcothene in its various forms, tubing, film, powder, rod, etc. The booklet also describes gutta-percha products and 'Telstic' adhesive coatings; mouldings in PTFE and polystyrene are not detailed, and for these enquiry should be made to the company at the Farnborough Works, Green Street Green, Farnborough, Kent.

THE valuable properties of the silicones are becoming widely known; one of the outstanding properties is that of water repellency, and this has enabled the development of 'Tretol' external impregnation for roughcast, brickwork, cement rendering, concrete, etc. It is claimed that the surfaces of masonry correctly treated with this product are extremely difficult to wet with water, which simply forms droplets on the surface and runs off. The highly penetrative properties of silicones enable the waterproofer to line the pores of the building surface with a water-repellent film, without altering the appearance or 'breathing' characteristics of the masonry. 'Tretol' can be applied by brush or spray and needs no special skill. The manufacturers are Tretol Ltd., 12-14 North End Road, N.W.11.

* * *

CLAIMED to be particularly suitable for use in laboratories, for food processing, for chemical engineering and for paint spraying, the Compton portable air compressor seen in the accompanying illustration is made by Dawson, McDonald & Dawson, Compton Works, Ashbourne, Derbyshire, and powered by a Hoover fractional horse-power motor made by Hoover Limited, 211/213 Regent Street, London, W.1. The flange-mounted construction makes a neat and very portable unit and eliminates a driving belt. This is a diaphragm type compressor and thus an oil-free air supply is ensured, making the machine suitable for the purposes claimed.



Compton portable air compressor, powered by a Hoover fractional horse power motor

Next Week's Events

MONDAY 5 OCTOBER

Royal Institute of Chemistry

London: Burlington House, 6.30 p.m. Joint meeting with the London Section, Society of Chemical Industry. Dr. A. J. E. Welch: 'Recent Developments in the Chemistry of Metal Oxides.'

TUESDAY 6 OCTOBER

Institution of Chemical Engineers

London: Burlington House, 5.30 p.m. H. R. C. Pratt and others: 'Liquid—Liquid Extraction.'

Incorporated Plant Engineers

London: Royal Society of Arts, John Adam Street, W.C.2, 7 p.m. Barnet Levy: 'Patterns, Casing and Foundry Work: an Introduction.'

Edinburgh: 25 Charlotte Square, 7 p.m. Members' papers.

Institution of Works Managers

Leicester: Grand Hotel, 7 p.m. Annual dinner and discussion. R. B. Simpson.

WEDNESDAY 7 OCTOBER

Society of Public Analysts

London: Burlington House, 7 p.m. Symposium on 'Destruction of Organic Matter.'

Society of Chemical Industry

Slough: Works visit of Oils and Fats Group to I.C.I. Ltd., Paints Division.

Newcastle: Chemistry Lecture Theatre, King's College, 6.30 p.m. Papers by 'Saville-Shaw' medallists for 1951 and 1952. R. D. Peacock: 'Inorganic Fluorides'; H. Harker: 'Adsorption of Gases on Carbon'; L. E. Lawley: 'A Sonic Apparatus for the Analysis of Gases.'

Institute of Welding

Slough: The Community Centre, Farnham Road, 7.30 p.m. D. M. Kerr: 'Organisation for Production of Welded Ships.'

Manchester: Reynolds Hall, College of Technology, 7.15 p.m. Joint meeting with Institution of Structural Engineers. S. M. Reisser: 'Drawing Office Procedure for Welded Designs.'

Institute of Metal Finishing

Glasgow: 39 Elmbank Crescent, 7 p.m. H. A. Fairlie: Chairman's Address.

Incorporated Plant Engineers

Southampton: Polygon Hotel, 7.30 p.m. E. Ryalls: 'Oxygen in Industry,' with film.

THURSDAY 8 OCTOBER

Royal Institute of Chemistry

Dagenham: South East Essex Technical College, Longbridge Road, 7 p.m. Dr. J. E. Page: 'Polarography of Organic Compounds.'

Society of Chemical Industry

Nottingham: Technical College, 7.30 p.m. J. M. Preston: 'The Effects of Constitution and Architecture on the Properties of Fibrous Materials.'

Incorporated Plant Engineers

Newcastle: Roadway House, Oxford Street, 7 p.m. P. J. Gay: 'The Use of Paint in Factories.'

Institute of Welding

London: Manson House, Portland Place, W.1, 7.30 p.m. R. L. Swan: 'Automatic Welding.'

London: 2 Savoy Hill, W.C.2, 6.30 p.m. Chairman's address, followed by discussion: 'Weld Preparations—What is the Aim?'

Institute of Metal Finishing

Manchester: Engineers' Club, Albert Square, 7.30 p.m. B. J. Jones: Chairman's Address.

Textile Institute

Manchester: 10 Blackfriars Street, 7 p.m. Dr. Janette B. Reid: 'Weathering of Acetate Rayon.'

Institution of Works Managers

Wembley: Century Hotel, Forty Avenue, 12.45 p.m. A. G. Northcott: 'Work Study as a Factor in Industrial Efficiency.'

Doncaster: Danum Hotel, 7 p.m. Discussion. West Yorkshire: Works Visit.

FRIDAY 9 OCTOBER

Oil & Colour Chemists' Association

Liverpool: Exchange Hotel, Tithebarn Street, 6.30 p.m. 'Production of Carbon Black in the UK.'

Society of Glass Technology

St. Helens: Messrs. Beechams Ltd., Westfield Street, 6.15 p.m. B. Eichler: 'Refractories for Glass Tank Furnaces.'

SATURDAY 10 OCTOBER

Institution of Chemical Engineers

Manchester: College of Technology, 3 p.m. Joint meeting with Chemical Engineering Group, Society of Chemical Industry. Norman Swindin: George E. Davis Memorial Lecture.

Law & Company News

Commercial Intelligence

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

Mortgages & Charges

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

D. T. EVANS LTD., Margate. (M., 3/10/53.) 27 August, £6,000 charge to Midland Bank Executor & Trustee Co. Ltd.; charged on 1 High Street and 22 The Parade, Margate. £6,000. 16 October, 1952.

DELSHIRE, LTD., London, W., chemists' sundriesmen. (M., 3/10/53.) 1 September, £1,000 debenture to W. J. McFall, Stanmore; general charge (subject to, etc.). £5,000. 3 September, 1949.

LEDA CHEMICALS, LTD., London, W. (M., 3/10/53.) 1 September, mortgage to City Prudential Building Society securing £2,100 and any other moneys, etc.; charged on 49 Russell Road, Chingford. £7,299. 31 December, 1951.

SURGICAL PLASTICS LTD., Hythe (Kent). (M., 3/10/53.) 26 August, charge to Provincial Building Society securing £3,000 and further advances; charged on Bassett House, Blackhouse Hill, and land and buildings at Blackhouse Hill and also pieces of land, all Hythe (Kent). Nil. 22 May, 1953.

TECALEMIT LTD., Brentford, high pressure lubrication. (M., 3/10/53.) 27 August, £500,000 debenture stock secured by a Trust Deed dated 25 August, 1953; general charge. Nil. 13 May, 1953.

Satisfactions

BRUSH ELECTRICAL ENGINEERING CO. LTD., London, S.W. (M., 3/10/53.) Satisfactions 1 September, of charge registered 21 February, 5 and 9 April, 19 September, and 29 November, 1951 (the properties charged in each case having ceased to form part of the company's property or undertaking).

VACUUM OIL CO. LTD., London, S.W. (M., 3/10/53.) Satisfaction 2 September, of mortgage registered 23 May, 1952.

Increase of Capital

The following increase of capital has been announced: WILLIAM BLYTHE & CO. LTD., from £500,000 to £800,000.

Change of Name

The following change of name has been announced: NOEL PACKWOOD LTD. to ALAN HITCHEN LTD., on 8 September, 1953.

Company News

Associated Portland Cement Manufacturers

The directors of Associated Portland Cement Manufacturers Ltd. and its subsidiary, British Portland Cement Manufacturers Ltd., have announced increased interim dividends, but point out that these should not be taken to indicate that the total dividend distributions for the year will be greater than those for 1952. For some time, the directors state, they have realised that the interim dividends have been relatively small compared with the total, and they have, therefore, declared payments of 1s. per £1 unit, or 5 per cent, on the increased ordinary capital of both companies.

British Paints Limited

Mr. J. W. Adamson, chairman of British Paints Limited, has announced the purchase, from General Products Manufacturing Corporation, of the Langmuir paint division, Oakville, Ontario, and the establishment of British Paints (Canada) Limited. The latter will have its head office and manufacturing plant at Oakville and will shortly open an office in Montreal. This, said Mr. Adamson, is the nineteenth factory of the British Paints organisation, which is now established in the principal countries of the world.

Imperial Chemical Industries.

The directors of Imperial Chemical Industries, Ltd., announce that they have declared an interim dividend of 6 per cent (actual) in respect of the year ending 31 December, 1953, on the Ordinary stock of the company. This dividend will be payable on 1 December, 1953, less income tax at the United Kingdom standard rate for 1953/54, to members on the register on 9 October, 1953. For the purpose of payment of this dividend transfers in order had to be lodged at the company's Transfer Office not later than 2 October.

Market Reports

LONDON.—All sections of the industrial chemicals market report that there has been more inquiry from consumers and more confidence has been shown by their interest in placing orders for future use. Prices are little changed and remain steady. The call for export remains good. Conditions on the coal tar market are much the same, with a steady call for carbolic acid.

MANCHESTER.—Apart from one or two industrial outlets for heavy chemicals, traders on the Manchester market during the past week have had little cause for complaint regarding the rate at which contract deliveries covering a wide range of products have been taken up. On the home side, there has also been a fair number of fresh inquiries coming forward, while shipping interest seems to have been maintained at around the level of recent weeks. On balance, there has been little change in the price position. Moderate buying interest has been shown in fertilisers, and most of the tar products are being taken up in fair quantities.

GLASGOW.—With regard to home demand a week of steady trading has been reported by most sections of the industry, while some fairly substantial business has been arranged for export.

CLASSIFIED ADVERTISEMENTS

BUSINESS OPPORTUNITY

PURE SILICA SAND for sale, on the South Coast. A leasehold pit of practically 100 per cent silica sand, particularly suitable for the glass, vitreous enamelling and refractories industries and various chemical processes. A modern washing, crushing and screening plant with an output of about 250 tons per week, is installed. Offers are invited for the whole as a working unit. Samples, analysis and further particulars can be had of **FULLER, HORSEY, SONS & CASSELL, INDUSTRIAL SURVEYORS AND VALUERS, 10, LLOYDS AVENUE, E.C.3.** (Phone: Royal 4861.)

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.

CHEMISTRY graduates required by **LAPORTE CHEMICALS LIMITED, LUTON,** for chemical process development work. Candidates should have an appreciation of the fundamentals of chemical plant operation. These positions would suit men who have taken a course in Technical Chemistry or Chemical Engineering to supplement their chemical training. Age 25-40. A good salary will be paid. The position is pensionable, and there are good laboratory facilities. Apply **RESEARCH CONTROLLER, LAPORTE CHEMICALS LIMITED, KINGSWAY, LUTON.**

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" MILLS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH LONDON." TELEPHONE 3285 EAST.**

GRAVITY CONVEYOR. Rollers, 14 in. wide on 6 in. centres, with curves. **"JUNIOR" MIRACLE MILL** and **CYCLONE.** 25-gal. Copper-lined **C.I. STEAMING PAN** on three legs; also two 80-gal. C.I. Ditto. Vertical **STEAM BOILER,** 7 ft. by 3 ft., 100 lb. insurance. New 1951. **KIMMINS & SONS, LTD., LYNDHURST ROAD, WORTHING.**

FOR SALE

44—**VESSELS (PORCELAIN LINED),** 6 ft. dia. by 3 ft. 3 in. deep with conical base 2 ft. 6 in. deep.
21—**VESSELS,** ditto, **(BUT UNLINED).**
50—**VESSELS (PORCELAIN LINED),** 2 ft. 9 in. by 3 ft. 9 in.
38—**VESSELS, MILD STEEL,** 3 ft. 2 in. dia. by 3 ft. 7 in.
3—**VESSELS (PORCELAIN LINED),** 5 ft. dia. by 5 ft. 7 in.
4—**VESSELS (TILE LINED),** 7 ft. dia. by 14 ft. 6 in.
2—**TANKS, MILD STEEL,** 7 ft. dia. by 5 ft. 9 in.
1—**TANK, MILD STEEL,** 7 ft. dia. by 8 ft. 3 in.
8—**STAINLESS STEEL SEPARATORS,** 4 ft. 4 in. by 20 in.
35—**STAINLESS STEEL BENDS,** 6 in.
Inspection at Cradley Heath, Staffs.
MADEN & MACKEE LTD.,
317 PRESCOT ROAD, LIVERPOOL. 13.

FOR SALE

C. BARBER, LTD.

TWO "Hormann" 30 cm. Stainless Steel **FILTER PRESSES.**
STORAGE BINS in stainless steel, cylindrical with covers. 40/12/14/10 gallons capacity.
Cannon Steam Jacketed Enamel-lined **PANS,** 10 and 25 gallons. All new and unused.
Doulton 25 gallon **COPPERS** with lids. New and unused.
WELDED VESSELS of all types, in mild steel or stainless. Fabricated to customers' specifications.

C. BARBER LTD.
SILVERDALE GARDENS
HAYES MIDDLESEX
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1,000 16G. 45-gallon, unused, **CONTINENTAL MILD STEEL DRUMS.** Interiors excellent: exteriors stock rusty. 20s. each, ex-works. Apply **BOX No. C.A. 3266, THE CHEMICAL AGE, 154, FLEET STREET, LONDON, E.C.4.**

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