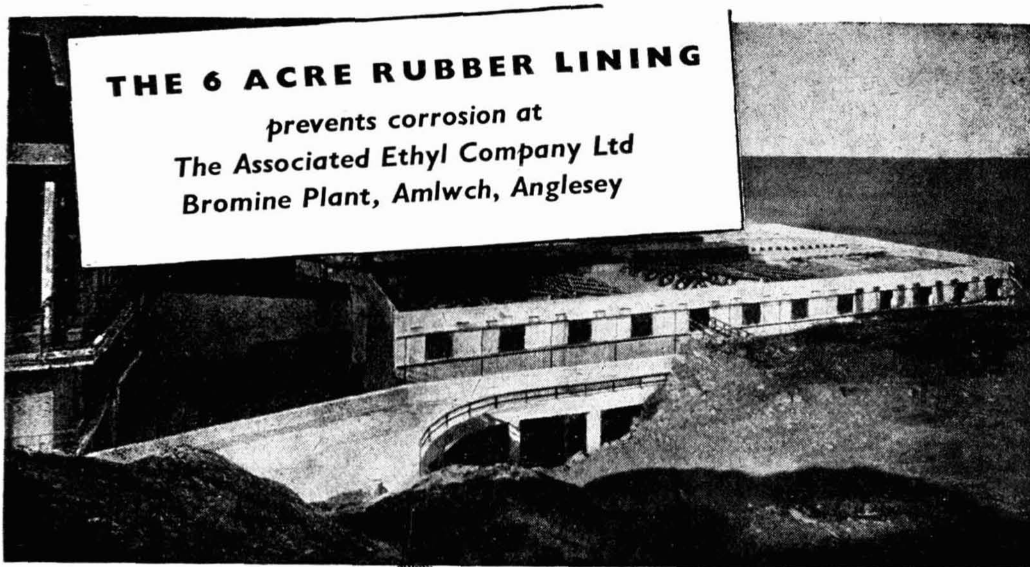
THE Chemical Age

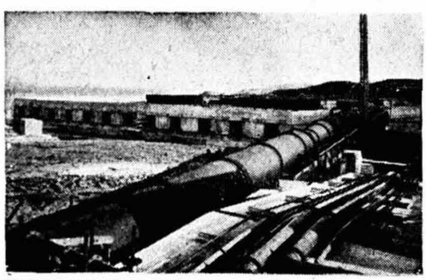
VOL. LXXI 6 NOVEMBER 1954 No. 1843



This huge rubber-lining contract completed by the General Rubber Goods Division of the Dunlop Rubber Company represents one of the largest plant-lining assignments ever undertaken. Rubber and rubber-based compounds were the only materials capable of protecting concrete and metal from the constant attack of hydrobromic, sulphuric and other acid mists liberated during the production of bromine . . . a vital element in the manufacture of "additives" for modern fuels.

In the Multi-cell "Blowing-out Tower", 75,000 sq. ft. of rubber sheeting lines the cells. To counter grave risk of fire which attended hot-air vulcanising in the enclosed "cells", air was heated outside the Tower and lining-crews wore rubber boots to prevent sparks. Day and night-shifts worked to synchronize lining-tasks with those of other sub-contractors.

In the Absorber Unit, 30 tons of rubber and rubber compound form a self-vulcanised inner lining and and an "overcoat" of sheet rubber which was vulcanised in situ.



Large-bore pipes such as this sea-water main, storage vessels and ducting throughout the plant are rubber lined, and rubber again covers the huge fan units and 4 miles of steel girders.

***rubber and synthetic linings by* DUNLOP**

DUNLOP RUBBER COMPANY LTD. (General Rubber Goods Division) Cambridge Street, Manchester, I. Tel: CEN 2131

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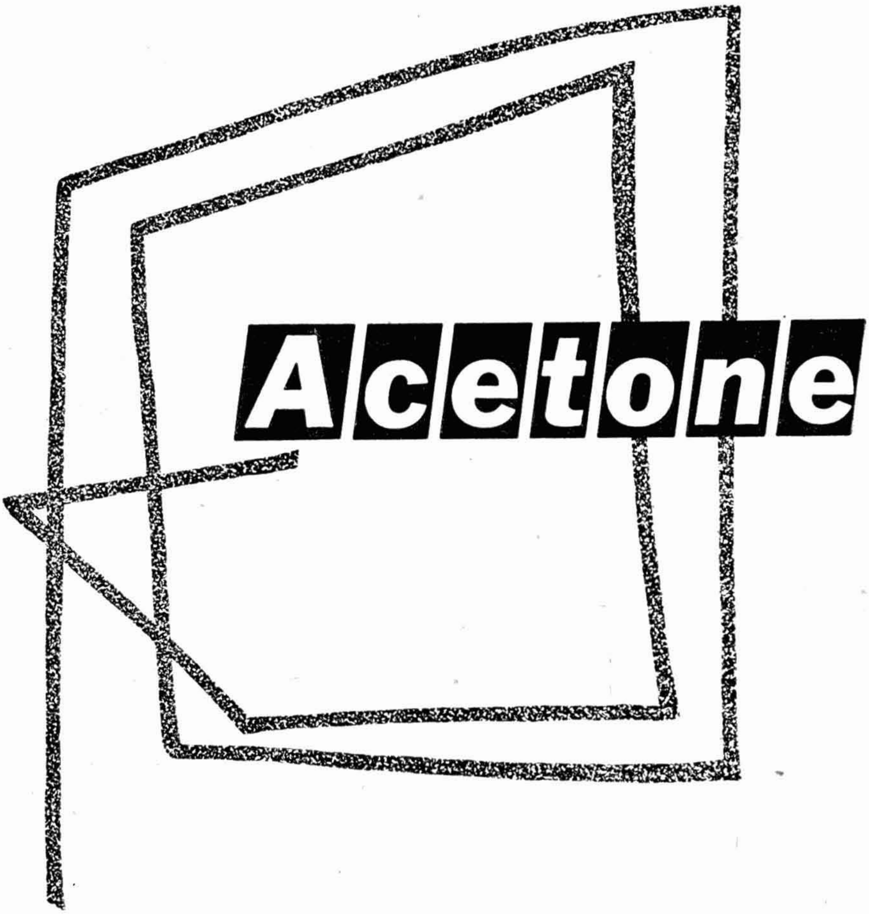
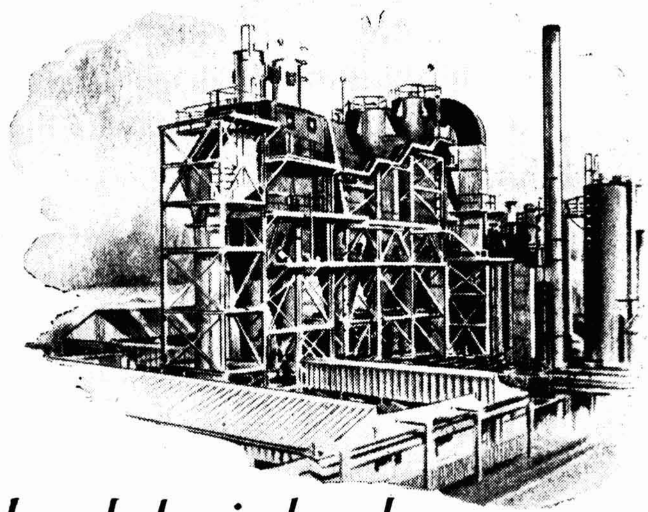
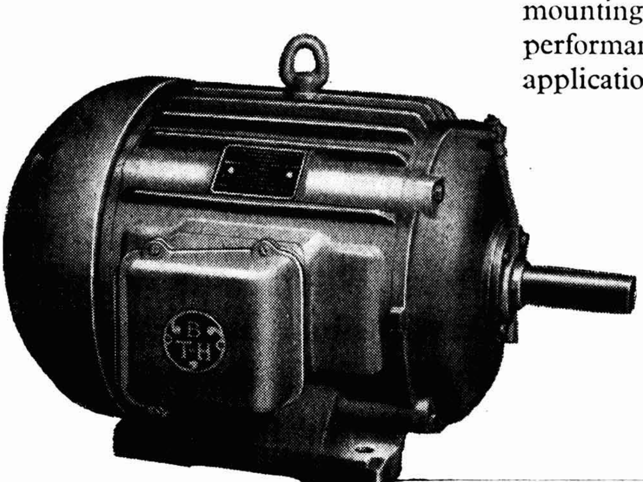

Acetone


SPARKS
RULED OUT





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The Chemical Age

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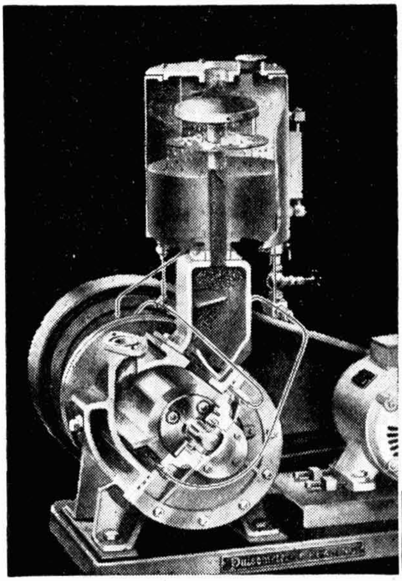
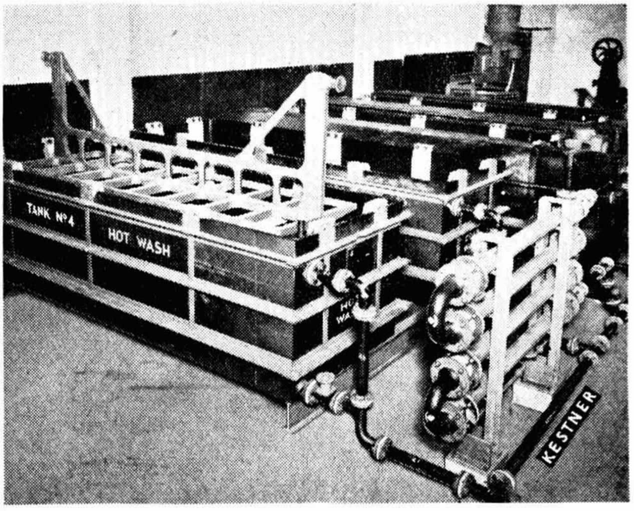




Pickling Plant for Brass and Copper Sheets, built in Keebush

A Neglected Centenary

A CENTENARY in the chemical industry has passed by without public acknowledgement during 1954. Before the year reaches its close this anniversary should be honoured. The superphosphate process, today operating in practically every country with an organised industry, did not leave Britain until 1854. It had started here on a factory scale in 1842 and possibly a year or two earlier on an experimental scale; between 1842 and 1854 the process prospered so well that at least 14 separate superphosphate businesses had been set up. Before a single ton had been made in any other country, the total yearly output of superphosphate in Britain had reached 30,000 tons. In 1854 the process was started in Germany and perhaps also in France. It would be supra-nationalistic indeed not to point out that the idea behind the process was not British. For once the idea was born in Germany and put into industrial practice in Britain.

The importance of phosphate as a plant-food had been empirically recognised for some years before 1840. Bones as 'manure' were frequently tried by farmers but with inconsistent effects. Once bone-grinding wastes became available from the Sheffield knife industry's handle-making workshops, however, the effectiveness of bone manure in a finely divided condition was appreciated. In 1840 Liebig's theory of mineral nutrition made it clear that the fertilising action of bone was derived from its phosphate or phosphorus content. At the same time, Liebig made the suggestion that the pre-treatment of bones with strong acids should produce a more quickly effective fertiliser by converting the insoluble tri-calcium phosphate into soluble mono-calcium phosphate. (There is some evidence that this suggestion had been anticipated by another German, Escher, in 1835, but it did not attract much attention).

Whether John Bennet Lawes, the founder of the industry, borrowed the idea from Liebig or whether he reached the same line of thought independently remains an open question. It is a fact, however, that in his farm sheds at Rothamsted he dissolved bone materials in acid during 1840/41 and in 1842 he opened the world's first superphosphate factory at Deptford, London. The journey from pilot-tests to works production does not seem to have been so sluggish in those early Victorian days; yet to put the period into perspective the postage stamp had only just then come into use and Faraday was lecturing on electricity at the Royal Institution.

If there is still doubt as to the genuine originality of Lawes's 'invention' of superphosphate, the most important contribution towards the process indisputably was his—the use of mineral phosphates instead of bones as the source of phosphate. And this took place during the first year of superphosphate manufacture.

From the start the supply of bones was insufficient to meet the demand for superphosphate. There were low-grade pebble-like mineral phosphates—the coprolites—to be surface-mined in Suffolk and Cambridge. Lawes was already mixing these with bones in 1842. It seems a simple enough innovation now, but it was revolutionary then.

Even a decade and a half later Lawes himself was saying that a superphosphate based entirely upon bones must be better than one based entirely upon mineral phosphate. The pioneer himself was not completely converted. Yet this innovation was the true beginning of the vast, world-wide superphosphate industry we know today.

If the early years of the industry here were successful, they were also arduous. The milled coprolite or bone was mixed with acid on brick floors, the mixing being controlled by workers armed with shovels. The pit and then the den were to come later, and in their first forms the fumes were released into the open air. At no time in the nineteenth century was mechanical extraction from the den introduced. It is obvious that many unknown chemical workers should be listed among the superphosphate pioneers as well as John Lawes and his competitors. In essence, however, the process of 1954 is still the same as the process of 1842-1854. The major changes have been those of mechanisation and hygienic refinement; if in the 1850's superphosphate as sold averaged 13 to 14 per cent of 'phosphoric acid' (it was expressed in terms of calcium phosphate then), our contemporary standard of 18 to 21 per cent must be attributed more to the use of richer mineral phosphate sources than to fundamental chemical improvements in the basic process.

In the early years sulphuric acid was bought from chemical producers. The first complete superphosphate works with its own sulphuric acid plant was established by Edward Packard in 1854 in Suffolk—another centenary. This is a pattern that the twentieth century industry has increasingly followed, although for many years it was often equally or more attractive to build a superphosphate works close to a chemical works with surplus by-product acid. If superphosphate rapidly established itself as a valuable fertiliser, it was also rapidly appreciated as a useful vehicle for utilising industry's surplus acid. The days of surplus sulphuric acid seem to have passed; indeed so markedly that the recent history of the process has seen production restricted by acid scarcity.

For at least 12 years British manufacturers—Edward Packard of Suffolk, Charles Norrington of Plymouth and the Proctors of Bristol, Joseph Fison of Ipswich, in addition to the young and enterprising John Bennet Lawes—developed not only the 'know-how' of the process but also fostered the farming experience that established superphosphate as an important and profitable fertilisers. From 1854 onwards their work passed out into the rest of the world.

In these modern days of high-tonnage chemical production, the older examples of massiveness are apt to be forgotten. The story of this world process begun by British enterprise is one of almost intimidating statistics. World production of superphosphate passed the annual 1,000,000 ton mark in 1882; by 1911 it had passed the 10,000,000 ton mark. Thereafter the effects of wars and industrial depression from time to time checked the course of steady expansion but world output often reached 15,000,000 or 16,000,000 tons a year before 1939. As about 11 cwt. of 68-69 per cent sulphuric acid are required to make each ton of superphosphate, the tonnage implications for the world's acid industry are obvious enough.

There has been some tendency in the last 10 or 15 years to question whether the superphosphate process is the best means of converting relatively inactive mineral phosphates into an effective fertiliser, but the post-war progress of superphosphate hardly suggests that it is losing ground. In 1946 production, excluding the large tonnage of Russia, was 15,898,000 tons; by 1948 this had risen to 21,267,000 tons. Despite the setbacks of the sulphur scarcity period since, world production has continued to expand steadily. Few processes have remained as dominant for so long, and 112 years after its birth in Britain and 100 years after its beginning as a world industry, superphosphate manufacture is still expanding. The new development of triple superphosphate is not competitive; it is simply a chemical extension of the original process. Nor, truthfully, is it new, for a 'double superphosphate' was made for the export trade by Edward Packard and Co. during the 1890-1914 period.

Notes & Comments

Before Your Very Eyes

IT is not a new story, although it is still amusing, that of the fictitious 'Professor' who was reported to have isolated a universal solvent. The fallacy, of course, is that he would have been totally unable, in fact, to collect or keep the product, since it would have dissolved any material of which his apparatus was constructed. Not quite in this class, the chlorosilanes are neverthelesss a problem to the engineer, and Mr. S. J. Hart, plant manager at Albright and Wilson's new silicones factory, did not exaggerate when he described them recently as 'the best solvent we have.' Like Houdini, chlorosilanes will get out of almost anything: gaskets, valves, pump packings. Coming into contact with water vapour they evolve hydrogen chloride—and away fade protective coatings and materials of construction. Albright's frankly admit that they cannot prevent occasional leakages, and they have wisely instituted thorough safety measures. Everybody working in a danger area is compelled to wear a visor, goggles, or safety glasses, and already several nasty accidents have been avoided by this means. The company also follow American practice in insisting upon the wearing of helmets—ten thousand times a burden but once, just once, a godsend. These are precautions we have often advocated in these pages, but few companies have the good sense to adopt them. No doubt the principal obstacle is the general feeling that such wear makes one look ridiculous. However, it seldom takes long to persuade the British to wear 'ridiculous' clothes when they are required for a specialised purpose. The cricketer going out to bat, the rider to hounds, even our fictional 'Professor' in his cap and gown, have never felt the objects of ridicule, and Albright and Wilson have successfully reached the stage where it is customary to wear safety clothes. Other safety measures are also in force, for at Barry there is not only the possibility of the escape of the corrosive and inflammable chlorosilanes, but of any number of organic solvents, and the highly toxic methyl chloride. Safeguarding the life, eyesight, and general health of every employee, Albright's are among the most enlightened of chemical companies.

A Therm Stand

A SMOKING chimney never was a sign of prosperity, says a character in *Guilty Chimneys*, a film produced for the Gas Council by the Pathé Documentary Unit and shown to the Press last week. Indeed, as figures which take up nearly the whole of the screen announce, the cost to the country of smoke pollution is estimated at £100,000,000 a year. The film takes the stand against this menace in no uncertain manner and points to the number of deaths from 'smog' and the general running-down of health caused by shutting out the sun. Industry receives a faint pat on the back—'the battle is not yet won, but at least it is being fought'—and the strongest criticism is reserved for the domestic open hearth which is squandering the nation's wealth and endangering its health. The use of smokeless fuels 'such as coke' is recommended, and the point is made that if less coal is burned in grates, more of its by-products, like ammonium sulphate, can be produced. The whole argument is put over with skill and vigour and, since it is a Gas Council film, there need be no complaints that nowhere is the use of electrical power suggested.

Lesson for Grandma

WE praised last week (p. 925) the great success of Mr. Bertram White, deputy managing director of A. Boake, Roberts and Co., Ltd., in applying work study to the chemical industry. A few days ago the British Productivity Council, whose deputy chairman is Sir Ewart Smith, technical director of I.C.I., published another piece of Mr. White's writing as No. 2 in the series of 'BPC Action Pamphlets', though were it not for the association of these two names with the pamphlet we should have felt that the subject—'Simplification in Practice'—had little to do with the chemical industry. We have already expressed a considered opinion (THE CHEMICAL AGE, 1954, **71**, 265) of the value of the first of these little homilies, and the second is of much the same complexion. Beginning with a paragraph on Why Simplification is a Good Thing (surely a phrase from 'Productivity and All That' by Sellar and Yeatman?) it proceeds (apologies to Mrs. Thomas Mortimer) from How to Simp-lif-y and Tell-ing Ev-er-y-bod-y to Tak-ing Ac-tion and Fur-ther Steps. These pamphlets, says the introduction, are for the managements of small firms, junior members of managements, supervisors, trades union officials and members. Were we a junior manager, a supervisor, even a union member, we should feel oddly insulted at being instructed in this way. And for good measure, the argument is bolstered up with three entirely fictitious charts, showing the imaginary benefits to be gained by introducing simplification into business.

Not Applicable

THERE is no doubt that reduction in the number of products can increase the efficiency of a manufacturing company, and there is little doubt that in the case of light engineering, for example, it could also be good for business. But it is quite clear that Mr. White had ideas about the chemical industry. 'Each interruption of a production run involves cleaning, preparation, loss of material. Elimination of short-run products at once results in longer runs of the remaining products. . . . This . . . may be useful in such process industries as chemicals, food, paints—indeed, in any type of repetitive work.' Although we are rather ignorant of methods employed in the food and paint industries, this sounds unlike the chemical industry we know. Nowadays, surely, a piece of plant is constructed for a particular product, and is seldom suitable for any other. The demand for the product may be large or it may be small; the plant will be commensurately large or small. The plant may sometimes be adapted to the preparation of another product, but only because it would otherwise stand empty. There can be very few examples in the chemical industry of profitable substance A being taken out of production, so that the plant may be cleaned before the preparation of rather less profitable substance B. Another point, and one which goes much deeper, is the wisdom of reducing the number of chemicals produced. Few chemists would be so foolhardy as to predict the eventual future of any new chemical, and there have been many firms who for years produced some substance at a loss, gave it away to those who might find some use for it, kept faith that one day it would prove a winner—and who suddenly found sales rocketing. The claim of Eastman Kodak's organic division to be able to supply over 3,500 reagents is well known, and the debt of American chemistry to their enterprise cannot be estimated. There are some 250 reputable chemical manufacturers in this country; if they take the advice of the BPC and of Mr. White, the result could be establishment of a monopoly in many vital chemicals, and stultification of development—but never increased efficiency, output or vitality. I.C.I. claims to produce 12,000 products and who could say they lack efficiency or vitality. We have a very high regard for Mr. White and the work he is doing but we cannot agree with him on this occasion.

Epikotes on Show

AN opportunity to study the wide applications of the new epoxide resins will be provided by an exhibition entitled 'Epikote Resins and Their Uses' to be staged by Shell Chemicals Ltd. at the Criterion in Piccadilly, London W.1, from 7 to 11 December. This exhibition should prove of great interest to all concerned with surface coatings, whether as makers of finishes, as manufacturers, as designers or as students. It will have much of interest, too, in the electrical and plastics fields.

Admission will be by invitation, obtainable on application to Shell Chemicals Ltd., Norman House, 105-109 Strand W.C.2. The exhibition will be open from 10 a.m. to 8 p.m. on 7, 9 and 10 December, from 10 a.m. to 4 p.m. on 8 December and from 10 a.m. to 1 p.m. on 11 December.

Sulphuric Acid from Anhydrite

Work on USAC Factory Progressing

UNLESS something unforeseen occurs, the £5,000,000 anhydrite sulphuric acid factory at Widnes will commence operations in April of next year. This information was released on Thursday, 28 October, when representatives of the Press were shown the progress being made on the site.

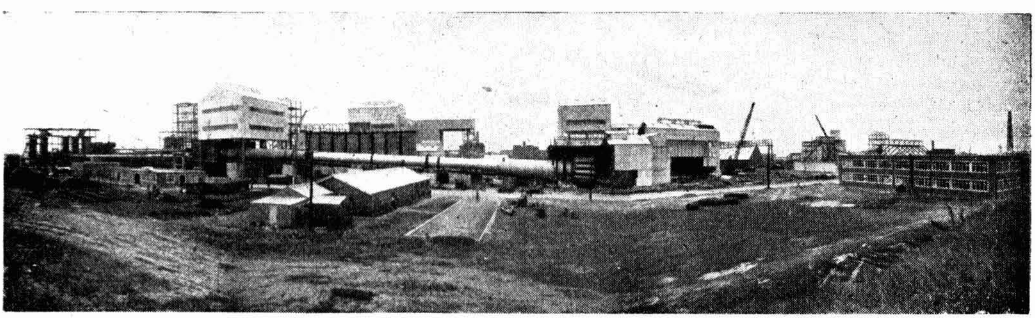
The factory is being built by United Sulphuric Acid Corporation which was set up in 1951, under the chairmanship of Mr. F. G. C. Fison, when it was realised that supplies of sulphur were running low in face of growing demand and that provisions would have to be made for the manufacture of H_2SO_4 from raw materials other than American dome sulphur. Eleven big users of H_2SO_4 participated in the scheme, each contracting to purchase a fixed quantity of acid each year on a 'cost-plus' basis. The companies concerned, with the tonnage of 100 per cent acid that each agreed to take, are as follows: The Alumina Co. Ltd. (4,500), Thomas Bolton & Sons Ltd. (9,000), British Celanese Ltd. (5,500), Clayton Aniline Co. Ltd. (13,500), Courtaulds Ltd. (20,000), James H. Dennis Co. Ltd. (6,000), Fisons Ltd. (35,000), Imperial Chemical Industries Ltd. (35,000), McKechnie Brothers Ltd. (6,000), and Transparent Paper Ltd. (3,500).

The factory will use about 240,000 tons of anhydrite per year and will produce approximately 148,000 tons of sulphuric acid and 132,000 tons of Portland cement clinker per year. The clinker will be bought by Associated Portland Cement Manufacturers for use in a works which is being built immediately adjoining the site of the acid factory. The anhydrite is being supplied by British Plaster Board (Holdings) Ltd. from their Long Meg mine in Cumberland. The acid output is roughly 7½ per cent of Britain's present total production and will save the importing of some 53,000 tons of sulphur. At present values this will mean a saving of about $2,000,000 a year. Provision is being made for a 50 per cent increase in the capacity of the factory at some future date.

The process to be used is essentially that developed by I.C.I. at their Billingham factory, but some slight modifications have been introduced.

The anhydrite process first saw the light of day in Germany during the 1914-18 war but was not perfected until 1930. After considerable research I.C.I. started one kiln in 1930 and another in 1935 after they had ironed out operating troubles. These two kilns have produced ever since and at the present moment are turning out approximately 100,000 tons of sulphuric acid per year and a similar amount of clinker. At the present moment another plant, similar to one of the two being built by USAC at Widnes, is being brought into operation and Billingham will soon be producing 175,000 tons per year.

When the sulphur crisis arose in 1951 I.C.I. offered to licence their knowledge and experience of the anhydrite process and agreed to act as technical advisers to USAC when that combine was formed. Their responsibilities cover all aspects of the project



General view of USAC's factory showing (left to right) drying and absorber towers, kiln feed house, rotary kilns, kiln firing house, clinker bunkers and the administration building from provision of technical design data to assistance with initial operation of the factory. I.C.I. have also provided a team of engineers and inspectors under a construction manager to supervise, on behalf of USAC, the construction of the factory by the contractors. The formal agreement for the construction of USAC's factory was signed in October 1952 and clearing and levelling of the 66 acres site began the same month. The first consignment of plant equipment was delivered in March of the following year. About 99 per cent of plant and equipment is British, the principal exception being specialised aeration equipment supplied by a well-known German firm.

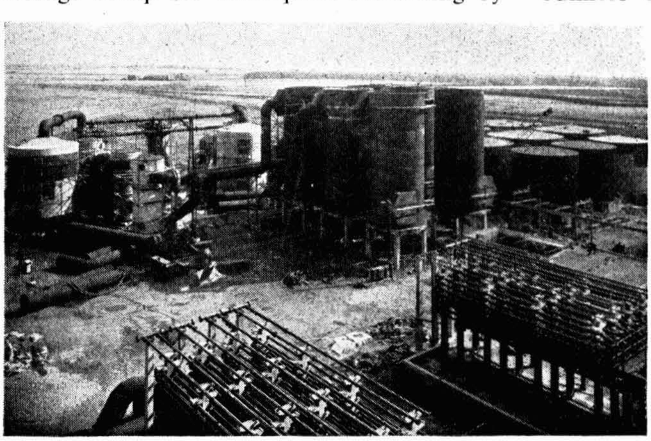
The main contractors are Simon-Carves Ltd. (whose contract amounts to approximately £4,000,000) and their associated company Simon Handling Engineers Ltd., who are responsible for the materials handling and preparation equipment, and whose contract amounts to over £1,000,000. The Simon Group of companies has had many years of experience in the designing, building and equipping of large factories throughout the world and Simon-Carves has probably built more sulphuric acid plants of one type or another than any other British company. Amongst their many licence agreements is one with I.C.I. under which they can build anhydrite plants of this type in any part of the world.

The raw materials used in the factory are anhydrite (a relatively pure form of calcium sulphate without any water of crystallisation), coke, sand and shale. Anhydrite is delivered dry by rail in 25½-ton wagons and is received by rail hopper and skip hoist where it is either conveyed to a 12,000-ton storage dump for subsequent reclaiming by mechanical excavator and travelling hopper, or conveyed direct to a pair of crushers and thence elevated to a storage bunker. The sand, shale and coke are transported by angle hoist to wet storage bunkers from which they are delivered to two large Head-Wrightson rotary driers. One drier treats sand and shale, the other coke, but both are heated by combustion gases from oil burners. The dried materials are taken by International Combustion gravity bucket conveyors to storage bunkers.

Below these bunkers is a battery of automatic weighers which feed a pair of belt conveyors. The weighers are electrically controlled and interlocked to give a feed of the correct proportions for producing top-grade Portland cement clinker. The two conveyors deliver the proportioned feed to two Ernest Newell ball mills in which the materials are ground and mixed. This 'raw meal' is then elevated and delivered by an air-slide distributing conveyor to storage and blending silos.

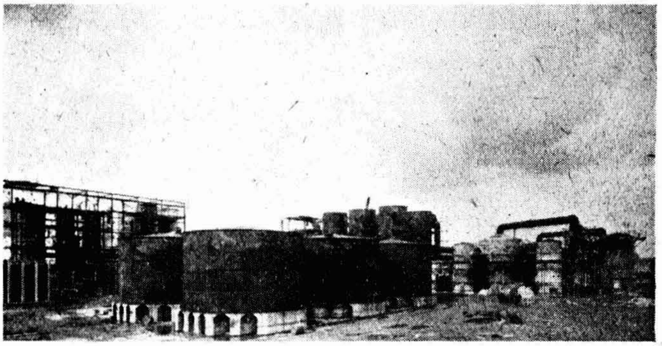
The most important part of the factory are the two rotary kilns, each of which is 355 feet long and specially lined. Pulverised coal is fired at one end and the raw meal is mechanically fed into the other end. The silica, alumina and iron oxide from the sand, shale and coke combine with the lime in the anhydrite to form cement clinker which leaves the kilns through tubular coolers. The final temperature of the solid materials in the kilns is approximately 1,400° C.

The clinker is received in hoppers and carried by shaker conveyors to jaw crushers and from there elevated to automatic weighers. From these it is fed to clinker bunkers by conveyors with travelling trip-



On the left of our picture can be seen the oxidation units, comprising catalytic converters and heat exchangers; centre, SO_3 coolers. The acid coolers are in the foreground

On the left, absorber towers and tail gas scrubber towers; centre, acid storage tanks with SO_3 coolers behind; right, oxidation units



pers and from the bunkers it is carried through an overhead gantry to a 10,000-ton covered store. From the store it is elevated to another pair of weighers and then conveyed to the adjoining works of Associated Portland Cement Manufacturers.

The gases from the two kilns are kept in two separate streams, which are cleaned, cooled and converted into sulphuric acid by two almost identical parallel plants. The bulk of the dust in each stream is removed in a smoke box and cyclone. The gas then passes to a Simon-Carves cooling tower which uses clarified river water to cool and saturate the gas and to remove most of the remaining dust.

Each stream of gas then passes through a set of four pairs of Simon-Carves electro-precipitators, in which the last particles of mist and dust are removed. In order to allow any two precipitators to be taken out of service for cleaning or repair, an extra pair is provided, which can be used on either gas stream.

The sulphuric acid plants operate on the orthodox contact system, the two units being identical in all respects except that one of them incorporates an oleum tower. Each gas stream from the precipitators passes through a drying tower in which water is removed by counter-current circulation of strong sulphuric acid. The dried gas then passes through blowers into a multi-stage converter, containing the vanadium catalyst. As the oxidation process is exothermic, heat exchangers are used between the stages of conversion. The SO_3 then passes through three annular cooling towers in series, the last being water-cooled.

Each stream then passes through two absorber towers, where the SO_3 is absorbed in strong H_2SO_4, part of the SO_3 in one stream having been absorbed in the oleum tower. The strength of the acid leaving the absorbers is kept constant by dilution with water, and the 'nett' make of acid thus obtained is pumped to storage. From the storage tanks it is pumped through loading arms to either road or rail tankers.

Traces of unconverted SO_3 in the gas streams leaving the absorbers are removed in tail gas scrubbing towers before release to atmosphere.

Town's water is used for sulphuric acid dilution but for cooling purposes clarified river water is pumped from the River Mersey at Fidler's Ferry and carried to the factory by a two-and-a-half-mile 24-inch underground pipe-line. A 36-inch main drain carries effluent back to the Mersey. This pipeline is thought to be the largest Alkathene (polythene) drain in Britain. Traffic was stopped on the St. Helens canal for nine days while a section of the canal was emptied to enable the drain to be laid beneath it, and while the drain was being installed under an adjacent railway line it was necessary to freeze the ground to prevent leakage of water into the excavations.

Royal Statistical Society

A MEETING on 'Sales Forecasting—Is it a Science or an Art?' is to be held by the Study Section of the Royal Statistical Society at 6 p.m. on 10 November at the ELMA Lighting Service Bureau, 2 Savoy Hill, London W.C.2. The speaker will be Mr. D. J. Liston of the Metal Box Co. Ltd. On the same date the Industrial Applications Group (North-Eastern Group) will hold a meeting at 7 p.m. in the Old Staff Room, Armstrong Buildings, King's College, Newcastle-on-Tyne, when Dr. B. P. Dudding will speak on 'Facts and Figures.'

Sulphur Recovery

Conclusions of Fuel Conference

FUEL technologists, engineers and scientists from Britain and a number of overseas countries were among those who attended the conference of The Institute of Fuel on removal and recovery of sulphur from fuels, held in London on 6 and 7 October (see THE CHEMICAL AGE, 1954, **71**, 847). The proceedings were opened by Sir John Maud, K.C.B., C.B.E., Permanent Secretary, Ministry of Fuel and Power, who was introduced by the President, Dr. W. Idris Jones, C.B.E.

Thirteen papers were presented and the discussions, which ranged over a wide field, were summarised at the close of the conference by the official Rapporteur, Dr. J. G. King, O.B.E.

The following general conclusions, taken from Dr. King's summary, were endorsed by the conference:—

The main source of indigenous sulphur is that contained in our coal. This amounts to over 3,000,000 tons per annum and we now recover only 5 to 6 per cent of it. Sulphur in petroleum represents another 600,000 tons and we are aiming to recover only 5 per cent of that.

The recovery of a higher proportion is essential for reasons of national economy, since we now import 75 per cent of our sulphur requirements. Action is made more pressing by the deleterious effects of sulphur in industrial processes, particularly metallurgy and glass; and by injury to buildings, plants and human health by oxides of sulphur emitted to the atmosphere.

Sulphur in the Coal Seam

Sulphur in the coal seam is rising slowly and in fuel oil has risen markedly, and every effort must be made to find means of reducing sulphur content after mining the coal or before marketing the oil in such a manner that recovery in usable form is possible. The industrial value of a lower sulphur content of fuel to industry is not clearly defined and some definition should be attempted in order to assess the possible value of removal processes, since these are likely to be expensive. The gas industry now recovers 40 per cent of the sulphur of its coal by effective means. A number of large-scale flow methods are now available but there are doubts as to their suitability for British conditions and as to their operating costs. They will remove 70 to 80 per cent of the hydrogen sulphide from gas, but the real consideration is whether any process can be worked in a given environment so as to produce by-product sulphuric acid or sulphur on an economic basis. The cleaning of coke-oven gas not now cleaned could add 60 per cent to the gas industry's contribution to indigenous sulphur.

Combustion gases from very large power stations are a potentially large source of sulphur of which effective recovery is more than desirable, as well as its removal from the atmosphere.

It is regrettable that no new indigenous source of sulphur has been disclosed by the conference, but the papers have focused interest so strongly on existing methods of recovery that this surely must give added impetus to further industrial action.

The Organising Committee, under its chairman, E. C. Evans, is to examine the implications of the papers and discussions from the conference and present a report to the Council of The Institute.

Research Wing Opened

CANADA'S industrial research effort has improved considerably since before the last war, according to Dr. E. W. R. Steacie, president of the National Research Council, who officially opened the new wing of the central research laboratory of Canadian Industries (1954) Limited, at McMasterville, Que., on 22 October. The ceremony was attended by prominent representatives of education and industry in Quebec who were welcomed by H. Greville Smith, president of Canadian Industries (1954) Limited, in a brief address in which he reviewed the progress made by the central research laboratory in the 25 years of its existence.

Containing 12 individual laboratories and space for ancillary and service departments, the new extension is constructed in accordance with latest trends in research design. Its completion makes the C-I-L central research laboratory, with a staff of 110, one of the largest and best equipped industrial laboratories in the country. The C-I-L central research laboratory is concerned with the search for new products and processes and in improving those existing. Serving all divisions of the company, most of its work is in the fields of chemistry and chemical engineering.

Pechiney's New Research Centre

French Company Designs Buildings for Adaptability

ONE of the most modern research centres in France was opened by the large chemical concern Pechiney at Aubervilliers, 17 miles outside Paris, on 4 October. Speaking at the inauguration, M. Frejacques, head of the company's central research and documentation service, said:

'As for the situation, several possibilities were envisaged: either in the region of Paris, or beside one of our most important factories, or in the country away from all noise. . . . The region of Paris appeared the most suitable. . . .

Allowing for Future Growth

'We had an available site at Aubervilliers, opposite one of our factories, a site sufficiently big to allow for all future development. Experience shows that laboratories are always designed too small—and already we have planned an extension to be carried out next year. Finally, the industrial nature of the district allows us to install all necessary pilot plant. . . .

'While studying the most economical building methods, we have tried to provide a sufficiently agreeable environment for the research workers. Above all, we have tried to create a very flexible installation. . . .

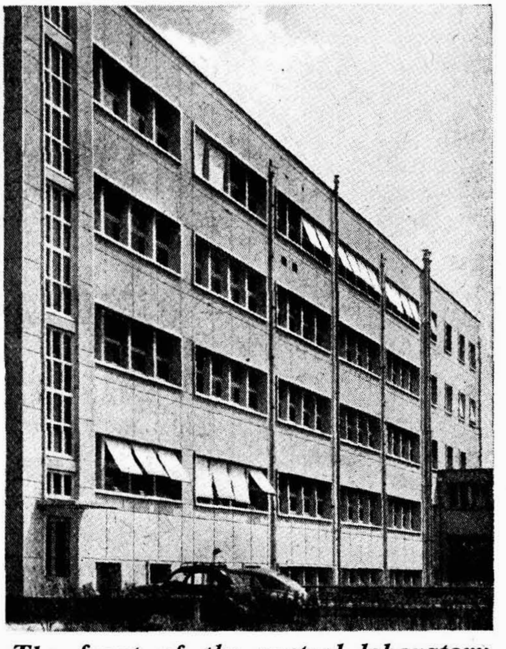
'The Centre is divided into several sections. The laboratories proper consist of a group of mineral chemistry laboratories; a mineralogy laboratory; a group for preparative organic chemistry; a group for chemistry of macromolecules; and a group for physical measurements. This last is available to all research workers, including those in works, for physical determinations requiring a costly apparatus which can only be operated by trained personnel.

'To these laboratories must be added those for applied work. . . . These have several roles to play: taking part in the final developments of new products; acting as liaison between the research workers, the technical and commercial services, and the customer; and, eventually, advising the latter on the applications of new products. . . .

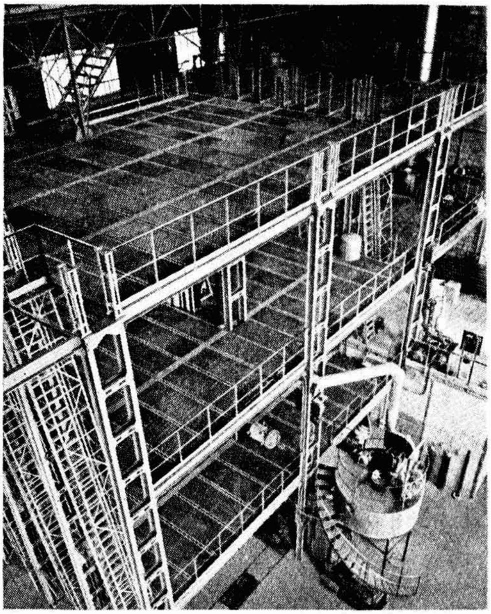
'A chemical engineering service, with its own offices, is concerned with the preparation of pilot plant or industrial studies, at the same time being in constant contact with research workers and with the factories. . . .

'A building for pilot-plant installations . . . allows the development to semi-industrial scale of processes studied in the laboratory. We have tried to give this also the greatest flexibility. The workshops are, naturally, attached; a small precision machine workshop has been installed in the laboratory building. The documentation service, comprising a library, microfilm files and several offices, has been placed as near to the centre of gravity as possible.'

The main laboratory building has five floors, each being devoted, effectively, to one functional group. Except in one or two cases, the laboratories are all of the same basic design, which can be supplemented according to the particular requirements of the work. Each floor has a floor area of about 500 sq. ft., and along the window wall runs a fixed bench. In the centre of the room, a mobile island bench may be



The front of the central laboratory building



A view of flexible erection inside the pilot plant building

erected at will; this may have a top of 95, 140 or 190 cm. in length, with a central channel of rigid PVC.

Services are brought to the island bench from a metal trunk running the length of the ceiling and carrying gas, compressed air, electricity, and the tap and waste water pipes of the room above. Another bench may be set along the inner wall as desired.

The end panels of the rooms are fitted with T-section grooves running from floor to ceiling. These have holes at 40 mm. intervals to carry brackets, enabling all kinds of laboratory installation to be made with unusual stability. Draught hoods, which also extend from floor to ceiling, may be transformed into fume-cupboards.

The only laboratory for applied work at the moment is that for plastic materials, which comprises a 1,770 sq. ft. shop containing injection presses, calenders, mixers, moulding presses, etc., and two 780 sq. ft. laboratories.

The pilot plant erection building is essentially a large nave, which may be extended when required, and which is at present 114 ft. long, 59 ft. wide and 64 ft. high. As in the laboratory building, a minimum amount of basic equipment has been provided, which may be augmented at will.

The flexibility of arrangement of plant is a result of the division of the nave into six sections, separated by vertical girders carrying the whole weight of the structure. These are braced by steel joists without the use of masonry.

Within each section three floors 16 ft. by 24 ft., each composed of three independent sections 16 ft. by 8 ft., may be established at heights which are multiples of 50 cm. All are made up of grid panels which may be moved by gantry. At the end of each section are fixed floors at the 13, 26, 39 and 52 ft. marks.

An acid-resistant drain receives the waste water and carries it to delay tanks, where inflammable liquids are separated, and the effluent is neutralised before discharging into the municipal sewers.

Throughout the laboratories rigid PVC, a product of the company, has been used for drains, exhaust vents of fume cupboards, and for the pipes and turbines drawing off fumes from the fixed wall-benches.

A striking feature of the site is the amount of space left for future extensions to all the principal buildings, space which will be filled within a very few years, as the importance of this project grows. The chemical industry in France should profit greatly from the new and exciting ideas which have culminated in the Aubervilliers Research Centre.

Containers and Canals

FIVE industry authorities representing chemicals, chemical specialities and steel discussed the present and future use of small bulk containers, such as drums, cylinders and plastic carboys, for the transport of chemical products during a symposium of the 8th National Chemical Exposition at Chicago rcently. The experts discussed three of the major materials used for this type of packaging: steel, fibre and plastics.

During a technical symposium of the exposition, Mr. F. G. Moore of the Columbia-Southern Chemical Corporation, said that water-borne movement of chemicals and related products on inland and coastwise waterways had increased from 7,148,311 net tons in 1949 to an estimated 12,495,344 net tons in 1953. The increase in water-borne traffic had led to the construction of special barges and vessels capable of carrying liquid chemicals.

Armour Surface-Active Chemicals

To be Made in Britain by Armour and Hess

ARMOUR & Company Limited, London, will sell next year from British production the range of chemicals now made solely by Armour & Co., Chicago. A new plant for producing these chemicals is being built at Littleborough, near Rochdale, Lancashire, by Hess Products Ltd., and when completed the total plant will have cost in the neighbourhood of £250,000. This expense will be met from the companies' own resources and no fresh capital will be needed. Hess Products Ltd. have recently signed a contract with royalty payments to Armour & Co., Chicago, for which they have obtained the exclusive manufacturing rights for the new process and also any new developments in this field which might be discovered through the Armour research organisation. Sales and distribution of the new chemicals, both for the home market and for export, are exclusively in the hands of the Chemical Division of Armour & Co. Ltd.

This carries one step further the introduction into this country of a new line of chemicals pioneered and developed by Armour & Co. in Chicago. It began here when Hess Products Ltd. started to produce the Distec range of fractionated fatty acids a few years ago. The new venture is a logical development of this, and will make available to British industry the vast experience gained by Armour & Co. with this new line of chemicals.

Hess Products Ltd. are associated with the old-established Leeds firm of Adolph Hess & Brother Ltd., which has been in the distillation business for eighty years. Also connected with Hess Products Ltd. is the well-known Leeds chemical firm of Brotherton & Co. Ltd., who have a considerable interest in this development.

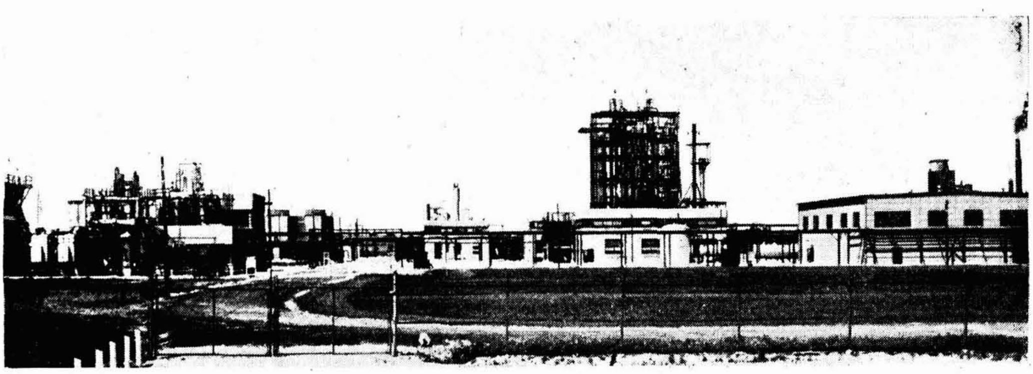
Nearly all the new plant will be of British manufacture and will be erected and operated by British labour. It will be adjacent to the existing Hess Products' fractional distillation unit, which has been producing Distec fatty acids since 1950. Fatty acids will be pumped across to the catalyst plant now under construction, where they will be contacted with ammonia. Operation will be continuous and completely automatic yielding high grade aliphatic nitriles:

$$RCOOH + NH_3 \rightarrow RCOONH_4$$
$$RCOONH_4 - H_2O \rightarrow RCONH_2$$
$$RCONH_2 - H_2O \rightarrow RCN$$

This represents the overall form of the reaction.

As the nitrile issues from the plant in continuous flow it is passed to the hydrogenation section where it is turned into the primary amine. Depending on the type of fatty acid used, a whole range of these amines (Armeens) can be produced.

By a modification of this process, other amines can be produced, including the diamines of the general formula $RNH\,C_3H_6\,NH_2$ (Duomeens). By reacting any of the amines with an organic acid, water soluble salts are obtained which have high surface activity. Among the new chemicals will



A view of the fatty acids and nitrile plant of Armour & Co. at McCook, near Chicago. It is said that the factory at Littleborough will be a replica of this therefore be the Armacs and Duomacs which are the water soluble salts of the amines and diamines respectively.

The amines are also used as starting materials for a wide variety of organic chemicals. They are, for instance, quaternised to give a useful range of bactericidal and substantive products (Arquads). They are the basis for certain ampholytic chemicals, alkyl morpholines and many others, including ethylene oxide compounds (Ethomeens). Their uses are widespread.

In ore dressing the Armacs have opened a new field by being used as collectors for potash, phosphate, feldspar, silica, mica and other non-metallic ores, as well as such metallic ores as cerussite and smithsonite. In the laying of asphalt roads about 0.5 per cent of Duomeen T is used to prevent failure from stripping of bitumen or tar from stones in wet weather. In surface coating, Duomeen compounds are used not only as anti-rusting additives, but also as grinding aids and for flushing of pigments. Applications in the printing ink industry are similar.

In the rubber industry Armour chemicals are used as mould release agents for hard rubber, as stabilisers in the production of cyclised rubber, and in the manufacture of latex foam rubber, to mention only a few applications. The petroleum industry uses Armeens and other Armour chemicals to prevent corrosion in oil wells and in oil refining, to control algae in underground flooding operations and as anti-sludging agents in some finished products.

Some are used as permanent anti-static agents for plastics, including long-playing gramophone records and household utensils, and also for synthetic fibres. Others are used as emulsifiers in agricultural sprays, in the photographic and film industries, in cosmetics, in textiles, for waterproofing of paper, in waxes and polishes, to mention only a few.

Glass for Yugoslavia

COMMERCIAL history was made on a North East of England railway siding last week when a number of long international rail trucks, sealed and bearing the Union Jack on their side, swung away on the first stage of a fortnight's journey to the frontiers of Yugoslavia. The trucks carried an initial consignment of specially-manufactured scientific and laboratory apparatus in glass, worth many thousands of pounds, made at the Wearside factory of James A. Jobling & Company Limited of Sunderland, makers of 'Pyrex.'

One of the Joblings employees is a little optimistic, but when this International wagon is unsealed after its fortnight's journey, it will be in the capital of Yugoslavia, with its load of scientific glassware

The deal had been clinched, following a lengthy stay in Yugoslavia, by 38-year-old Mr. C. L. Songhurst, Export Sales Manager for Joblings. He was faced with many difficulties, most of which had to be settled on the spot. His selling arrangements had first of all to be formulated in accordance with the requirements of the Yugoslavian State Commercial Department and then the arrangements had to be approved and receive an official number confirming that they could be carried through. After this had been effected he had to convince the State Trading Agency that the British goods were unsurpassed and indispensable to Yugoslavia. In addition, he was faced with world competition—especially from Germany and Czechoslovakia.

Ion Exchange Life Tests

New Apparatus is Automatically Controlled

ION exchange resins are employed extensively in extraction processes, and a knowledge of how a resin will behave on repeated use is of considerable importance. In the case of columns used for metal adsorption and recovery a complete cycle—adsorption, wash, elution and wash—may take up to a day, and for a life test several hundred cycles are required. A test of this kind is facilitated by a new apparatus being marketed by Baird & Tatlock (London) Ltd., the BTL ion-exchange resin tester.

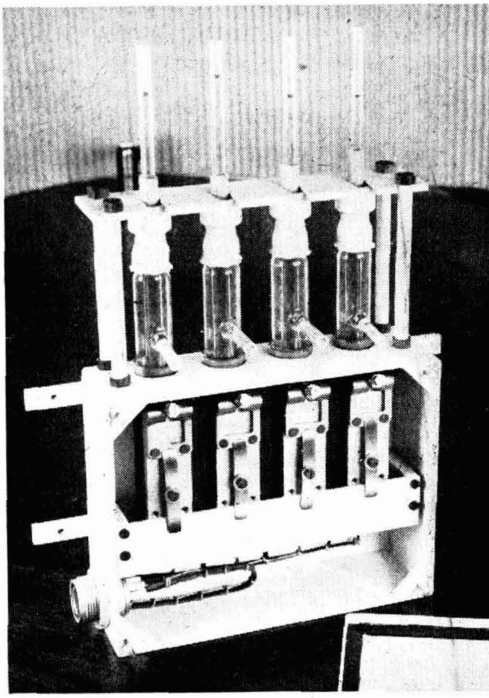
This apparatus, which was designed at AERE, Harwell, will automatically pass known volumes of the four solutions through a column and record the number of cycles completed on a register. The column under test can therefore be left unattended, measurements of the adsorptive capacity being made at, say, twenty-cycle intervals.

The equipment required to test each column consists of a four-way flow valve unit; a metering vessel; and a control unit, which is actually capable of controlling two separate columns.

The flow valve unit admits the four required solutions, for adsorption, wash, elution and wash, in turn, by means of four electromagnetically controlled on-off valves in a common mounting. It is initially adjusted to control solutions with a head of 15 ft. or less, but with careful readjustment a head of 25 ft. can be controlled. With a 10 ft. head the valves will pass approximately 5 l. per hour.

In the case of small test columns the control is capable of handling one complete cycle per minute, although one cycle per day is normal. In the event of a power failure all valves are automatically closed, and indicator lights show the state of the four-way valve at any moment during operation.

The interior of each valve is constructed



The electronic control unit, and (above) the four-way flow valve

entirely of glass and rubber, and the electromagnets are enclosed in a metal box sealed with a rubber gasket.

The metering vessel, which receives the outflow from the ion exchange test column, is fitted with a series of conductivity probes; it is normally designed to the requirements of the user. The five probes comprise glass tubes with tungsten electrodes connected to a suitable plug. A siphon tube, with bubble trap, leads from the bottom of the cylindrical glass envelope of the metering vessel.

As the liquid level rises in the metering vessel it covers probes in the order: common earth probe; No. 1, used as the liquid level is falling to indicate that the vessel is nearly empty; No. 2, indicating completion of the adsorption stage; No. 3, indicating completion of first wash; and No. 4, indicating completion of elution. Finally the liquid level rises to that at which the automatic siphon comes into operation, emptying the vessel.

The control unit, which is suitable for AC only, consists of two identical sequence control circuits and may be fitted with mains transformers to customers' requirements.

Further details and full specification may be obtained from the manufacturers, Baird & Tatlock (London) Ltd., Freshwater Road, Chadwell Heath, Essex.

MPs & Chemicals

Commons Discuss Use in Food

FEARS that the use of chemicals in food might be responsible for the increase in the incidence of diseases like poliomyelitis and cancer were expressed in the House of Commons on 26 October, during the committee stage of the Food and Drugs Amendment Bill. The issue was raised by Mr. John Eden (Con., Bournemouth West) who said it had been estimated that about 700 chemicals were now being used in foodstuffs and others were applied while they were growing. Some of them had been found to do considerable harm to animals.

'If it is impossible to list the drugs which are known to be safe and which may be included in foodstuffs, can we not have a list of the drugs which are known to be dangerous?' he asked.

Mr. Richard Fort (Cons., Clitheroe), speaking 'as one who has been closely connected with the chemical industry for many years' said that Mr. Eden had allowed his imagination to run riot.

'The chemical industry, like everyone else concerned, is very much concerned to make sure that nothing which is added is injurious to health,' he said. 'All those who are engaged in the industry with whom I have spoken have welcomed the Bill because it is contributing to the end that all reputable manufacturers of chemicals and food processes want to see, namely, better food.'

Members concerned with the food industry and chemical production knew that prolonged investigations were carried out by independent bodies, such as the Medical Research Council, and numerous committees set up by the Government, Mr. Fort went on. Continuous investigations were also carried out by the universities and the industries concerned.

Mr. Norman Dodds (Lab., Dartford): 'In view of the hon. Member's great knowledge of chemicals, can he deny that there are in use today 276 chemicals which have not been cleared as being safe and are being used in food?'

Mr. Fort: 'It depends on what the hon. Member means by "being safe."'

Mr. Dodds: 'That they will not do any harm.'

Mr. Fort: 'There are certainly a large number which have not had the full, exhaustive tests of the United States Food and Drug Administration investigation. There is no proof at all, either in this country or in the United States, on the tests carried out that these things are in any way injurious, although it is perfectly true that they have not been through the 'five years' or seven years' investigation which is carried out in America.'

Liquid Gas from Middle East

The bringing of natural gas from the Middle East, where it is at present burnt off because there is nothing else to be done with it, may one day be accomplished. A reference was made in Parliament recently, by the Minister of Fuel and Power, to the possibility of shipping the liquid gas in specially pressurised tankers. Already in the US a scheme for sending some 18,000,000 cu. ft. of gas each day up the Mississippi by barge from Louisiana to Chicago is about to come into operation, and in Hungary, liquid gas is to be carried by rail tanker.

Metallurgical Developments

HRH The Duke of Edinburgh at Fulmer Open Day

FULMER Research Institute, Britain's 'baby Batelle,' was honoured with the presence of HRH the Duke of Edinburgh at the open day on 2 November. Speaking after lunch, His Royal Highness said that he was very grateful for the opportunity to take a look round the institute. He was of the opinion that a good research business was a good investment, and here was a research institute which, without subsidisation, made a profit.

The Fulmer Research Institute was founded by the late Col. W. V. Devereux, C.B.E., to carry out sponsored industrial research (see THE CHEMICAL AGE, 1952, **67**, 603). The results arising from research, including patents, belong solely to the sponsors; no dividends are distributed, and any excess of income over expenditure is converted into new equipment to improve the facilities available to industry.

Founded by the then managing director of the Almin group of alloy factories, the institute was staffed and equipped primarily to deal with metallurgical problems, and this bias has persisted, but many problems outside this field have been tackled successfully by the staff. The first seven years of the institute's life have been taken up with a programme including over 1,100 problems dealing with service failures, design of equipment and development of materials and processes.

New Engineering Laboratory

Highlight of the Duke of Edinburgh's visit was the official opening of the new engineering laboratory. This houses a 50-ton tensile testing machine, apparatus for fatigue and hardness testing at high and low temperatures, an impact machine and other equipment. The tensile and compression creep testing machines are located in a special thermostatically-controlled room. A 50 channel strain gauging apparatus is available for use in the laboratory or in the field for measuring the loading of complicated structures.

Among investigations being carried out in the engineering laboratory are the effects of composition and strain rate on the brittle-ductile transition temperature in chromium; protection and lubrication of metal surfaces by penetrating monolayers of long chain alcohols; and the measurement of bend fatigue at high temperatures.

One of the principal early successes of the institute was the 'catalytic distillation' of aluminium. This depends on the reversible reaction between aluminium trichloride and any aluminium-bearing material to form volatile aluminium monochloride, which subsequently decomposes to form purified aluminium and aluminium trichloride, which is then recirculated. This method is now being adapted by Dr. P. Gross to the purification of titanium.

In this case, titanium tetrachloride is passed over the titanium-bearing material, and the unstable intermediate is believed to be $TiCl_2$. In connection with this research a number of physicochemical determinations are being carried out. Titanium activities in titanium alloys, free energy measurements on lower halide vapours by capillary vessel method, and investigations of the equilibria:

$$3TiCl_{4g} + Ti \rightleftharpoons 4TiCl_{3g}$$
$$TiCl_{4g} + Ti \rightleftharpoons 2TiCl_{2g}$$
$$3TiF_{4g} + Ti \rightleftharpoons 4TiF_{3g}$$

are among those being carried out.

Work is now in hand to convert laboratory scale apparatus for this process to pilot plant scale. Some pure titanium has already been produced by the method, and melted in a direct arc furnace.

Among numerous other pieces of interesting work are: application of low emissivity refractory coatings to the inside of gas turbines, thus reducing the amount of radiant heat absorbed; development of new aluminium-tin bearing alloys containing up to 30 per cent tin; improvement of the mechanical properties of reinforced plastics by the use of alumina flake; and a study of embrittlement of steel by hydrogen evolved during electrolytic treatment.

Guests included Lord Brabazon of Tara, Sir Edward Bullard, Sir W. S. Farren, Sir Henry Aubrey Fletcher, Sir Arthur Gouge, Sir Frederick Handley-Page, Mr. P. Horsfall, Brig.-Gen. Sir Harold Hartley, Lord Hives of Duffield, Sir Thomas Merton, and Mr. W. J. Worboys.

Obituary

We announce with regret the death of Sir Wallace Alan Akers, C.B.E., B.A., D.Sc., F.R.S., F.R.I.C., who was formerly research director of Imperial Chemical Industries Ltd. and director of atomic energy research in the Department of Scientific and Industrial Research from 1941 to 1946. He was 66. Educated at Christ Church, Oxford, he was with Brunner Mond & Company from 1911 to 1924 and after four years with the Borneo Company went to I.C.I., of which he later became a director. After taking part in wartime research on the atomic bomb, he returned to I.C.I. in 1946. Sir Wallace Akers was made a C.B.E. in 1944 and knighted in 1946. He was a trustee of the National Gallery, a Fellow and treasurer of the Chemical Society, a Fellow of the Society of Chemical Industry and a member of the Faraday and Biochemical Societies. In 1952 he became a member of the Advisory Council of the DSIR and in April 1953 was appointed a member of the committee to devise a plan for transferring responsibility for atomic energy from the Ministry of Supply.

We also regret to announce the death, at the age of 60, of Sir John Lennard-Jones, K.B.E., F.R.S., Sc.D., D.Sc., Principal of the University College of North Staffordshire since 1953. Educated at Manchester University and Trinity College, Cambridge, John Edward Lennard-Jones obtained a doctorate of science at both universities. He held the appointments of lecturer in mathematics at Manchester University and reader in mathematical physics at Bristol University and in 1925 was made Professor of Theoretical Physics at Bristol. He was later Dean of the Faculty of Science there, and in 1932 was appointed Plummer Professor of Theoretical Science in the University of Cambridge, a position he held until his appointment to the University College of North Staffordshire. During the last war he served in the Ministry of Supply, being for three years Chief Superintendent of Armament Research and later Director-General of Scientific Research (Defence). From 1942 to 1947 he was a member of the Advisory Council of the Department of Scientific and Industrial Research and from then until last year he was chairman of the Scientific Advisory Council at the Ministry of Supply. Sir John Lennard-Jones was the author of papers on the electronic structure of molecules, theories of chemical interactions at surfaces and theories of liquid structure and interatomic forces. He was elected a Fellow of the Royal Society in 1933 and was awarded the society's Davy Medal last year for his work in the field of application of quantum mechanics to the theory of valency and to the analysis of chemical compounds. He was made a K.B.E. in 1946 and from 1948 to 1950 was president of the Faraday Society. Two months ago he was awarded an honorary doctorate of science by the University of Oxford.

The death occurred on 26 October of Frederic Sutcliffe Aumonier, B.Sc., F.R.I.C., aged 75. Entering the Civil Service at the end of 1900 as an examining officer of Customs, he was appointed analyst in the Government Laboratory in 1911. He became superintending chemist in 1929, a post he retained until 1945, when he retired.

The death has occurred at his home in Glasgow of Mr. Thomas H. Ramsay, chairman of Shields and Ramsay Ltd., exporters of chemicals, of West George Street, Glasgow. He was 86, and had served with the firm for 63 years. Mr. Ramsay was a former director of the Glasgow Chamber of Commerce and a chairman of the West of Scotland section of the Society of Chemical Industry. He leaves two sons and a daughter.

Mr. Joseph Rogers Barkla, of J. W. Towers & Co. Ltd., Widnes, died on 27 October in his 80th year. He joined the company in July 1893, 11 years after it was founded, and had served it ever since until the day before his death.

Fire Protection in a Chemical Factory*

How I.C.I. Keep Down Incidence Rate

QUITE clearly when considering chemical plant fire protection there are many ways in which the problem can be tackled. After a general consideration of a few of the more common fire hazards likely to be met with in the chemical industry and general design of fire prevention, I propose to discuss one method of application of fire protection which has been adopted within our company which is not necessarily the best way of tackling the problem, but which is one that has been evolved for the particular requirements of the factory concerned.

One of the most common classes of chemicals met with in industry is the acid group. Organic acids are combustible, an example being acetic acid, used in the rayon, lacquer and plastics industry. Generally they are soluble in water, and do not present any difficulties to the fire engineer. On the other hand, inorganic acids are generally incombustible and their fire hazard comes from the fact that they may cause fire. For example, strong nitric acid in contact with such materials as straw or sawdust can generate sufficient heat to cause ignition.

Alcohols a Danger

Industrial alcohols loom very large on the horizon at present. Their flash point is very low and their explosive range in air lies between 3 per cent and 20 per cent by volume. Usually they are soluble in water and normal spillage can be easily dealt with by water spray—but it should be remembered that this is not always the case. Butyl and amyl alcohols are not soluble and foam should be used in the event of fire. Where an alcohol is soluble in water the alcohol/water mixture will remain inflammable until the concentration of alcohol is very low, in some cases down to about 15 per cent, and special precautions may be required for large stocks.

The aldehydes and ketones are usually volatile and are inflammable, but again usually soluble in water. They are used largely in the synthesis of dyes, plastics and resins.

The ammonium compounds vary considerably. Some, such as ammonium hydroxide, are non-hazardous from the fire point of view, while others, such as ammonium nitrite and nitrate, are susceptible to detonation by shock or heat. Usually the compounds are water soluble and water can be used effectively if they become involved with fire.

Amines are used as insecticides and plasticisers, and sometimes in the detergent industry. They can be treated as alcohols for the purpose of fire. They are water soluble and have a very low flash point.

Storage of Carbon

Carbon such as charcoal, lamp black, coke or coal, varies in its risk of fire. For instance, freshly prepared charcoal can absorb oxygen so rapidly that the rise of temperature can produce spontaneous combustion. On the other hand, large stocks of coal do not easily ignite and if the proper precautions on height and depth of stocks are observed, and temperature checks carried out, such stocks cannot be considered hazardous.

Hydrocarbons form one of the big hazards in industry, but when one considers the large quantities of these materials in use today, in the form of fuel or process material, the point that strikes one is not the number, but the lack, of fires. I think this very satisfactory state of affairs is due to the very adequate fire prevention and protection measures which are practised with these materials.

An example of a solid hydrocarbon used in the explosives, dyeing and fine chemical industries is naphthalene; it has a low melting point, a fairly low boiling point, and is insoluble. Its vapour pressure is such that storage of naphthalene in a warm place presents a hazard, as an inflammable mixture of air and vapour may be produced. Water or foam should be used for fire fighting.

The chlorates tend to cause fire under the action of heat or friction, and the case of

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* From a paper read before the Institution of Fire Engineers Conference at Torquay on 28 September by J. H. Hutchinson, A.M.I.Mech.E., of I.C.I. Ltd., Billingham.

Industrial Safety

a pedestrian causing a gas leakage when walking on sodium chlorate which had been spread as a weed killer struck me as being one of the more obscure causes of fire. Chlorates are, of course, strong oxidisers, and when mixed with organic dust, such as grass, do give conditions under friction for ignition and burning. In bulk and in drums, chlorate can explode if overheated. Water is the answer when fire-fighting.

Esters & Ethers

Esters and ethers, with their oxides, are a group of organic compounds which are usually highly inflammable, and many of them are liquid. The ethers generally have a high explosive range with a very low flash point, and their heavy vapour is a particular hazard, giving flash-back over considerable distances. These, in a class, are difficult to place with regard to water solubility. Some compounds classed as ethers, such as ethylene oxide, are water soluble, while ethyl ether is only very slightly so, and burning ether will float on water. According to recent tests ether fires can be most effectively dealt with by the dry powder chemical extinguisher, although water can, of course, be used to cool exposed containers and water in the form of spray can be used to extinguish fires caused by the water miscible ethers.

Gases which are normally met with in industry range from hydrogen, which is highly inflammable and has a very wide explosive range, through the hydrocarbons and acetylene, to those which assist fire extinction, such as CO_2 and nitrogen. All bring their particular problems to the fire engineer when considering fire protection, but the answer is straightforward; arrange for positive isolation and flood with inert gas and the fire is taken care of. The awkward cases you get, such as burning gas cylinders, cannot, of course, be isolated except under extreme danger and inert gas is not available. I am afraid that all that can be done in these circumstances is to isolate as far as possible and keep the container cool.

Tar acids is another group of chemicals. They are used as disinfectants and in the plastics industries; and include cresol, cresol compounds and phenols. They are all combustible and the use of water or water spray is effective if they are involved in fire.

The hazardous metals used generally in the chemical industry are the alkaline metals potassium and sodium and the alkaline earth metals calcium and magnesium. They are usually used as reagents and not as metals. They take fire and burn when heated and with the exception of magnesium they react with water to produce highly explosive gases. Great care should be taken when fighting fires of these materials, and smothering with dry sand or soda ash is the usual answer.

The sulphides, carbides and phosphides of the above metals have some application in industry and all must be regarded as hazardous when stored in bulk, particularly in damp atmospheres. Calcium carbide is the most likely to be met with, and as is well known, acetylene gas is freely produced when it is in contact with water. Should this gas be ignited it is generally thought to be inadvisable to attempt extinction, as, of course, in so doing, you may only bring on a worse condition with the mixture of gas in air. The usual practice is to keep the surrounding plant cool, keeping the water away from the fire, which should be allowed to burn out.

A Hazardous Substance

Sulphur is a chemical which is widely used in industry and it is one which causes lots of fires. I have been struck by the number which have come to my notice, and usually it is because the sulphur has been in the form of dust and in this state it easily ignites. It is a readily oxidisable substance and it is very hazardous in the presence of an oxidising agent. Usually, however, the cause of ignition is static or accidental spark and normally water is the answer in fire fighting. For the fire prevention officer, elimination of the point of ignition and segregation of stocks is the answer.

After this brief outline of hazards likely to be met with in the chemical industry, I want to come to the main point of this paper, which is fire protection. It is apparent that a greater or lower proportion of the hazards discussed above will decide the general line of approach to the problem. Another point which will influence such a decision is the type of factory to be dealt with. One of the principal problems is the old type of factory. The plant is generally housed in a building, not originally designed for the purpose, which probably has quite a lot of wood in its construction and often will be sited on a congested site. The staff may have inadequate facilities and manifestly the risks in cases like this are greater than on a modern concrete and steel structure designed with an eye to fire prevention and the restriction of fire spread. It is clear that the time to prevent fires is in the design stages of the plant and that a reduction in the number of chemical fires can only be achieved by careful planning and design.

Modern chemical practice demands that before a plant is built research work has to be carried out and probably a pilot plant operated so that sufficient information can be collected upon which to base the design of the plant. It is at this stage also that the design of the fire prevention measures should be decided upon. The extent of the chemical processes and their fire hazards are then known and a proper fire prevention should be incorporated in the design.

Fire Prevention Code

What are these fire prevention measures? Well, my company has given considerable thought to this matter and has drawn up a fire prevention code to be worked to when designing plant or modifying existing plant. The code is available and can be obtained at any time. It contains recommendations on all normal engineering practice; what to do when preparing a site for a factory; how to arrange and site the building and structures; where to put fire hydrants; what to do with inflammable liquid spillage which could spread fire through the drains; the legal requirements of fire prevention (a point which is too often overlooked); how to build machinery and plant to avoid a fire (such simple things as the arrangement of hot pipes and ducts and the arrangement of hazardous plants so that access is available for firemen and equipment); how to classify plant for suitable electrical apparatus; what to do about static electricity and spontaneous ignition and how to avoid means of fire spread; how to handle special risks such as transfer of inflammable liquids; how to arrange storage of hazardous materials to prevent fire; what to do about inflammable dusts, the supply of firefighting water equipment and special installations; and what is probably the most important of

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all, the general fire prevention measures to be incorporated during operation and maintenance, such as good housekeeping, line demarcation of hazardous areas, the prohibition of smoking, the issue of clearance certificates for maintenance work and the precautions to be taken when work of a hazardous nature is carried out. It is at this stage also that the aid of the Fire Prevention Officer should be enlisted in the discussions of the practical aspects of these fire prevention measures.

Right Thing at Right Time

So much for the design of plant. The next point of fire protection is application. Fires are prevented, if possible, and if, unfortunately, they do start, they are put out immediately by the men on the job—not a fireman, as one generally accepts the description, but a process worker who has knowledge of fire. A long time ago I once heard a very wise man say that there is a time in every fire when it can be put out with a bucket of water, and although time has now taught me that this statement is not entirely true, the main point behind it is quite clear; if you do the right thing at the right time the fire is out. The right time is certainly the first few seconds, and as it is impossible to get a fully-trained fireman on the job in a few seconds, the man to put the fire out is the man who is already there—the operator.

We believe that if the man is trained in his own special fire risk—if he deals with sulphur he is shown how to put out a sulphur fire; if he works with sodium he is given dry sand and a shovel—in other words, if he is given the special knowledge he requires, he is the man to do the job, quickly, efficiently, and in no great danger. It does not always succeed, and we must therefore see that the County Fire Brigade is called immediately, and I can say that if we fail, they always succeed.

And there we have our three main stages of fire protection. We have a wealth of technical knowledge which we use in design to prevent fires starting. If they start we depend upon the fire service to put them out and we get them to the fire as quickly as we can, but with a factory over 1,000 acres in extent this takes time—three

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or four minutes, and in that three or four minutes we try to put out the fire ourselves with the process worker who is actually on the spot. We train these people for the job and for this purpose we employ a squad of firemen whose job it is to keep the process workers fully trained and supplied with the right equipment.

In how far does this policy succeed? Last year we had reported 195 fires. Of these, 175 were put out on the spot, the remaining 20 were reported to the local authority, and of these 11 were put out before the brigade arrived, which leaves us with 9 out of 195 that the brigade were able to work on. This gave us a total fire loss of £2,300 which compares with capital assets of the factory of many millions of pounds. It should be explained that this factory operates 24 hours a day, as will most large chemical factories, and it has a priority fire call system on the internal telephone exchange, which allows for a fire call from any part of the factory to be transmitted by direct private line to the County Fire Brigade.

Help for Fire Officers

In what other ways does fire prevention operate? A point was once put like this: 'Well, that is all very well, but it does not help the fire officer if he is called and is faced with a chemical fire which he does not know much about. He may, for example, have a road tanker on fire, or it may be a chemical fire in the factory in the middle of the night and the management have gone home.' It is admitted that these things do happen but progress has been made. Road and rail cars are now usually marked to indicate their contents. The booklet entitled 'Marking Containers' is issued by the ABCM with details of how containers shall be marked to give an indication of their contents and also with instructions of what to do in the case of fire; incidentally, what to do with regard to the other hazards which are sometimes met with, such as the toxic nature of the contents. If a customer buys hazardous chemicals he is issued with an instruction sheet, letting him know all about the hazard and the type of extinguisher which could best be used.

All this information is available to the fire officer. There is always some technical man available who can supply the necessary information, and the time to collect it is before the fire starts. Other points which are noticeable in modern chemical design, which were put there as a means of helping the fire officer, are the provision of water dams at strategic points throughout the factory, in addition, of course, to the usual hydrants. The colouring of pipe lines as an indication of their contents, although primarily for the use of the process worker, is also of great assistance to the fire officer, who knows by the colour of the line that it is carrying water or steam and not an inflammable liquid.

Causes of Fires

Up to the present in this paper, I have dealt with what happens before a fire and at a fire. I suppose it might well be pointed out that these arrangements which have already been outlined did not prevent during last year 195 fires occurring. After-fire investigations reveal that only a very small proportion of these fires were caused by chemical hazards; the cause was generally carelessness.

Spillage of inflammable liquids	29
Gas leakage	20
Sparks from burners or welders	44
Naked flame or applied heat	21
Spontaneous combustion	19
Electric faults	8
Sparks from locomotives	1
Friction, hot bearing, etc.	22
Oil soaked lagging	14
Smoking	7
Doubtful	4
Explosion	5
Flashback of welding or burning torches	1
	195

Very few of these causes can be said to be of chemical origin: 'Spontaneous combustion,' 'Explosion,' 'Doubtful' (total 28). The rest are due to carelessness in one form or another—'Spillage of inflammable liquids,' usually in laboratories—'Gas leaks,' usually at glands or joints, due to lack of proper maintenance—'Naked flames or applied heat.' We must have heaters and we must, at times, have naked flames in the chemical industry, but we should be able to keep hazardous materials away from these sources of ignition. At times, however, someone will do something foolish, and the result is fire, but it is not always the fault of the operator. Quite recently we had a fire started from a burner head, which ignited material which had drifted in from a normal cleaning process; this was being carried out some distance away, outside the prescribed limit and certainly under a clearance certificate, but still near enough to give flashback and the result, of course, was a fairly serious fire. The solution was to rearrange the plant, to allow for cleaning at a safer place, or compound the area to enclose the naked burner so that inflammable materials could not get to it.

Good housekeeping in plants helps considerably—the painter who left his paint-

brush on a live steam pipe at the finish of his job did not realise that some time later the paint brush would smoulder and ignite a nearby gas leak which had not been detected, but that was the cause of a fire which gave us some considerable trouble, and had the principle of good housekeeping been observed we would have had one fire less.

Cancer in the Chemical Industry

By D. HAMER, Ph.D., A.R.I.C.

(Cancer Research Laboratories, The Medical School, Birmingham)

CANCER is an abnormal and uncontrolled growth of the cells of the body. The malignant cells spread through the body impairing the normal functions. If not treated adequately, illness and death may result. In most cases the cause of cancer is still not known, but in a very small proportion of cases it has been possible to attribute the origin of the disease to particular factors. One of these factors is exposure to an abnormal environment which may result in damage to the tissue cells, usually of one particular organ, and production of malignant cancerous growth. Nearly 200 years ago attention was first called to the high incidence of cancer of the scrotum among chimney sweeps and it was tentatively suggested that prolonged contact with soot was the cause.

No other features of this occupational disease were investigated in detail until the early part of this century when it was noticed that many cases of cancer of the skin were to be found among workers continually exposed to particular types of oils in spinning and other industries. Simultaneously the introduction of X-rays and radioactive materials and their expanding use was resulting in many cases of leukemia (cancer of the blood-forming organs) among workers who had been exposed to radiations before the danger was suspected.

The realisation of the cancer-producing (carcinogenic) activity of crude oils gave an impetus to chemical work in cancer research and led eventually to the isolation by Cook and Kennaway of an active agent from coal tar in pure form. It was a polynuclear aromatic hydrocarbon, 3:4-benzpyrene. A number of other complex hydrocarbons have since been synthesised and found to have different degrees of carcinogenic activity when tested on animals. Work is currently in progress on the isolation of the carcinogens in petroleum oils.

Recognition of Cancer-producing Conditions

Only indirect methods are available for the recognition of cancer hazards. The first is the statistical survey of the incidence of cancer of various types in particular occupations as compared with the incidence in the population as a whole. In some industries it is then found that where people have been exposed to a carcinogen for long periods, more cancer appears than would normally be expected. The success of this approach is largely dependent on the maintenance of accurate vital statistics for the whole community. Of course, not all workers exposed to an industrial cancer hazard will develop cancer nor is the actual number of people affected significant compared to the total number of cancer deaths.

The second method is to test the suspected conditions on experimental animals. Mice, rats, rabbits, etc., are not all equally susceptible to the known carcinogens and it is therefore very difficult to say if comparable effects would be obtained in humans. However, positive results in animals do point out potentially dangerous conditions and can serve as useful confirmatory evidence when taken in conjunction

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with the results of statistical surveys.

Identified Hazards

It should be noted here that there does not seem to be any close relation between toxicity and the cancer-producing power of chemical agents. Some are highly toxic (e.g. arsenic, nickel carbonyl) but others, such as the aromatic amines, are notable for their lack of ordinary toxic effects. Generally speaking, however, the dose which over a long period can produce cancer will probably be much less than the toxic dose.

(*a*) *Tars, pitches and oils.* As described above, the origin of cancer from industrial hazards was first observed in processes involving these types of materials. Among the agents in this group which have been found to be associated with the production of occupational skin cancer are Scottish shale oils, spindle lubricating oils (spinning), mineral cutting oils (engineering) and coal tar pitch. In some of these cases it seems likely that benzpyrene is the active agent, but in the case of petroleum oils the active material has yet to be isolated. Many crude oils are carcinogenic as obtained and this activity is increased by high temperature distillation and cracking. Distilled shale oil has been shown to contain other carcinogens in addition to benzpyrene, but these have not been isolated.

A great deal of work on the role of mineral oils in skin cancer was carried out by Twort and co-workers at Manchester. They found that some light textile oils produced cancer of the skin in mice much more readily than heavier engineering oils. It was believed that some unsaturated hydrocarbons in the oil were responsible since extraction with methyl sulphate and sulphuric acid would remove the carcinogenic potency[1,2]. Generally white oils of the liquid paraffin type have been found to be inactive in biological tests and it has been possible in some cases to use them to replace suspected oils in industry.

Hueper[3] has reported that in some cases fumes and dusts laden with oil and tar products present the danger of lung cancer. However, with the provision of machine guards, the use of adequate protective clothing, barrier creams and washing facilities coupled with regular medical inspection, cases of skin cancer from the above conditions should be completely avoidable. Two reviews by Henry[4,5] giving the historical background of industrial skin cancer are recommended.

(*b*) *Aromatic amines.* Statistical surveys in Europe in 1933 called attention to the high incidence of cancer of the urinary bladder among male workers in certain dye industries. Of the compounds in this group acting specifically on the bladder, all are primary aromatic amines. Some claims have been made in continental Europe that the simplest member, aniline, and its alkyl derivatives are active, but this has not been confirmed in Britain and the US. Both α- and β-naphthylamine are believed to be responsible for bladder cancer, particularly the β-isomer. Benzidine has also been found to present a cancer hazard. Although the naphthylamines and benzidine have been shown from statistical evidence to be responsible for bladder cancer in some industries[6], only β-naphthylamine has produced tumours in biological tests on animals.

Evidence Inconclusive

Case[6] considers that it is insufficient to consider contamination of α-naphthylamine with the β-form as the reason for its carcinogenic power. He has also pointed out that the experimental evidence that β-naphthylamine or one of its metabolites is directly responsible for tumour production is not yet completely conclusive since other carcinogenic impurities are to be found in 'pure' β-naphthylamine.

Use of these amines, and therefore the cancer risk, may involve other industries. For example, until recently a condensation product of naphthylamine and formaldehyde was used as an anti-oxidant in the rubber industry. This material contained a small amount of free naphthylamine isomers and statistical investigations indicated that there was an occupational risk of bladder cancer. Its use was therefore stopped[7].

In contrast to the materials considered in section (*a*), cancer produced by these amines ultimately develops at a site distant from the original point of contact with the body (skin and lungs). In such cases statistical work is of particular value. Careful medical supervision of workers in suspected conditions is imperative, along with adequate protective equipment and particularly good ventilation. In some cases it may be possible to modify the sequence of the stages of a process to avoid using the free amine by introducing the amino- group at a later stage.

(*c*) *Inorganic materials.* In a few cases inorganic compounds have been suspected of being associated with the occurrence of cancer of the skin and lung. Cancer of the lung has been attributed to the intake of arsenical dusts and fumes, while skin cancer has occurred through prolonged treatment of skin disease with arsenic. Cancer of the lung in cobalt mining may be due to the high arsenic content of the ore (cobalt arsenide, smaltine), but the picture is complicated as there is also appreciable radioactivity in the mine dust. The mining of asbestos has been found in various countries to introduce the danger of lung cancer.

Nickel Carbonyl

In England, nickel carbonyl has been reported as a cancer hazard, particularly for the lungs and nasal sinuses, but here too the data are not simple since there is arsenic present in the materials handled. Chromate and beryllium manufacturing processes also have an abnormally high incidence of lung cancer. In most of these cases it has not been possible to reproduce in experimental animals the suspected action on humans.

(*d*) *Radiations.* The early history of radium and X-rays well exemplifies the dangers to those who are reckless in dealing with them. The incidence of lung cancer in some old mines in Bohemia and Saxony where ores of high radioactivity were mined was found to be 42 as opposed to 1.5 for the general population. Dust conveying radioactivity deposited in the lungs and subsequently led to the development of lung cancer.

Another example occurred in the early 1920s when girls employed to paint luminous watch dials using a radium-zinc sulphide paint, started to develop anaemia, jaw necrosis and bone tumours. These disastrous results are believed to be due largely to a practice of pointing the paint-brush between the lips, so resulting in the continued intake of small amounts of radioactive material.

Safe dosage standards for workers are now a matter of great importance for the welfare of the individual and possibly, since the effects are often long-term ones, the

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welfare of future generations. With the prospect of the increasing and widespread uses of sources of short-wave radiation and the development of nuclear energy, the problem of protecting personnel exposed to these sources will become more acute.

It is obvious that the spectrum of the types of cancer caused by environment is still only partially known. New carcinogens will doubtless be discovered from time to time, and only by constant surveys of new industrial processes can possibly dangerous consequences be avoided. Periodic and extensive medical supervision, general personal hygiene, adequate protective clothing, control of machinery and plant design, etc., have all a part to play in reducing cases of cancer attributable to industrial hazards.

REFERENCES

[1] Twort & Fulton, *J. Path. Bact.*, 1929, **32**, 149.
[2] Twort & Twort, *J. Indust. Hyg.*, 1931, **13**, 204.
[3] Hueper, *Indust. Med. Surg.*, 1951, **20**, 49.
[4] Henry, 'Cancer of the scrotum in relation to occupation.' Oxford University Press, 1946.
[5] Henry, *Brit. Med. Bull.*, 1947, **4**, 389.
[6] Case *et al.*, *Brit. J. Indust. Hyg.*, 1954, **11**, 75.
[7] Case & Hosker, *Brit. J. Preventative, Soc. Med.*, 1954, **8**. 39.

For data on compounds tested biologically see 'Survey of Compounds which have been Tested for Carcinogenic Activity,' J. L. Hartwell. US Public Health Service Publication No. 149 (1951).

Safety Prizes

THE Royal Society of Arts offered this year a prize of £20 under the Fothergill Trust for an essay or model embodying some new idea for the prevention or suppression of fire. On the advice of the judge, Mr. S. H. Clarke, M.Sc., Director of the Fire Research Station, DSIR, the Council have divided the prize as follows: £10 to Mr. H. G. Bayliss, of Weymouth, for his essay on the inculcation of fire-consciousness in children; £5 to Mr. P. M. Pucill, of Chiswick, for a description of a warning device for the prevention of crankcase explosions in motor ships; and £5 to Mr. A. R. Broomfield, of Northampton, for a scheme for connecting a sprinkler alarm system direct to a fire station. The Council were unable to award the Benjamin Shaw Prize for Industrial Safety and the Howard Prize for Mechanical Motive Power, each of £20, which were offered at the same time.

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AN independent health research centre to study the effects of chemcials on humans is now under consideration by the US Manufacturing Chemists' Association, Inc., William C. Foster, president, told the Seventh Industrial Health Conference at Houston, Texas, recently. The chemical industry, Mr. Foster said, had invested millions of dollars and man-hours in toxicological research. If a central research centre was found feasible, the results from the correlaton of existing data and of original research would be available.

Mr. Foster told the meeting that a basic reason for the high level of American health lies in the contribution of industry as it applied scientific advancements. Next to medical and scientific skill, he cited chemistry as 'the greatest tool we have to protect and preserve human health' and said that the control of chemical reactions has provided mankind with a whole new set of tools for fighting disease and preserving health. He outlined how the industry pools its knowledge and ability to assure safe use of chemicals in public hands through proper labelling, education, publications, and by assisting public officials, when asked, in preparation of regulatory codes.

Mr. Foster then pointed to the results of these efforts. In accident frequency, he said, companies in the MCA safety programme stood fifth among 40 industries at the end of 1953 and the accident frequency rate had improved by 65 per cent over the 1935-39 average. In the same period, he pointed out, the industry had increased fourfold. As an indication of the decline of all chemical accidents, including those in the home, he cited National Safety Council figures which revealed that the number of deaths from poisons and poison gases in the United States dropped more than 50 per cent since 1927 to one of the lowest of the accidental death rates, while in the same period the population had increased by about 40,000,000.

TWO men were killed in an explosion in a blasting explosives cartridging house at I.C.I's Ardeer factory on 18 October. Seven other people were injured. The explosion was heard over a wide area, and shop windows in the main street of Kilwinning, four miles away, were shattered. Plate glass fell into a pram, but the child in it was unhurt. This was the third explosion this year at Ardeer. Three men were killed and four injured in March, and in August two men were hurt when there was an explosion in a glycerine nitrating house.

* * *

EXPLAINING the need for warning labels on hazardous chemicals, R. D. Minteer of the Monsanto Chemical Company told a symposium at the 8th National Chemical Exposition at Chicago, USA, that although the hazard of a sharp knife was apparent, the hazards of chemicals were invisible and therefore needed identification.

The regulations used in the chemical industry are based upon principles developed by the Labelling and Precautionary Information Committee of the Manufacturing Chemists' Association. Mr. Minteer, a member of that committee, said that while the MCA does not initiate regulations, it is available upon request to assist cities and states in drafting labelling codes.

He announced that the LAPI Committee is cooperating with the Chemical Specialities Manufacturers' Association in work on the labelling of household products applying the MCA principles. In this connection, Mr. Minteer told his audience that the important task of educating the public to read warning labels still confronts the industry.

* * *

RECENTLY issued by the Factory Department of the Ministry of Labour and National Service was the report on 'Electrical Accidents and their Causes' for 1952. (Form 929, HMSO, 3s.) The total number of reportable electrical accidents in factories during the year was 721, of which 38 were fatal. The report points out that portable apparatus at mains voltage has again been responsible for a high proportion of fatal and serious accidents. The socket-outlet, the plug, the flexible cable, the connections and terminal arrangements within the apparatus, and (last but not least) the earth continuity system and the earthing arrangements in the fixed installation—each takes its toll. Says the report, 'It is plain that a significant reduction in the number of accidents can only be achieved if the factory occupier and the actual user of the tools exercise greater care and realise that the very ease and convenience afforded by electrical gear must be accompanied by a high sense of responsibility on the part of those concerned.'

More and more firms are realising that earth leakage indicating and recording instruments reveal gradual deterioration and that, apart from the safety aspect, they help the maintenance engineer. However, these devices may give misleading results if they are not properly connected to the system, and the report gives some helpful hints, with examples of faulty connections.

The Chief Inspector of Factories issues certificates in respect of electrical apparatus for use in certain specified atmospheres. The number of these certificates is growing more rapidly than in the past, and the apparatus concerned is available as a safeguard against explosion and fire. An up-to-date list of certificates, showing the type of apparatus certified and giving the names and addresses of the manufacturers, is included as an appendix to the report.

* * *

DAMAGES of £3,900 were awarded at Birmingham Assizes recently to Mrs. Ellen Elizabeth Freeman of Hilton Street, West Bromwich, whose husband, Dennis Freeman (28), died 12 days after an explosion at the plant of Robinson Bros. Ltd., chemical manufacturers of Oldbury, on 5 February, 1953. Mr. Justice Finnemore held that the explosion could have been prevented if the firm had provided a safe method of working.

He apportioned £750 of the damages to a nine-month-old child and £500 to one aged three years and granted an application by Mr. A. E. James, for the firm, for a stay of execution pending consideration of an appeal.

Mr. F. Blennerhassett, for the widow, had said that the firm failed to take the most elementary precautions in the type of apparatus used in a process for making

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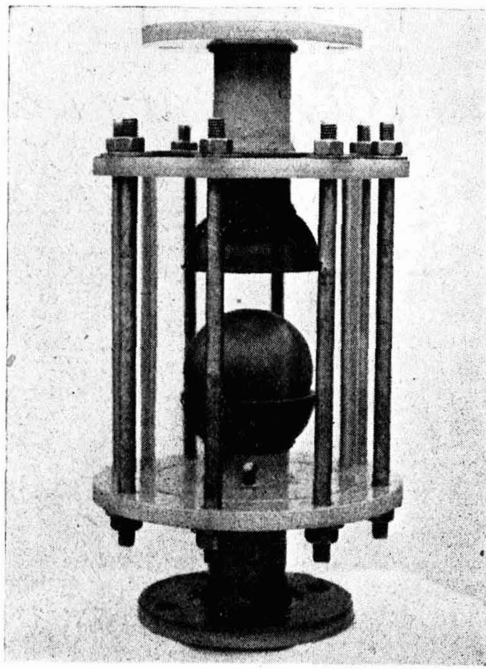
synthetic lubricating oil and in the building where the process was carried out. Mr. Justice Finnemore said that both sides accepted that the cause of the explosion was the contact between vapour fumes arising from the process and a naked pilot light in an adjoining room.

* * *

THERE were three fatal accidents during September in factories producing chemicals, oils, soap, etc. A total of 32 cases of industrial diseases were reported during the month. Among them were 11 cases of chrome ulceration, two of compressed air illness and one of manganese poisoning.



A sight check valve designed and fabricated by Turner & Brown Ltd., of Bolton, in Vybak VR215 and armoured glass. The valve is intended particularly for handling corrosive agents. It operates on the principle that the liquid flows in through the top and out through the aperatures below the float bowl; if the valve becomes full the Vybak ball floats and cuts off flow of liquid into the valve. This grade of Vybak sheeting has good chemical resistance and is easily formed and fabricated by hot gas welding

[*Photograph by Bakelite Ltd.*

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FIVE fire engines attended an outbreak at the Hillhouse factory of I.C.I. at Thornton, near Blackpool, on 14 October, the fourth blaze at the factory within six months. A stock of paraffin wax in a storehouse was involved. The fire was put out after two hours, and no one was injured. The cause of the blaze was unknown.

* * *

THE US Manufacturing Chemists' Association has been selected for a 1954 National Safety Council Association Award, made annually to trade associations who most actively promote safety in small businesses. According to the NSC the awards, 'give recognition to associations for the general excellence of their safety services and for their contribution to the reduction of occupational injuries in their industries.'

In making the awards the Council's technical committee and committee of judges take into consideration accident prevention activities such as publicity, safety conferences, contests and publication of technical material.

* * *

PROOF of the efficacy of industrial safety boots was provided in Birmingham at the beginning of National Industrial Foot Safety Week on 25 October by Mr. R. Bramley-Harker, chief superintendent of factory inspectors, South Midland division. Wearing the boots, he allowed a double-deck bus, weighing more than seven tons, to pass over each foot in turn. He survived.

Industry Gives £53,000

New Chair to be Established at Edinburgh

SIR Edward Appleton, Principal of Edinburgh University, announced on 29 October that in response to an appeal for funds for the endowment of a University Chair of Chemical Technology, £53,000 had been received from industry. Preliminary target for the endowment was £50,000.

Sir Edward also said that a new degree of Bachelor of Technological Science would be instituted within the University and would replace the present degree of B.Sc. in technical chemistry. In the first place it would be given only in the Department of Chemical Technology, but it might be awarded later in other fields of technology. Accommodation for the new department would be provided in the Heriot-Watt College, in new laboratories which were being constructed, and the University would transfer to the college the equipment in its present sub-department.

'Ever since the war Government and industrial spokesmen have repeatedly stressed the need, urgent need, for a large increase in our supply of thoroughly trained technologists and, in particular, of chemical technologists," said Sir Edward. The decisions they had taken, he went on, would provide a contribution to meeting the national need and might also give a lead to other centres.

Donors of the £53,000 were: Anglo-Iranian Oil Co. Ltd.; Imperial Chemical Industries Ltd.; Boots Pure Drug Co. Ltd.; Scottish Agricultural Industries Ltd.; The Brewers' Association of Scotland; Scottish Gas Board; Alex. Cowan & Sons Ltd.; Scottish Tar Distillers Ltd.; Tullis Russell & Co. Ltd.; Burmah Oil Co. Ltd.; A. B. Fleming Ltd.; Michael Nairn & Co. Ltd.; Distillers Co. Ltd.; Esso Petroleum Co. Ltd.; Paterson Engineering Co. Ltd.; William Thyne, Esq.; Bruntons (Musselburgh) Ltd.; Darling & Co. (Princes Street, Edinburgh) Ltd.; Henry Balfour & Co. Ltd.; Enamelled Metal Products Ltd.; British Oxygen Co. Ltd.; Fisons Ltd.; Glaxo Laboratories Ltd.; T. & H. Smith Ltd.; Babcock & Wilcox Ltd.; Albert E. Reed & Co. Ltd.; Whitbread & Co. Ltd.; The British Drug Houses Ltd.; Truman, Hanbury, Buxton & Co. Ltd.; and The Newcastle Breweries Ltd.

More Working

There were 514,000 people employed in the chemical and allied trades at the end of August, according to the *Ministry of Labour Gazette*. This was an increase of about 3,000 since the end of July and compares with a figure of 495,000 people employed at the end of August 1953.

HOME

Grant for Research

A grant of £750 a year for three years to provide assistance with research work in the Department of Chemistry was intimated at a recent meeting of Edinburgh University Court.

Bitumen Tank Alight

A bitumen tank in a paint store at the works of Evode Ltd., Stafford, caught alight on 31 October. Prompt action by Stafford firemen prevented serious damage.

Extension to Steel Works

A £1,500,000 extension and development of the Steel Company of Wales' Abbey works at Port Talbot (Glam.) will increase the weekly output of sheet steel by 2,700 tons, the company announced on 28 October. The plan, which will take 20 months to complete, has been approved by the Iron and Steel Board.

Trade Practice Rules

The Board of Trade have received copies of the Trade Practice Rules for the 'Chemical Soil Conditioner Industry' as promulgated on 15 October by the United States Federal Trade Commission. A copy may be seen at the Export Services Branch (Tariff Section), Board of Trade, Room 603, Lacon House, Theobalds Road, W.C.1.

Physical Society Exhibition

The Physical Society exhibition of scientific instruments and apparatus is to be held in the New Hall of the Royal Horticultural Society, Westminster, from 25 to 28 April 1955. It is anticipated that about 140 exhibitors will take part.

Rayon Production

Production in the rayon industry in September showed a marked improvement over August, despite the shorter month. An overall increase of 7 per cent, from 35,300,000 lb. to 37,900,000 lb. 'delivered weight' basis, brought the total to a level 5 per cent higher than that of September 1953. Production of continuous filament yarn rose for the first time since June and was 9 per cent higher than in August, although less than in September last year. Staple fibre production increased by 6 per cent above the August level and was 12 per cent better than a year ago.

Meeting Cancelled

The Chemical Engineering Group of the Society of Chemical Industry announce that, owing to unforeseen circumstances, it has been necessary to cancel the meeting arranged to take place in the apartments of the Geological Society, Burlington House, London W.1, on 9 November, when a paper on 'The Decolorisation of Sugar Liquor by Solid Adsorbents' was to have been read by H. C. S. de Whalley.

Donation from Dunlop

Dunlop have made a donation of £250 towards the cost of next July's annual meeting in Birmingham of the Society of Chemical Industry.

Unemployment in September

There was an increase of three in the figures of people in the chemical and allied trades in Great Britain unemployed in September, the number rising from 4,003 in August to 4,006. This included 2,293 men, compared with 2,414. The number of unemployed women rose from 1,589 to 1,713.

Genatosan Celebrates Golden Jubilee

To mark the completion of 50 years of growth Genatosan Limited, of Loughborough, recently held a reception and presentation ceremony for its employees and pensioners. Mr. H. C. Noton, managing director, gave silver tankards to those with 25 years or more of service in the combined names of Genatosan and Fisons. The 46 employees who received tankards had been with the firm for a combined total of 1,403 years.

Gassing Fatality

A valve mishap in a gas washing tower at the Cargo Fleet Iron Company's works, Middlesbrough, early on 29 October resulted in the death of the gas washer attendant and the gassing of 17 others, most of whom were allowed home after treatment. After the fouling of the gas seal clapper valve at the base of the washing tower, the gas washer attendant tried to remove the obstruction and prevent further escape of gas. He put on a gas mask and a lifeline but was overcome by gas and collapsed. The other casualties were due to the amount of gas which escaped.

OVERSEAS

Sulphur Production Starts

Production has begun at Noranda Mines' sulphur iron plant at Port Robinson, Ontario, Canada. Daily output will amount to about 62 tons of elemental sulphur, 240 tons of sulphur dioxide and 250 tons of iron sinter.

More Stockpile Copper Released

The US Office of Defence Mobilisation has authorised the release of 25,000 tons of refined copper from the stockpile for use by industrial consumers. This is in addition to the 26,500 tons released several weeks ago and is designed to help industry combat the copper shortage due to recent labour difficulties.

More Overseas Co-operation

Theme of a recent meeting of the Commercial Chemical Development Association, an American trade group, was that US chemical producers can obtain successful results in foreign operations—larger sales, increased technical knowledge and profits—if they co-operate with foreign companies.

Coal-Tar Products

Increased production of refined tar, pitch, and creosote oil raised the factory value of products shipped by Canada's coal-tar distillation industry in 1953 by 8 per cent to $13,634,899 from $12,634,276 in the preceding year, according to the Bureau of Statistics annual industry report. There were 11 distilleries in operation with 541 employees (500 in 1952) and a wage and salary bill of $1,861,353 ($1,679,495).

Aden Platformer Commissioned

The first platforming unit to be commissioned in the Middle East, that at Anglo-Iranian's Aden Refinery, is now operating. Only one other unit in the refinery—an autofiner, in which sulphur will be removed from power kerosene—remains to be brought on stream. The Aden platformer, which produces a high grade motor spirit component by a reforming process using a platinum catalyst, has a capacity of approximately 500,000 tons a year.

Soviet Steel Claim

Earlier this week Moscow radio claimed that during 1953 the USSR produced 38,000,000 tons of steel, more than Britain, France, Italy and Belgium combined.

Refinery for Ceylon

The Shell Company of Ceylon has agreed to consider the possibility of establishing an oil refinery in Ceylon, it is reported from Colombo. Several possible sites have been investigated.

Canadian Tungsten Cre

Burnt Hill Tungsten Mines of Canada has, it is reported, made new finds of high grade tungsten ore 65 miles north of Fredericton, New Brunswick. There is believed to be enough ore to supply the firm's 150-ton concentrator for 20 years.

Extension to Fibre Plant

Extensions being undertaken at the Glanstok-Courtaulds plant in Cologne will result in the daily capacity of staple fibres being doubled at the end of the year from 25 to 50 tons.

Australian Rayon Bounty

On the recommendation of the Tariff Board the Australian Government has decided to pay a bounty on a type of rayon produced by Courtaulds (Australia) at its Tomago works, near Newcastle, New South Wales. The bounty will be 6d. per lb. on continuous filament acetate rayon yarn and operate for three years from 1 November. The maximum amount payable in any year will be £A100,000.

Rand-Durban Pipeline

Documents were lodged recently with the Registrar of Companies in Pretoria for the registration of a company entitled OPCOR (Overland Pipeline Corporation) with a provisional capital of £10,000. The company's representatives have signed a contract for the survey of the route for a petrol pipeline from Durban to the Rand.

Nonyl Phenol Production

Production of nonyl phenol has started at the Elmira, Ontario, plant of Naugatuck Chemicals, a division of Dominion Rubber Company. In addition, a second unit is intended to be operating early in 1955. Naugatuck has also begun production of a new, light stable polyester resin. The new resin, called Vibrin 152-7-LS is especially designed for the manufacture of corrugated and flat translucent sheets for building and decorative use.

· PERSONAL ·

MR. G. V. K. BURTON and MR. M. N. GLADSTONE have been appointed directors of Pest Control Ltd. Mr. Gladstone was previously an alternate director.

On reaching the retiring age, MR. D. M. HUGHES has resigned from the board and the office of managing director of British Benzol and Coal Distillation. MR. G. H. JOHNSON, the chairman, will now combine his office with that of managing director. MR. IDWAL WILLIAMS, who has been with the company since its foundation and secretary for the past ten years, has been appointed a director.

The British Aluminium Company Limited announce that MR. P. RALPH has been appointed manager of the Scottish branch sales office in succession to MR. M. J. J. RICHARDS, who has been appointed assistant manager of London branch sales office. These appointments took effect from 1 November.

The appointment has been announced of GEORGE MURRAY BURNETT, B.Sc., Ph.D. (Aberdeen), D.Sc.(Birmingham), to the chair of chemistry at the University of Aberdeen. Dr. Burnett, who was born in South Africa in 1921 and educated in Aberdeen, is at present a lecturer in physical chemistry at Birmingham University, where he has been concerned with polymerisation kinetics. He will take up his new appointment early next year in succession to PROFESSOR R. M. BARRER, D.Sc.(NZ), Ph.D., Sc.D.(Cantab.), F.R.S.E., F.R.I.C., who has been appointed Professor of Physical Chemistry at the Imperial College of Science and Technology, London.

MR. FRANK HANDFORD, manager of Imperial Chemical Industries Ltd. shipping offices, at Middlesbrough, since 1945, has retired after 35 years with the firm and its predecessors. Mr. Handford's successor is MR. C. HOLTTUM.

GENERAL SIR G. IVOR THOMAS has been appointed a director of Rubber Improvements Ltd., manufacturers of rubber, plastics, etc.

The first holder of the Tin Research Institute Fellowship, which has been established at University College, London, is R. H. PRINCE, B.Sc. He is to carry out research in organo-tin compounds.

Wills

MR. GEORGE ALFRED PARKES, of the Palace Hotel, Birkdale, Southport, and the Union Oxide & Chemical Co. Ltd., Wigan, sales manager, left £19,399 (duty £2,308).

MR. DANIEL SILLARS, of 32 Rivington Road, Hale, Cheshire, formerly of Saltburn, a former chief metallurgist and technical adviser to Dorman Long & Co. Ltd., left £14,199 (duty £843).

DR. CHAIM WEIZMANN, who died in November 1952, left estate in England valued at £12,072. He left all his property, with the exception of a bequest of £100, to his wife. Dr. Weizmann, who was the first President of Israel, spent most of his life in England and made great contributions to the British chemical industry, particularly in the field of organic chemistry.

Exemptions From KID

THE Board of Trade are considering the question of the renewal for the period 19 February, 1955 to 18 August, 1955, of the exemptions from Key Industry Duty as set out in the Safeguarding of Industries Exemption Orders, namely, the Nos. 8 and 9 Orders, 1954 and in any further Exemption Orders which may be made prior to 19 February, 1955, under Section 10(5) of the Finance Act, 1926, as amended by subsequent enactments. Lists of the articles exempted from Key Industry Duty by these Orders until 18 February, 1955 were published as Statutory Instruments 1954, Nos. 1086 and 1191.

Any communications arising out of this announcement should be addressed to the Industries and Manufactures Department, Division 1A, Board of Trade, Horse Guards Avenue, London S.W.1, as soon as possible and in any case not later than 20 November.

The two orders (See THE CHEMICAL AGE, 1954, **71**, 373 and 580) deal with imports of various fine chemicals and scientific instruments.

Publications & Announcements

ADDENDA and corrigenda to the catalogue of Hopkin & Williams Ltd., Chadwell Heath, Essex, are issued from time to time. They contain those alterations, additions and price revisions which have been made since the catalogue went to press. So far three have been issued: in March, June and August. Over 90 additions are listed, including useful reagents such as 2,9-dimethyl-1, 10-phenanthroline, 2,2′-diquinolyl, potassium dibenzyldithiocarbamate, and sodium tetraphenyl boron.

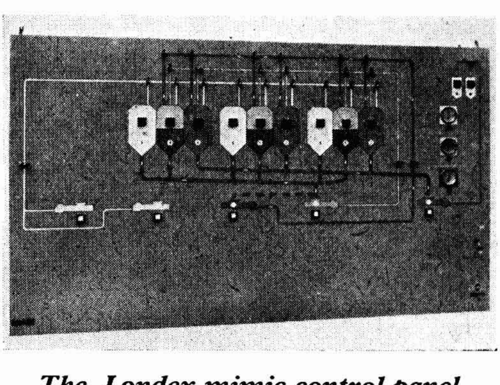
* * *

INCREASED factory area has enabled Londex Ltd. to accept more orders for the design and manufacture of automatic control panels. Units are made mostly to customers' specifications, but advice and assistance is often required in connection with the electrical circuitry in which Londex engineers have a great deal of experience.

A good example of the production capabilities is illustrated by the photograph of a Mimic Control panel which has been manufactured to the specification of Constantin (Engineers) Ltd., 123 Victoria Street, London S.W.1.

This equipment has been despatched recently to the Solway Chemical Company Whitehaven, Cumberland. Its function is to control automatically various blending processes and also to give a complete visual indication of what is taking place; alarm circuits are provided to give warning of over-full hoppers.

Among the components incorporated in this equipment are relays; condenser delay units; sequence controllers; auto-reset timers; and direct-on starters.



The Londex mimic control panel

A PROBLEM frequently encountered in solvent type carnauba wax polish formulations is the prevention of surface bloom, shrinking and crazing on storage. Experimental work recently carried out by Monsanto Chemicals Ltd., London S.W.1, has indicated that replacement of part of the solvent by Aroclor 1242 greatly reduces surface bloom, and in some instances shrinkage and crazing have been virtually eliminated. The work has been based on a typical formulation containing 6 per cent carnauba wax which was taken as a standard and compared with similar formulations in which varying amounts of solvent were replaced by Aroclor 1242. From the results it is evident that the inclusion of 10 per cent Aroclor 1242 in solvent based carnauba wax formulations offers a distinct improvement in the storage properties of the polish and it is suggested that further work along these lines by polish manufacturers would be worthwhile, particularly in view of the relatively low price of Aroclor 1242.

* * *

AN interesting development in Pyrex laboratory and scientific glassware is the co-operation of James A. Jobling & Co. Ltd. with Dr. J. H. Wilkinson of the Chemistry Department of Sunderland Technical College, in the production of a range of semi-micro glassware for organic preparation. In science teaching today there is a trend towards the use of semi-micro apparatus because of its obvious advantages, including the low initial cost, the small quantities of chemicals required, the reduction of the danger factor where poisons and obnoxious fumes are concerned, the shorter time necessary for preparations on this scale and the relatively minute storage space required. Dr. Wilkinson has standardised on a range of apparatus in Pyrex glass that is easily adaptable to all the work of the chemistry teacher in technical colleges who is dealing with organic preparations; in particular the needs of the pure science and pharmacy students have been catered for. These semi-micro preparations, and specifications of the apparatus, are described in Dr. Wilkinson's book *Semi-Micro Organic Preparations* (Oliver and Boyd). The Pyrex glassware is manufactured by James A. Jobling & Co. Ltd., Sunderland.

Next Week's Events

MONDAY 8 NOVEMBER

The Institute of Fuel

Newcastle-upon-Tyne: Chemistry Lecture Theatre, King's College, 6.30 p.m. 'Smoke Abatement' by Dr. A. C. Monkhouse.

The Institute of Metals

Glasgow: The Institution of Engineers and Shipbuilders in Scotland, 39 Elmbank Crescent, C.2, 6.30 p.m. 'Some Metallurgical Problems in Welding Non-ferrous Metals' by P. T. Houldcroft.

TUESDAY 9 NOVEMBER

The Royal Institute of Chemistry

London: Large lecture theatre, Chemistry Department, Imperial College of Science and Technology, S.W.7, 5.30 p.m. Meldola medal lecture on 'Fluorocarbon Derivatives' by Dr. R. N. Haszeldine.

The Institute of Metals

Swansea: Metallurgy department, University College, Singleton Park, 6.45 p.m. 'Some Aspects of Creep' by Dr. J. P. Dennison.

WEDNESDAY 10 NOVEMBER

The Royal Institute of Chemistry

Norwood: Technical College, Knight's Hill, 7 p.m. Film display.

The Chemical Society

Aberdeen: Robert Gordon's Technical College, 6 p.m. 'Food Legislation During the War' by Sir Harry Jephcott (with the Royal Institute of Chemistry and the Society of Chemical Industry).

Society of Chemical Industry

Greenford, Middlesex: Glaxo Laboratories Limited, Greenford Road, 6.30 p.m. Food and Agriculture Group Conversazione.

British Association of Chemists

London: The Wellcome Institute, 183 Euston Road, N.W.1, 7 p.m. 'Work Study as a Means of Increasing the Productive Efficiency of Chemical Plants' by J. Grange Moore.

The Institution of Chemical Engineers

Birmingham: The University, Edmund Street, 6.30 p.m. 'Evaporator Entrainment' by Professor F. H. Garner, S. R. M. Ellis and J. A. Lacey.

Chester: The Grosvenor Hotel, 7 p.m. 'The Pulsed Column in Liquid-liquid Extraction' by J. A. Williams and D. J. Little.

Cardiff: University College of South Wales and Monmouthshire, Cathays Park, 7 p.m. Graduates and students section. 'Plant Management' by Dr. R. A. Gregory.

Midlands Society for Analytical Chemistry

Edgbaston: Chemistry theatre, The University, 6.30 p.m. 'The Analytical Chemistry of the Halogens' by Dr. R. Belcher.

The Institute of Fuel

Manchester: The Engineers' Club, Albert Square, 6 p.m. 'Gas Turbines' by F. Hickson.

Manchester Metallurgical Society

Manchester: Lecture room, Central Library, 6.30 p.m. 'X-rays in Metallurgical Research' by Dr. E. A. Calnan.

THURSDAY 11 NOVEMBER

The Royal Institute of Chemistry

Acton: Technical College, High Street, W.3, 7 p.m. 'Some Recent Developments in Isotope Chemistry' by Dr. J. M. Fletcher.

The Royal Society

London: Burlington House, Piccadilly, 4.30 p.m. 'The Optical Properties of Thin Oxide Films on Tantalum' by A. Charlesby and J. J. Polling, and 'The Interaction of Oxygen with Clean Metal Surfaces' by M. A. H. Lanyon and B. M. W. Trapnell.

The Royal Institution

London: 21 Albemarle Street, W.1, 6 p.m. 'Some Aspects of Geophysics—Continents and Oceans, Part 1' by Dr. J. McG. Bruckshaw.

The Chemical Society

Manchester: Robert Robinson Lecture Theatre, The University, 5 p.m. Meeting for reading of original papers.

Edinburgh: University Chemistry Department, King's Buildings, West Mains Road, 7.30 p.m. Visit to the research laboratories (with the Royal Institute of Chemistry and the Society of Chemical Industry).

Society of Chemical Industry

London: Large hall of the Medical Society of London, 11 Chandos Street, W.1, 6.15 p.m. Joint meeting of the Agriculture and Microbiology Groups on 'Digestion in the Ruminant'. 'Bacteriology and Protozoology' by Dr. A. E. Oxford, and 'Physiological Aspects' by Dr. A. T. Phillipson.

The Institution of Chemical Engineers

London: Geological Society, Burlington House, Piccadilly, 5.30 p.m. Eighth Hinchley Memorial Lecture. 'Reflections on the Management of Heat' by Sir Alfred Egerton.

The British Ceramic Society

London: Library of the Royal Sanitary Institute, 90 Buckingham Palace Road, S.W.1, 10 a.m. Opening of autumn meeting of Refractory Materials Section (to 12 November).

Incorporated Plant Engineers

Newcastle-upon-Tyne: Roadway House, Oxford Street, 7 p.m. 'Industrial Lubrication' by N. Errington.

Institute of Metal Finishing

London: Royal Empire Society Hall, Northumberland Avenue, W.C.2, 7 p.m. 'Surface Finish and its Measurement by Electronic Methods' by S. F. Smith. (Joint meeting with Institution of Production Engineers, London Section).

The Institute of Fuel

Nottingham: Gas Showrooms, 6.15 p.m. 'Grit and Dust Collection from Industrial Furnaces' by J. O'Breen.

The Institute of Metals

Harwell: Visit by Birmingham Local Section to the Metallurgy Division, Atomic Energy Establishment.

FRIDAY 12 NOVEMBER

The Chemical Society

Newcastle-upon-Tyne: Chemistry Building, King's College, 5.30 p.m. Bedson Club Lecture, 'The Comparative Organic Chemistry of Nitrogen, Phosphorus and Arsenic' by Dr. F. G. Mann.

Swansea: Chemistry Department, University College, 6 p.m. 'Reactions of Some Organic Cations' by Professor H. Burton (joint meeting with the Royal Institute of Chemistry).

Society of Chemical Industry

Plymouth: The Technical College, 2.30 p.m. and 6.30 p.m. Corrosion Group. Discussion of practical corrosion problems of industries in the South West.

The Institution of Chemical Engineers

London: Caxton Hall, S.W.1, 6.30 p.m. Graduates and Students Section. 'Feedback in Chemical Engineering Processes' by F. F. Ross.

SATURDAY 13 NOVEMBER

The Society of Analytical Chemistry

Cardiff: Merton House, Bute Crescent, 2.30 p.m. 'Gas-phase Chromatography as an Analytical Technique' by C. J. Hardy.

The Institution of Chemical Engineers

Darlington: Technical College, 2.30 p.m. Graduates and Students Section, North-East and Yorkshire Centres. Joint symposium on the 'Mixing of Solids'.

Leather Trades' Chemists

A MEETING of the Manchester Group of the Society of Leather Trades' Chemists was held on 27 October in the Reynolds Hall of Manchester College of Technology, when Mr. J. M. Harrison, A.R.I.C., read a paper on 'The Use of Waste Products from the Heavy and Light Leather Industries.'

The lecturer said that waste products from the tannery had for many years provided the raw materials for such industries as glue and gelatin manufacture and felt making, but there were other wastes for which no use had yet been found.

The factors to be considered in waste product recovery were the quantity available, the ease of handling, the plant required for conversion and the value of the end product. As the tanning industry consisted of a large number of comparatively small units, the amounts of waste products from each were not sufficient to make the setting up of recovery plants in each unit an economic proposition. Where such units were grouped geographically, however, a collective policy might be advantageous to each member of it.

Large quantities of myrabolams were used by tanners every year and the disposal of the spent material often created a problem. Mr. Harrison described experiments in the conversion of this material into activated carbon. Chrome tanning salts had been recovered from used tanning liquors and also from chrome shavings, the latter being suitable for conversion into gelatin when the chrome has been removed. Chrome tanned shavings had been used for the reduction of dichromate in the manufacture of one bath chrome tanning liquors. Vegetable tanned leather wastes could be prepared for use as fertilisers or converted into leather boards for various applications.

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.)

PLASTICS MARKETING CO. LTD., Sevenoaks. 28 September, mortgage to National Provincial Bank Ltd., securing all moneys due or to become due to the bank; charged on freehold property, part of the Old Bakery, Buckhurst Avenue, Sevenoaks, with plant, fixtures, etc.

Increases in Capital

The following increases in capital have been announced: WM. NEILL & SON (ST. HELENS) LTD., from £200,000 to £250,000; KEMBALL BISHOP & COMPANY LTD., from £400,000 to £800,000; ROBERT HALDANE & CO. LTD., from £10,000 to £15,000; RUTIN PRODUCTS LTD., from £1,100 to £3,000; MAGADI SODA COMPANY LTD., from £830,000 to £1,000,000; GEORGE H. ANDERTON LTD., from £40,000 to £120,000; PANCREOL LTD., from £30,000 to £75,000: BREMNER-WHITE LTD., from £1,000 to £5,000.

New Registrations

C. Gardner Ltd.

Private company. (538,672.) Capital £4,000. Chemists, druggists, drysalters, oil and colour men, etc. Directors. Clifford Gardner and Mrs. Jean W. Gardner. Reg. office: 153 Briercliffe Road, Burnley.

Northumbrian Finance Ltd.

Private company. (538,983.) Capital £30,000. To acquire and hold shares, stocks, debentures, etc. Power is taken to carry out physical, chemical, metallurgical, engineering and other research, etc. The subscribers (each with one share) are: R. Angus Fraser, Cyril J. Pollard and Geo. Conrad. The first directors are to be appointed by the subscribers. Reg. office: Cross House, Newcastle-upon-Tyne.

Change of Address

The Birmingham address of London Metal Warehouses Ltd. from November will be Gazette Buildings, 168 Corporation Street. Tel.: CEN 4751/5.

New Cardiff Office

From Monday, 25 October, the Cardiff office of Babcock & Wilcox Limited, formerly at 102 St. Mary's Road, has been at 26 High Street, Cardiff. The new telephone number is Cardiff 29366.

Company News

Bakelite Ltd.

The directors of Bakelite Ltd. are raising the 1954 interim dividend from 3 to 5 per cent, but state they have been influenced in order to bring about a closer relation between the interim and final payments. The increase, they add, must not be taken as an indication of a higher total dividend.

Courtaulds Ltd.

Courtaulds Ltd. have declared an interim dividend of 4 per cent on the £48,000,000 capital. Last year interims of 5 per cent and 1¼ per cent were declared, both on £24,000,000 capital. The directors state that this year's dividend is justified by trading results during the first half of the company's financial year.

Erinoid Ltd.

Erinoid Ltd. are repeating the 5 per cent annual dividend for the year ended 31 July. The trading profit, subject to audit, is £148,351, compared with £154,012 and the net profit after tax is £41,081 (£36,087).

Fisons Ltd.

Net group profit of Fisons Ltd. for the year ended 30 June was £993,208, after tax, compared with £701,429 for the previous year. A final dividend of 10 per cent on the £4,800,000 capital makes a total of 15 per cent last year. This recommendation compares with a 12½ per cent total last year on capital of £4,400,000.

[continued on p. 1006

Benzol & By-Products Ltd.

At the 35th annual general meeting of Benzol & By-Products Ltd. on 21 October it was reported that the total revenue of £14,419 showed a relatively minor increase on the figure for the previous year.

British Match Corporation Ltd.

The board of British Match Corporation Ltd. has declared an interim dividend of 3½ per cent for the year ending 31 March, 1955 (against 2½ per cent), payable to ordinary stockholders on 15 December. The increase in rate is to reduce the disparity between the interim and final dividends and does not necessarily indicate a higher rate for the year.

Unilever Ltd.

The directors of Unilever Ltd. and Unilever NV announce one-for-four scrip issues by a capitalisation of share premiums. They also state that they intend to declare interim dividends on 29 November of the equivalent of 6 per cent (Unilever Ltd.) and 5¼ per cent (Unilever NV) on the increased capital.

Thos. W. Ward Limited

Increasing production costs may result in the narrowing of profit margins, says Mr. H. W. Secker, the chairman of Thomas W. Ward Limited, in his annual review. But as long as the iron and steel industry maintains its present rate of productivity, the firm can expect its activities to continue at a high level. Profits after taxation but before allocations for the year to 30 June amounted to £782,313, against £798,097. The meeting is to be on 19 November.

Vacuum Oil Co. Ltd.

The 1953 report of Vacuum Oil Co. Ltd. shows a deficit for the year of £761,625, after providing £391,140 for interest and £624,373 for depreciation. The loss was largely due to the fact that the Coryton refinery operated at a substantial loss which was augmented by the loss on crude-oil freighting. The extent of the company's expansion programme is shown by the fact that fixed and current assets increased during the year from £19,000,000 to £27,000,000, of which some £5,900,000 represents expenditure on capital projects. After allowing for £1,247,842 depreciation, the net value of the refinery and other buildings, plant and equipment as at 31 December 1953 was £18,180,870.

Powell Duffryn Ltd.

The board of Powell Duffryn Limited announce that arrangements have now been concluded through Hoare & Co. for the sale privately to institutional investors of the £7,250,000 5 per cent Loan Stock 1960/85 of Vacuum Oil Company Limited at a price of £101 per £100 Stock. The first half-year's interest payment due on 1 November next will be received by the Powell Duffryn Group. As a result of the early sale of this Loan Stock it may be found possible to accelerate the capital reorganisation of the company, and consideration is now being given to the preparation of a scheme for submission to shareholders without necessarily waiting for the final settlement of the company's claims against the National Coal Board.

Market Reports

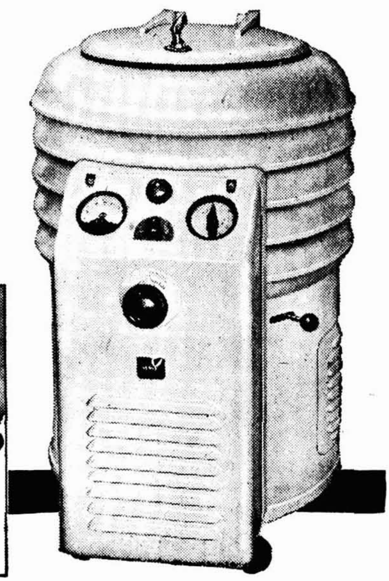
LONDON.—Activity on the industrial chemicals market has been fairly brisk with the movement on home account fully up to recent volumes. Orders for shipment have been on a steady scale with the Commonwealth countries the chief outlets, but considerable leeway has to be made up in the serious delays caused by the dock strike. Otherwise, supply conditions are reasonably good. There have been no important price changes other than the reduction in the Convention quotations for white lead and red lead which became effective as from 2 November. The new basis prices are—white lead £140 per ton, red lead £135 5s. per ton, and litharge £137 5s. per ton. Conditions on the tar products market are unchanged and prices are steady. Pitch and creosote oil are perhaps a little more active.

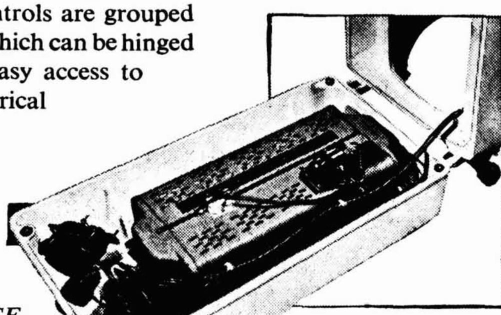
MANCHESTER.—A fairly active movement of supplies of a wide range of heavy chemicals to the textile and allied trades has been reported on the Manchester market during the past week, with steady contract delivery going forward to most other leading industrial outlets. New inquiries for the soda and potash compounds and other lines have been circulating fairly satisfactorily. Quotations generally are maintained on a steady to firm basis. Fresh bookings in fertiliser materials have been moderate in extent, while a ready outlet continues to be found for most of the light and heavy tar products.

MSE 'MAGNUM' CENTRIFUGE

★ Capacity 1.5 litres ★ Speeds up to 5,000 r.p.m. ★ Large range of accessories ★ Automatic timer

This is the perfect general-purpose larger capacity centrifuge. It will accommodate a swing-put head for six 250-ml. bottles and a large range of other swing-out, angle and basket-type heads with all usual buckets, adaptors and multiple carriers. Super-speed unit available. All controls are grouped in a single panel which can be hinged right down for easy access to the entire electrical installation.





MSE

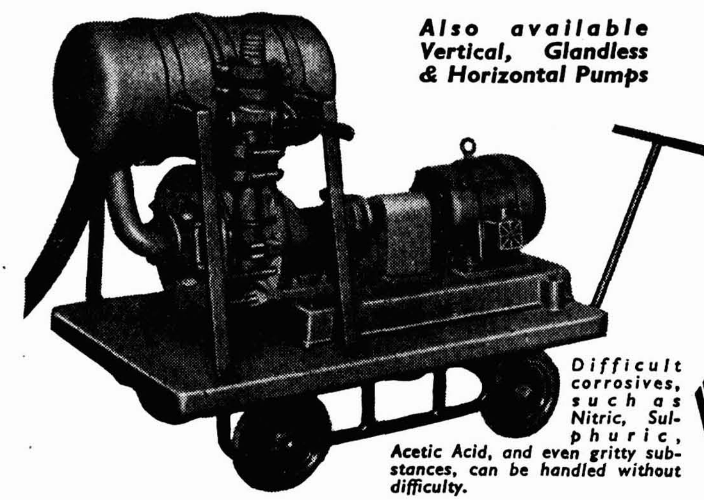
Full details in MSE Publication 133, *on request.*

MEASURING & SCIENTIFIC EQUIPMENT LTD.
SPENSER STREET, LONDON, S.W.1.

Acid handling

PORTABLE PUMPING UNITS

FOR REGULAR OR AUXILIARY WORK



Also available Vertical, Glandless & Horizontal Pumps

Lennox Portable Pumping Units are invaluable in every Factory where Chemicals are employed. The Pump is easily wheeled to the required position and can be connected with flexible pipe in a few minutes. It will empty Store Tanks, Pickling Tanks, Sludge Sumps, Tank Wagons, etc., and deliver the contents wherever required.

Difficult corrosives, such as Nitric, Sulphuric, Acetic Acid, and even gritty substances, can be handled without difficulty.

Lennox

LENNOX FOUNDRY CO. LTD.
Tantiron Foundry, Glenville Grove, London, S.E.8.

CLASSIFIED ADVERTISEMENTS

FOR SALE

600

COMPLETE VACUUM DRYING PLANT by Scott comprising two horizontal cylindrical jacketed vacuum driers, each approximately 8 ft. long by 42 in. i.d. Interior tinned and fitted agitator in glanded bearings. Drive by motor through reduction gear together with two horizontal Scott wet vacuum pumps, condenser, calorifier, hot water pump, and water circulating tank. Common feed hopper with breeches outlet. Motorised 400-440/3/50.

UNUSED DRYING PLANT by Richard Simon, comprising size 5C patent horizontal continuous drying machine approximately 20 ft. long by 6 ft. wide of cast-iron construction, fitted revolving reel of solid drawn steel tubes heated by live steam with agitators fitted, rotary feed screws, vertical bucket elevator chain driven from main drive shaft, vapour extraction fan, and ancillary equipment. Loco. type boiler for steam supply available.

NEW ESCHER-WYSS SYSTEM TWIN ROLL SPRAY DRIER—rolls of chilled cast iron, 40 in. long by 32 in. diam. W.P. 74 lb./sq. in., fitted air-cooled doctor blades, rotary disc distribution trough, air spray jets and worm discharge conveyors. Ancillary equipment comprises stainless steel feed pump, jacketed feed tank, aluminium encased powder dresser, valves, gauges, and all electrics.

SIX NEW VACUUM DRYING OVENS—mild steel construction, approximately 7 ft. long by 42 in. wide by 42 in. deep, fitted 9 steam-heated shelves to carry 36 acid-resisting metal trays 36 in. long by 16 in. wide by 1¾ in. deep. Davit swung door at each end, with handwheel closing mechanism. Complete with motor-driven horizontal wet vacuum pump, metal trays, all pressure and vacuum gauges, and connecting pipe.

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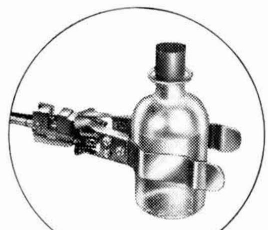

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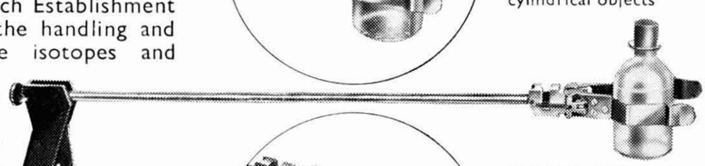

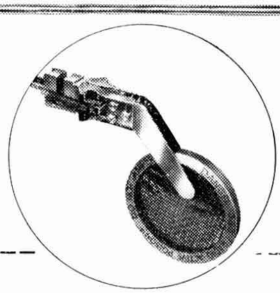

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